

An e-learning Manual for Implementing Total Quality Management

Volume 1

A Roadmap to Quality



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

 Japanese Standards
Association

A Roadmap to Quality

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Total Quality Management**

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
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Introduction



Introduction

A Roadmap to Quality is an online e-learning manual for implementing Total Quality Management (TQM) throughout your company. Its 20 units with over 160 short texts provide clear practical guidelines for the full range of management activities – from managing company policy to keeping the workplace clean and tidy. Learning activities help you to relate the guidelines in each text to the concrete situation in your company, and to prepare well-structured implementation plans. All the materials can be downloaded completely free of charge.

1. How will it help?

Small and medium-sized enterprises (SMEs) in developing countries have major obstacles to overcome in marketing their products – whether competing against foreign imports in their domestic markets, or gaining access to international markets. A number of factors bear on this – finance and investment issues, international trading regulations, agricultural subsidies in developed countries etc. – many of which are largely beyond the power of the SMEs and their governments to influence. There is, however, one critical factor that SMEs can themselves do much to improve – the quality of their products.

Delivering products with a level of quality that meets customer requirements is essential to business success. Indeed, in the fierce competition of today's markets, the level of quality needs to exceed what customers already expect, and at a competitive price.

Achieving this quality will involve your entire company – and often suppliers and customers as well. It requires good management systems and practices throughout the organization, from having a vision of the future of your company to maintaining a safe and healthy workplace. It means having well-trained and motivated employees, standardized work procedures, and effective production control. It means ensuring the quality of incoming supplies, and operating a fast and efficient after-sales service. Above all, it requires the active participation of senior management. In short, every function in your company, and every member of staff can and must support quality, hence the name Total Quality Management (TQM).

Implementing TQM can be expensive, if one thinks in terms of costly training programmes and highly paid consultants. There is however an alternative. In *A Roadmap to Quality* the United Nations Industrial Development Organization (UNIDO) and the Japanese Standards Association (JSA) provide a low-cost solution: a comprehensive TQM training and implementation package that will enable SMEs to implement TQM themselves – within the limits of their own resources, and by drawing on the capabilities of their own staff. A member of staff can be assigned as a facilitator to study selected units, and then lead colleagues in discussing these materials and preparing systematic TQM implementation plans. Facilitators should have a sound knowledge of their industry and basic facilitator

skills, but need not have a great deal of familiarity with TQM. Staff in training institutes will find that they can use the materials to assist local companies to plan and implement TQM.

2. Key features

A *Roadmap to Quality* has three key features that enable it to provide this kind of support:

- **It is an e-learning programme** distributed free over the Internet. Any company, however small, can simply register and download the entire training programme without making any payment. The special features of the web and CD versions, with pop-up word definitions, graphics windows, automatic cross-referencing, and a self-testing system make it easy for facilitators and trainers to select and prepare a TQM implementation course for groups of employees in their company, or in their training institute.
- **It is company-centred.** It is designed to enable companies to implement TQM in their specific and concrete situation, using only the resources they have. The 160 short texts are each followed by two learning tools: Discussion and Action Plan. The Discussion questions focus participants on how the ideas in the text can be applied to their company. The Action Plan gives them a framework for preparing well structured and concrete plans to implement these ideas. *A Roadmap to Quality* can therefore be used by companies with a few employees, or by those with hundreds. It can be used in different industrial sectors and in different countries and cultures. It can be used as part of a company-wide programme to introduce TQM throughout the organization, or a few units may be selected and applied to making specific improvements in one or two departments.
- **It is practical.** The texts, although often detailed, are written in a language that is clear and easy to follow, and the learning activities are concrete and practical:
 - Which of these guidelines are relevant to our company?
 - How can we apply them?
 - What difficulties could we meet in doing so?
 - How can we overcome these?
 - What alternatives could we try?
 - What resources will we need?

It contains a wealth of examples, in over 200 sample forms, tables and charts, which can be copied and adapted to be used in your company.

3. The training package

The complete *Roadmap to Quality* training package consists of:

- A website that contains the entire materials in both HTML and PDF formats.
- A CD, also containing the entire HTML and PDF versions, that can be received by surface mail or downloaded from the website.
- A print version that can be printed out from the website or the CD to provide you with your own *Roadmap to Quality* manual. This includes a cover page which you can put on the front of your folders.

4. TQM content

A *Roadmap to Quality* covers the entire range of TQM activities in 20 units presented in four modules:

Module One: Leadership

1. Chief Executive Officer: Managing policy
2. Chief Executive Officer: Ensuring quality
3. Managers: Managing systems
4. Managers: Managing people

Module Two: The work environment

5. Disposal and storage
6. Hygiene and health
7. Safety

Module Three: Systems and tools

8. Standardization
9. Problem Solving
10. QC Circles
11. Statistical methods
12. Education and training

Module Four: Production and sales

13. Production control
14. Process control
15. Inspection
16. Management of facilities & equipment
17. Measurement control
18. External suppliers
19. After-sales service
20. Product design and development

5. Unit structure

Each unit consists of:

- Several texts, each with discussion questions and the writing of an action plan.
- Graphics: sample forms, tables and charts.
- Glossary links in the web version.
- A multiple-choice interactive test.
- ISO references (in most units).

Texts: There are an average of eight short texts per unit, each presenting a different sub-topic of the unit's main theme. They vary in length and detail depending on the nature of the sub-topic: some are half a page and quite simple, others are two pages and detailed. Since this is a practical implementation manual and not an academic textbook, the texts only become fully meaningful when participants discuss how to apply them to their company. Reading and discussion go together. This of course means that examining a text will often be

a slow progress – discussing how to implement the guidelines in one paragraph may be quite enough for one training session.

Discussion: The Discussion activity consists of a set of questions with two primary functions:

- To encourage participants to reflect critically on what they have been doing in their company in the area presented in the text: how effective is this and where is there need for improvement.
- To get participants to think about the relevance of the ideas in the text to their company, and how they could apply them.

Central to the Discussion are the RADAR questions, specially devised for *A Roadmap to Quality*:

R Are the ideas in the text **relevant** to my company?

A How would I **apply** each of them?

D What **difficulties** might I meet and how would I overcome them?

A Are there any **additional** actions that I might take that are not mentioned in the text?

R What **resources** would be needed, what would they cost, and how could they be acquired?

A full discussion of these questions leads participants to their own conclusions about how best to implement the ideas in the text in their concrete situation.

Action Plan: Participants now write a well-structured action plan. This has three purposes:

- It gets participants to focus their thinking, and to be clear about their conclusions.
- It enables participants to prepare a set of clear proposals for implementing their conclusions. These can then be presented to the decision-makers in their company as draft proposals for implementing this particular aspect of TQM in their company.
- It provides a record of the discussion.

The core of the Action Plan is the 6-Point Structure:

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts or tables that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these might be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

Graphics: *A Roadmap to Quality* has over 200 sample forms, tables and charts. These provide concrete examples of how the guidelines can be implemented. Many can be copied and adapted for company use.

Glossary: All of the TQM terms used in the 20 units are presented with clear definitions in a glossary that can be accessed on the website or the CD, whether centrally through an alphabetical index, or in pop-up windows in the texts. It may also be printed out as a PDF file.

Interactive test: Each unit has a multiple-choice test with an average of 35 questions. This allows participants to check for themselves how well they can recall the contents of specific texts, or of the whole unit. On the website and CD this test is interactive, allowing participants to automatically receive their own scores.

ISO references: This section presents the relationship of most units to ISO standards.

6. Using the website and CD

Registration: *A Roadmap to Quality* is delivered online at www.e4pq.org/tqm. You can download and/or print out the specific units or texts you want, or download the complete CD version. This is all free. All you have to do is fill in a very brief online registration form. This will allow UNIDO to get a profile of typical users of the *Roadmap* and to send you updates of the materials if you choose to receive these.

Site content: The website and CD contain:

- All the materials described above in both HTML and PDF formats.
- Theory, guidelines and sources:
 - An Introduction to TQM: an overview of the key concepts of Total Quality Management.
 - Trainer Guidelines: practical guidelines for trainers and facilitators.
 - Origins of *A Roadmap to Quality*: a brief description of the ASEAN/Japan/TQM Project that generated the TQM materials used in *A Roadmap to Quality*.
- A needs analysis form to help identify and collate the specific TQM-related needs of user departments and individual employees.
- A user forum (only on the website) that allows users to share their experience of implementing TQM, both the problems they have encountered and the solutions they have found (see below).

Finding what you want: *A Roadmap to Quality* contains the equivalent of over 500 full A4 print pages, covering all of the TQM practices and procedures that a company could wish to implement. The website and the CD have been carefully designed to enable users, in particular trainers and facilitators, to find their way around all this material, and to easily identify the units and texts they wish to use. The Overview provides a complete set of short summaries of the units. From each of these there are links to a similar set of short summaries of the texts in each unit. Cross-reference links provide quick access to other relevant texts. Other helpful features, both for individual users and for trainers and facilitators, include:

- Pop-up windows showing the graphics referred to in the text.
- Pop-up definitions of TQM terminology.
- Pop-up windows of each text paragraph referred to in the Discussion.

Printing: All the materials are professionally laid out in an attractive PDF format. These can be printed out from the website and photocopied for use in training courses. You can also compile them in a loose-leaf folder as your own training manual, using the attractive coloured cover page that is provided.

User forum: This is structured in relation to the 20 units of the *Roadmap*, and with reference to different industrial sectors. If users meet some challenges in implementing the guidelines in a specific text in their field of business, they can present this to other users from the same sector, and find out how they have dealt with it. Or if a company has been particularly successful with some specific implementation they can share this too with similar companies.

7. Deciding to introduce TQM

The commitment to introduce TQM must ultimately come from senior management. Their positive engagement in implementing TQM will make a crucial difference to its success. However the first initiative may well be taken by one or two managers who have become aware of TQM and the benefits it could bring, either to their own department, or company-wide.

Their first objective should be to secure the active support of the CEO. It is hoped that *A Roadmap to Quality* will help them to do so. They may decide to make a presentation based on 'An Introduction to Total Quality Management', showing the rationale of TQM, and to include the Overview and relevant Unit Summaries to show the practical improvements that TQM can bring. They should, of course, relate this to the concrete improvement needs of their company.

8. History

A Roadmap to Quality has its source in the TQM handbooks written by experts with the Japanese Standards Association (JSA) for the ASEAN/Japan/UNIDO TQM Project. This project, which ran from 1995 to 1999, assisted twelve pilot companies in the seven ASEAN countries to implement a comprehensive programme of TQM. The countries which participated were Brunei Darussalam, Indonesia, Malaysia, The Philippines, Singapore, Thailand and Vietnam.

A summary of these handbooks together with reports and case studies from the companies that participated in this project was published by JSA and UNIDO in 2001 in *A Pathway to Excellence*. UNIDO and JSA then decided to make these handbooks available online to SMEs in developing countries around the world. With JSA's support UNIDO edited and arranged the original handbooks, developed learning activities and an interactive testing system, and has now made this available online in *A Roadmap to Quality*. (See *Origins of A Roadmap to Quality* for more details.)

Overview



Overview

Unit 1. Chief Executive Officer: Managing policy

The full implementation of TQM requires the commitment of the Chief Executive Officer and senior managers. As CEO you must take personal charge, providing a vision of where your company is going, and the leadership to realise this vision. This requires that you, with your senior managers, define your company philosophy, and develop long-term and mid-term plans based on this philosophy. Then translate these plans into annual management policies, and deploy these policies down through your organisation. This is known as policy management.

Unit 2. Chief Executive Officer: Ensuring quality

As Chief Executive Officer, you have a primary role in ensuring that quality is maintained throughout your company. This involves a number of activities, the most important of which are presented in this unit.

Unit 3. Managers: Managing systems

All that you do as a manager will have an impact on quality, but several of your functions are especially important in ensuring a high level of quality in your own department and in the company as a whole. The functions included in this unit have to do with establishing, implementing and monitoring work systems, while those in Unit 4 present ways of supporting the contribution your employees can make.

Unit 4. Managers: Managing people

This unit presents six key actions that you as a manager can take to maximise the contribution of your employees to the success of your department and of your company. Ensure that they follow the standards, train and motivate them, delegate to them, and involve them in making improvements.

Unit 5. Disposal and storage

A workplace that is neat and well organised is always more efficient. It is also more pleasant to work in. The texts in this unit present a number of actions you can take to achieve this.

Unit 6. Hygiene and health

Everyone should work in a comfortable, healthy environment. This is also the most productive environment. There are five sets of actions that you can take to keep your workplaces healthy and comfortable – and to avoid polluting the area around your factory or plant.

Unit 7. Safety

Each year thousands of employees are killed or seriously injured at work. The vast majority of these deaths could be prevented, and the severity of the injuries could be greatly reduced. There are nine key sets of actions that you can take to improve safety in your company.

Unit 8. Standardization

Standardization is an essential tool for maintaining and improving quality in a company. A standard is a written description of the best way to do a job, carry out an operation, or complete a process. Its purpose is to ensure that jobs, operations and processes are always carried out in the same way. It can also refer to the specifications of a product. The concept of standardization appears in many different units. In this unit we will be dealing with operation standards.

Unit 9. Problem solving

There will always be problems in work processes. What is important is that you spot them at once, report them to whoever will act on them, take emergency action to stop them doing any damage, find out what is causing them, and prevent them from happening again. This unit presents systems that can help you to recognise and deal with problems. (Unit 11 provides detailed guidelines on using statistical methods to solve problems by analysing and interpreting data.)

Unit 10. QC Circles

A QC Circle is a small group of frontline employees who meet regularly to try to improve the quality of their work. QC Circle activities are at the core of TQM. They can play a major role in creating a dynamic atmosphere in the workplace.

Unit 11. Statistical methods

There are many problems that cannot be solved simply by examining equipment and machinery. Data has to be collected, usually over a period of time, and then analysed and interpreted. Data is numeric information that represents objective facts. When data has been collected the statistical methods and tools presented in Unit 11 will help you to analyse and interpret it.

Unit 12. Education and training

The quality of the education and training that your company provides for its staff will determine the quality of the products and services you offer. Ultimately it will determine the success of your business. You should approach it systematically, implement it thoughtfully, and continuously evaluate and improve it.

Unit 13. Production control

Production control is the management of the production processes to ensure that the company produces goods of the quality that the market wants, in the right quantity, and ready for delivery at the right time - and that it continues to improve the efficiency with which it does so. The six texts of this unit present the key actions to take to achieve these goals.

Unit 14. Process control

Process control is about making sure that the manufacturing processes produce goods of the required quality in a continuous and stable manner. There are several mechanisms for maintaining process control.

Unit 15. Inspection

Inspections are essential to make sure that your products have the specific quality features that your customers want.

Unit 16. Management of facilities & equipment

Managing facilities and equipment involves carrying out regular inspections; dealing with any problems and making sure they do not happen again; deciding which forms of maintenance to use; and keeping records of maintenance.

Unit 17. Measurement Control

The purpose of measurement control is to ensure that the right measuring equipment is used to measure, within an acceptable range of precision, the conditions in which your products are manufactured and their quality characteristics. This is essential if your products are to meet the required standards.

Unit 18. External suppliers

The quality of the products that you are selling on the market will often be determined by other companies – your external suppliers. The raw materials and parts that you receive from your external suppliers will have a major impact on the quality and competitiveness of your products.

Unit 19. After-sales service

Your responsibility for your products does not end when you sell them. The success of your company depends, above all, on whether your customers are satisfied with your products. No matter how good your quality and inspection systems are, some defective products can always get through to your customers. This is why it is essential to have a good after-sales service. View it positively – it can make a good impression on the customer and lead to more orders and increased sales.

Unit 20. Product design and development

Product design and development is the process of creating a new product to be sold by a business to its customers. It involves identifying a market need, creating a product to meet this need, and testing and improving this product until it is ready for production. It consists of a series of activities: research, analysis, design, engineering, and building prototypes, and then testing, modifying, and re-testing until the design is perfect. Design and development is usually carried out by a project team, with members from both outside and inside the company. This unit presents detailed procedures for managing the process of product design and development.

Trainer Guidelines



Trainer guidelines

1. Introduction

A Roadmap to Quality is a practical training manual for implementing Total Quality Management (TQM). In its twenty units with over 160 short texts it provides clear guidelines for improving quality over the full range of management systems and practices. It is highly company-centred, guiding users to apply the TQM ideas in the texts to the specific, concrete situation in their company. Users do so in three stages with each text:

- They discuss what they are doing at present in the area dealt with in the text: the problems they face, the solutions they have tried, the successes they have achieved.
- They discuss how they could use the ideas in the text to bring improvements to their company.
- They prepare an action plan for implementing their conclusions, to be presented to decision makers in their company.

A Roadmap to Quality can be used in-house, with an internal trainer or facilitator leading groups of employees, or by a training institute that caters for small local companies. Participants may be senior managers, managers or general employees. A facilitator may be any employee with a sound experience of the industry and basic facilitator skills, but without an extensive knowledge of TQM. A training institute may use the materials to prepare facilitators from local companies to lead groups of their fellow employees.

2. Methodology

These trainer guidelines are intended to present a general methodology which you can adapt to your own situation, culture and training style. If you are unfamiliar with TQM you should read the short 'Introduction to TQM', to get an idea of the basic concepts.

Get started – Orientation: Begin with the Orientation Questions. Their purpose is to get your participants focused on the theme of the unit. In particular they will help them to start reflecting on their own work situation in relation to this theme. If you are only examining one or two texts in a unit some of the questions will not be relevant. Download the Orientation Word file, and then edit it and print out the questions you want to use. (They can be accessed from the link on the main index.)

Ask the questions orally, one at a time. If participants are hesitant about answering, give them a few minutes to discuss each question together before they give their comments. Alternatively, you may prefer to give participants a copy of the questions for the unit and let them talk together about them before they discuss them with you. Discourage excessive detail – this should be quite a short activity.

Then invite participants to briefly tell you their expectations of the course: the benefits they hope to gain from it for themselves, for their department or for their company. Briefly note these down on a flipchart or board. All these orientation activities will get participants

engaged in the course, and give you some understanding of their knowledge and experience of the area to be covered.

Reading and Discussion: The reading and discussion of a text form an integrated activity. The discussion questions are intended to lead participants into a more focused reading. With most texts, except the very short ones, you should concentrate on one or two paragraphs at a time. First ask participants to read through the complete text to get the general picture, clarify any minor queries they may have but do not go into detail, and then go into a full discussion of the first one or two paragraphs.

You will find that most discussion questions first ask participants to reflect on their own experience and then ask them how they would apply the ideas in the text. Here the RADAR questions provide a helpful tool.

The RADAR Questions

- R** Are the ideas in the text **relevant** to my company?
- A** How would I **apply** each of them?
- D** What **difficulties** might I meet and how would I overcome them?
- A** Are there any **additional** actions that I might take that are not mentioned in the text?
- R** What **resources** would be needed, what would they cost, and how could they be acquired?

Discussion is best treated as a group activity. If you have a small number of participants this will be quite straightforward. With a larger number – seven or more – form two or more small groups of 3 to 5 members (4 is often optimal) to sit separately and discuss the first question/s. One person could take notes. Then each group summarises its conclusions to the other groups (or to you if there is only one group), and receives feedback. Alternatively two groups can get together, compare their conclusions, and try to reach a set of agreed conclusions. Then go on to the next paragraph/s.

You need not take an active part in the discussion unless it is slow to get going, in which case you should prompt participants a little. Your primary role as trainer will be to encourage participation, and to monitor the discussions to ensure that they are going in the right direction – discussion can often be held back by participants telling long anecdotes about their own experiences, spending too much time on some detail, or going off on irrelevant tangents.

Participants should finish these discussions with clear ideas for improvements in their company, the obstacles that lie in the way, and how these obstacles could be overcome.

Action plan: Participants will now move on to preparing an action plan to present to decision makers in their company. After the dynamic of the discussion, with the RADAR questions, the ideas that go into the Action Plan will not be the guidelines in the text, but

rather the participants' conclusions about these guidelines. They may have decided to leave some out, adapt some, or add some new ideas of their own.

The action plan, too, is best prepared in a group activity, whether in the training room or with participants meeting on their own elsewhere. The 6-Point Structure, shown below, will provide a useful framework.

The 6-Point Structure

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts or tables that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these might be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

Again, groups can benefit greatly from sharing their action plans with other groups. One way of doing this is a client-consultant role-play. Two groups give or email each other a first draft of their action plan, read each other's plans carefully, and then hold a role-play meeting in which they take it in turns to be client and consultant. The consultants give feedback to the client – what they like about the plan, anything they find unclear, where they see problems arising and how these might be dealt with. This should be interactive and not simply an exchange of feedback. You may choose to give feedback yourself after the role-play. If you have more than two groups the other groups may be invited to watch each role play and give their feedback. Decide yourself on whatever approach you think will be most suitable.

After the client-consultant scenarios, each group prepares a second draft of their action plan and gives it to you for your critique. It is best if they do this by email, so that you can use the comment and track-changes functions in your word-processing programme to give them your feedback, and email it back to them. They can then improve their action plans on the basis of your comments, and resend them to you for final approval. You may of course find it more effective to give all your feedback in person using the print versions. In your feedback pay particular attention to how clearly the action plans are written: Are they easy

to read? Is their logic easy to follow? Are conclusions based on solid facts and well-developed arguments?

You may now choose, if you feel it is appropriate, to get all the groups to work together and prepare a final agreed action plan for their company. If the numbers make this difficult you could form new groups, each group being composed of representatives of different original groups. (You can do this by assigning each member of an original group the letters A, B, C and D, and then forming groups of As, Bs etc.) But, of course, it can also be a good idea to present alternative action plans to the decision makers. What is important is that, among these various methodological suggestions, you choose what is most appropriate for your participants and for your own training style.

Finally, in whatever manner is most appropriate in your situation, the completed action plans are sent to the appropriate person in the company.

3. Plan your programme

First establish the overall aims and content of your programme. One approach is to:

- Talk to those in charge and find out where they see a need for TQM-based improvements.
- Examine *A Roadmap to Quality* and identify the units that seem relevant to these needs. Here you will find helpful the unit and text summaries which give overviews of the materials.
- Present your proposals for programme content to those in charge and reach agreement on which units (or texts) to include in your programme.

Having established the broad aims and content, your next step is to identify the concrete and specific improvement needs in the departments and workplaces from which your participants will come. You can do this by talking directly to department heads and prospective participants, or by sending them the Improvement Needs Analysis from *A Roadmap to Quality*.

The Improvement Needs Analysis is a form which you can print out or email. Enter the web address of *A Roadmap to Quality* and a list the units and texts to be included in the training programme. Respondents should answer the following questions (adapted to suit the selected units and texts):

- What problems do you have in your workplace in each of these areas?
- What steps have you already taken to deal with these problems?
- How successful have these steps been?
- If they have not been completely successful what are the reasons: lack of funds, resources, know-how, motivation etc.?
- What steps could have been taken that were not?
- What steps do you think should now be taken?
- What would you hope your department will gain from this course?
- What do you hope your staff will gain?

The form is in two versions, one to be completed by the head of the client department and the other by participants. In the latter, participants also answer the questions listed above,

and enter their work experience, training courses taken, and qualifications etc. This information will help you in planning the course. Many texts, though short, have a lot of detail, so the probable reading skills of participants will affect your decisions about timing and whether to include complex charts or figures.

The form is in a Word file so that you can adapt these questions or add new ones. The web address of *A Roadmap to Quality* is included so that your clients can look, in whatever detail they wish, at the proposed training content – or you may choose to give them a copy of the CD, or send them printouts.

Examine this feedback carefully, look again at the agreed units and texts and decide whether any changes are needed to the selection. If yes, discuss and agree these with the person-in-charge. Read 'An Introduction to TQM' to get an idea of the basic concepts of TQM.

4. Prepare your programme

Study the materials: To prepare your programme you should first:

- Make yourself thoroughly familiar with the selected units and texts. This is best done on the website with the cross-referencing links, pop-up word definitions, and pop-up windows with sample forms, tables and charts.
- Do the Test to assess how well you have absorbed the content of the material.
- Review the returned Improvement Needs Analysis form to check if there are any parts of the selected materials that could be problematic for your participants, for example, specific guidelines that they may not find relevant, or some that may be particularly difficult to implement. In doing this you will find the RADAR questions useful. Give special thought to these problems, and perhaps discuss them with those in charge, or with the department manager.

Select graphic figures: Consider carefully which graphic figures to include. These vary a great deal in complexity and detail, even where the texts themselves are simple. You must decide how useful to your purposes each of them is. Do not use them simply because they are there. If they are not appropriate to your company or clients, then it is a waste of time to ask participants to study them, and may well confuse and discourage them. You may, of course, decide that although some are complex it would still be useful for your participants to look at them and consider what simpler forms they might devise for their own company.

These figures can all be viewed in pop-up windows on the web page. Those that are most essential are included in the PDF printout of each unit, while the others have to be printed out separately. For this second group, click on the link Unit X Figures in the top right hand corner of any page in the unit. This link in fact allows you to print out all the figures for the unit, including those in the PDF printout.

Print out your materials: You may choose to print out a complete unit, or a couple of texts from different units:

- If you print out a complete unit this will include everything for that unit except the Orientation Questions.
- If you print one or two texts per unit then you should also print the Learning Tools – the RADAR questions and 6-Point Structure – and the relevant Test questions. You may also

choose to print out the complete glossary and the cover page, using the latter to enhance the appearance of your materials.

Decide on programme duration: Decide how many sessions you will have and how long and how frequent they should be. This will be determined largely by the complexity of the units, the methodology you will use and the competence and experience of your participants – and of course when participants are free to come.

Complexity of units. The 20 units in RMQ vary greatly, from the simplicity of Unit 5 Disposal and Storage to the considerable detail of Unit 20 New Product Design and Development. How challenging a unit will be for your participants will effect your timing, how much you will try to include in a given session, and whether to ask participants to read through the materials beforehand (though if the text is very detailed, reading it beforehand may discourage them).

Methodology. Keep in mind that *A Roadmap to Quality* is focused on preparing for the implementation of TQM, and not simply conveying knowledge about it. The process of discussing the ideas in the text and how to implement them can therefore take quite a long time. In some texts one paragraph alone will be enough for one session. Likewise the preparation of useful action plans can take quite a while. Timing will be effected, too, by whether you decide to have small-group discussions, and whether groups work on their action plans during the training session rather than between sessions. In fact, until you have had some experience with these materials it will be difficult to predict how long they will take. Assume they will easily take longer than you think!

Decide on combining classroom work with individual computer-based study: Give thought to integrating group work in the classroom, using the printouts, with individual study on the computer. Depending on how difficult the text may be for your participants, you may ask them to read through it before the course (not in depth), preferably on the computer, and to do some preliminary thinking about the discussion questions. If you choose to do this, specify any figures they should (or should not!) look at.

Decide when and how to use the test: You may ask your participants to do the interactive test after each text or after the complete unit, to see how well they can recall the information in the texts. It is best if they do this on the computer where they will receive automatic scores, and be given the correct answers. If you choose to print out a test you can get the correct answers by doing the interactive version yourself.

5. Evaluate your programme

When your course is finished be sure to get feedback from your participants. This is invaluable for planning future programmes. This can be done simply by giving them about 15 minutes to individually write answers to the questions:

- What did you find most useful in this course?
- What did you find least useful?
- What benefits has it brought you, your department or your company?
- What changes would you recommend?

6. Give us your feedback

Finally, we would really welcome hearing from you. Use the Feedback link on the Homepage menu to tell us what you think of *A Roadmap to Quality* and how we could make it better.

An Introduction to TQM



An Introduction to TQM

1. Today's challenge

The challenge that companies face as the 21st Century gets underway, is to succeed in a global economy where competition is fierce and where customers are becoming increasingly demanding of quality. Companies must take a global perspective. They must supply products and services that are competitive in both price and quality, and in international as well as in domestic markets. To maintain a competitive edge in such an environment they must continually improve the quality of what they offer.

Total Quality Management (TQM) has proven itself as a way of managing and continuously improving quality. Its successful implementation in Japanese firms has been a major factor not only in their success, but also in establishing the levels of quality that customers now expect in whatever they purchase.

What is Total Quality Management? What indeed do we mean by quality? Quality may be simply defined as meeting customer requirements. In fact, given the level of competition in today's market place, we might better define it as meeting and improving upon requirements. Total Quality Management, as the name indicates, regards the continuous improvement of customer-oriented quality as both requiring active management and involving the entire company – and often suppliers and customers as well. TQM can be described in practical terms as customer focus, continuous improvement and teamwork.

A great deal has been written about TQM, and more scholarly analyses have identified four fundamental orientations of TQM: systems, customer, learning and change. From this perspective, TQM is seen as a dynamic economic effort by firms to adapt and survive in dynamic environments.

2. The background to TQM

Born out of management practice, and with roots in production, statistics and quality control, modern quality management began in the USA in the mid-1920s and has had a profound impact on modern business history. It was not however widely applied in the West until the 1980s, some two decades after it had taken off with remarkable results in Japan.

In the 1950s Japanese companies, dissatisfied with the quality of their products, looked to the quality improvement ideas of such western experts as Deming and Juran, then being given little attention in the West. Traditional approaches rely on inspection to prevent defective products being shipped to the customers. This results in lots of products being either discarded or reworked. It is highly wasteful, with loss rates estimated at 25% of sales revenue, and it is not effective. The Japanese chose instead to prevent any defective units being produced upstream in the first place.

A core objective in the prevention of defects, in ensuring that all products and services conform to customer requirements, is the reduction of variation. Products manufactured

under the same conditions and to the same specifications almost always vary to some extent. These variations may be great or small, and come from the main components of the production process: machinery, people, method or materials - for example machinery wears out and materials are never exactly the same. The critical question is whether these variations have any effect on quality. The answer to this question however is often unknown, because the variations are usually not measured. TQM provides tools which allow us to measure these variations and to take corrective action.

Tools alone however are not enough to achieve the successful prevention of defects and the continuous improvement that today's markets demand. This requires the cooperation of everyone in the company. It requires different departments and functions to work together. It also involves employees getting together regularly to solve problems in their own workplaces. This can only be achieved by a change in management style and way of thinking, and by an overall change in the company culture. All of this is what TQM is about.

3. The central role of management

TQM must first of all have the active commitment of top managers. They have to take personal charge, providing vision, forceful leadership and clear direction. They must translate this vision into detailed, long-term planning, often for a period of up to ten years. This includes:

- Developing a clear long-term strategy for TQM.
- Formulating and deploying an annual policy and ensuring everyone understands it.
- Ensuring that objectives, targets and resources are agreed among all those responsible for putting the policies into action.
- Building quality into designs and processes.
- Developing prevention-based activities.
- Planning how best to use quality systems, procedures, tools and techniques.
- Developing the organization and infrastructure to support improvement, and allocating the necessary resources.

They must also establish, not least by their own behaviour, an appropriate style of management throughout the company, a style that can both give direction and encourage employees to take on more self-management.

4. People involvement

At the heart of TQM is the recognition that a company's most valuable resource is its people. The involvement of all employees in achieving continuous improvement in quality is essential. The customer is seen as the end receiver of a product or service that is the outcome of a series of processes involving many different employees. Everyone who participates in each of these processes contributes to the final cost-effective quality of what the customer receives. Equally important is that every employee is a potential contributor to innovation and improvement.

Furthermore, within this series of processes, called a 'process chain', the work output of one process is the input for another. Each process in the chain supplies an internal customer. A weakness in one process will have an effect on the next. Critically also, this process chain crosses departmental and functional boundaries.

Both of these TQM perspectives, the need for the active involvement of everyone, and the inter-relatedness of the several processes in the process chain, have major implications for management at all levels of the company, and for the culture of the company.

For human resources management two behaviours are clearly indicated: learning to listen, and empowering employees to communicate both upwards in the hierarchy and laterally across horizontal boundaries. Normally communication in companies is directed downwards, with the objective of keeping employees informed. Clearly however, those involved directly in the work processes will have valuable knowledge about work problems. In the interest of continuous improvement, they need to be able to communicate their knowledge to managers. Clearly also there must be communication between those involved in the related processes in the full process chain.

This change in management style, in effect an overall change in the culture of the company, will lead to an environment where employees:

- Find that their views are sought out, listened to and acted upon.
- Have a clear understanding of what it is required of them, of how their processes relate to the business as a whole, and of how their own 'internal customers' depend on them.
- Are given practical scope through such devices as suggestion schemes, and especially through teamwork (e.g. quality circles), to participate in achieving innovation and improvement.
- Are motivated to contribute to the continuous improvement of their own work output.

5. Tools and techniques

Central to the implementation of TQM is the gradual introduction of tools and techniques with a problem-solving focus. Many of these have been around for a long time, or are derived from traditional tools. Process mapping, where a flowchart is used to show all the steps in a process with the aim of revealing irregularities and potential problems, is not unlike work-study flow diagrams. TQM tools include those that are simple to use, those that most employees can be trained to use, and those, such as Statistical Process Control (SPC), that require specialist training.

Statistical Process Control can be used to measure variation and to indicate its cause. Some variation is tolerated in the output of processes. However, all variation is caused and can therefore be reduced. Knowledge of variation theory is a powerful tool in the ongoing pursuit of quality.

Among the most widely used tools are the seven quality control tools (QC7): check sheets, histograms, stratification, Pareto diagrams, cause and effect diagrams, scatter diagrams, and control charts/graphs. Examples of these can be found in Unit 11.

Such tools must of course be used within a method of investigation. The typical TQM method is the PDCA (plan, do, check, act) Cycle, also known as Deming's Wheel.

6. The PDCA Cycle

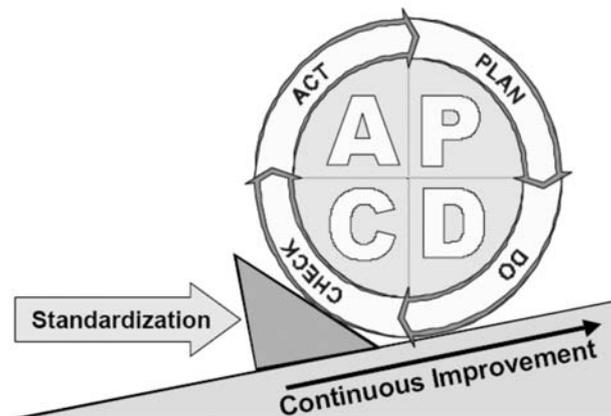
The PDCA Cycle, developed by Deming, one of the great original thinkers of TQM, is an invaluable strategy for improving any situation, from solving a tiny production problem to

introducing TQM itself throughout a company. It consists of 4 steps:

- **Plan:** gather data on the problem, identify the causes, decide on possible solutions or countermeasures, and develop a plan with targets, and tests or standards that will check whether the countermeasures are correct. This should be done systematically and thoroughly.
- **Do:** Implement the countermeasures.
- **Check:** Check the results of the implementation of the countermeasures against the standards established in the 'Plan' stage. If the countermeasures do not work, begin the cycle again with 'Plan'.
- **Act.** If the countermeasures are successful, standardize them and put them into regular use. They then become normal practice.

The resulting standards may then be improved and refined in further cycles of PDCA. The PDCA Cycle is in fact more than a problem-solving strategy. It is essentially a means to continuous process improvement. Figure 1 shows how the final standardization after each successful PDCA cycle acts as a consolidator of what has been improved, and as the base for a further cycle.

Figure 1

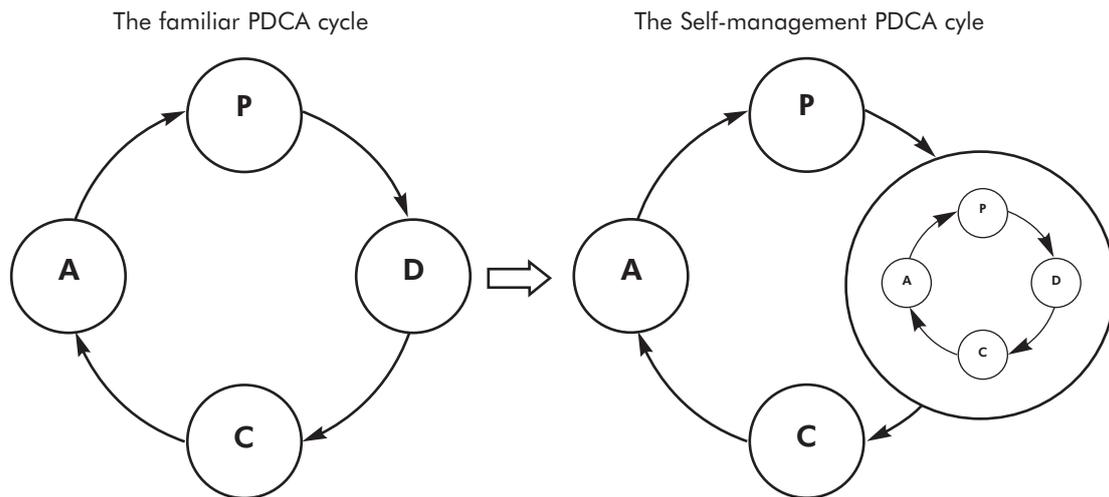


Source: Y. Otable, 2000

Kondo, the Japanese TQM expert, has made the critical point that the PDCA cycle is based not on the idea of "get it right first time", but rather on the fact that we rarely do get anything completely right the first time, nor indeed even the second or third times. The PDCA cycle must therefore be continuously applied if quality is to be a real goal. With each application the improvements made must be standardized and become the base for further improvement.

Kondo has also emphasised that the PDCA cycle must operate at every level in the pursuit of continuous improvement, not least on the shop floor. Workers too can follow a plan-do-check-act cycle, exercising a degree of self-management in their job performance that not only contributes significantly to the company's pursuit of continuous improvement, but also improves the quality of their own working lives, and the atmosphere of the workplace. Kondo has developed the diagram in Figure 2 which shows how the self-managing participation of workers in a PDCA cycle fits within the larger PDCA process.

Figure 2



Source: Yoshio Kondo, 1999

Is there a point where repeated applications of the PDCA cycle will run into the law of diminishing returns? Is there a point in the pursuit of quality where it is no longer cost-effective to try to achieve that final refinement that brings zero defects? Most people regard zero defects as an unrealistic goal in terms of manufacturing costs. Kondo however suggests that the answer lies in creatively finding low cost ways of improving quality: that the real aim should be “not to search for the indefinable optimum but to search for the ways and means with which we can improve quality with minimum cost.”

In the UNIDO/Japan/ASEAN TQM Project, then, the PDCA cycle was the engine of implementation at two levels:

- It was central to the many TQM procedures that the model companies began to implement.
- It was the basis of the strategy by which the Project itself was implemented.

7. Teamwork

Identifying the root causes of problems is not always easy. In addition to tools and investigative methodologies there is an important role for employees working together in teams on shared problems. The quality control circle (QCC) is a small group of employees who meet periodically to solve problems in their own workplace. Participation is voluntary, members usually choose which problems they wish to deal with, and they receive training in applying QC tools, presentation skills, project management and team building.

8. Education and Training

TQM obviously involves major changes in any organization where it is introduced. With the high value it gives to human resources development, a full programme of education and training is essential. Training is needed to develop the practical skills of applying TQM tools, education to effect the changes in behaviour and attitude and to ensure understanding of what is involved in the ongoing pursuit of continuous improvement.

9. ISO 9000

TQM has a close correspondence with the ISO 9000 series standards, the set of internationally recognised standards of good management practice which ensure that the organization consistently provides products or services that meet the customer's quality requirements. They define the requirements of a quality management system that can be applied in any organization. A company may invite its customers to audit its quality system so that they can be confident the company is able to meet their quality requirements. It may also get an independent quality system certification body to obtain an ISO 9000 certification of conformity. This certificate is a good reference in dealing with potential clients, and reduces the need for customers to conduct their own audits. TQM can assist companies in a very practical way to meet the requirements of ISO certification.

10. Gurus

A number of original TQM thinkers, in both the west and Japan, have made important contributions to the development and spread of TQM. The chief gurus on the western side are Deming, Crosby and Juran. Deming devised the PDCA Cycle and developed statistical process control. He emphasises the importance of management and leadership in achieving quality. Major changes in business can only be brought about by an organizational culture dedicated to quality, and such a culture can only be achieved by changing the attitudes of top management.

Crosby popularised the Zero Defects concept. He too emphasises the importance of transforming the culture of an organization, and of gaining individual commitment to quality at each level of the organization. He believes that each organization must create its own quality improvement process plan. His approach has been effective in communicating the need to change attitudes and behaviour, and is popular with many managers because of its success in getting organizations started with quality improvement.

Juran has developed an approach in which problems are thought of as projects, with all improvements being made project by project. He advocates the annual formation of teams to analyze problems and find solutions to them. This approach helps build communication and teamwork within an organization, and has been successful in organizations in which upper management has been fully involved.

The leading Japanese thinkers on quality, including Professors Ishikawa, Kondo, Kume, Kano and Taguchi – to name but a few – have ensured that Japan is the country where the development and implementation of TQM has been most widespread.

11. The prognosis

TQM is not easy and it is by no means a quick solution. Improvement is a slow incremental process. However there is no alternative in today's markets to continuous improvement in quality. This is the unavoidable challenge that companies are now faced with. Fortunately TQM, as evidenced by the success of Japanese companies, who regard it as essential to their survival, does provide any company that commits itself fully to its implementation, with the means to meet this challenge.

The Origins of *A Roadmap to Quality*



The Origins of A Roadmap to Quality

1. Introduction

A *Roadmap to Quality* has its source in the TQM handbooks written by experts with the Japanese Standards Association (JSA) for the ASEAN/Japan/UNIDO TQM Project. This project, which was established in 1995, has assisted companies in the seven ASEAN countries to implement a comprehensive programme of TQM. The participating countries are Brunei Darussalam, Indonesia, Malaysia, The Philippines, Singapore, Thailand and Vietnam.

A summary of these handbooks, together with reports and case studies from the first twelve model companies that participated in this project, was published by JSA and UNIDO in 2001 in *A Pathway to Excellence*. UNIDO and JSA then decided to make these handbooks available online to small and medium-sized enterprises (SMEs) in developing countries around the world. With JSA's support UNIDO has edited and arranged the original handbooks, developed learning activities and an interactive testing system, and has now made this available online as an e-learning programme in *A Roadmap to Quality*.

2. Origin of the ASEAN/Japan/UNIDO TQM Project

The Standards Department of the Agency of Industrial Science and Technology (AIST) of the Ministry of Trade and Industry (MITI) in Japan, the Japanese Standards Association (JSA) and UNIDO have together, over a number of years, helped enterprises in ASEAN countries to implement TQM systems. This programme, known as the Japan/ASEAN Cooperation Programme for Standardization and Total Quality Management, aims to provide ASEAN countries with the tools and methodologies that will promote standardization in companies. Based on the experience of Japan, its goal is the improvement of productivity. The Cooperation Programme evolved from giving awareness building seminars in the ASEAN countries, to conducting detailed reviews of the situation in each country, and running a programme to promote standardization and quality in these countries.

In 1995 the Cooperation Programme set up the UNIDO/Japan/ASEAN TQM Project with selected model companies in each of the ASEAN countries. This Project had its origin at a meeting of ASEAN's Economic Ministers with MITI in October 1993 where Japan was invited to draw up plans for a project to introduce TQM in the ASEAN countries. A survey was carried out, and two years later the Project was started. The aim of the Project, based on Japan's success with TQM, was to improve the productivity of companies in these countries, and promote their international trade.

The Project's main activities have been to:

- Select model companies in ASEAN countries in which TQM would be first implemented, and provide these companies with expert guidance and support in introducing TQM.
- Develop TQM procedures that would be both internationally acceptable and suitable for each participating country.

- Provide TQM training courses in each participating country.
- Implement TQM effectively through joint activities.

3. Structure of the Cooperation Programme and the TQM Project

The Cooperation Programme has been administered by a) The ASEAN Consultative Committee in Standards and Quality (ACCSQ) in the ASEAN countries and b) The Standards Department of AIST in Japan. UNIDO was responsible for the implementation of the TQM Project, together with the Japanese International Cooperation Agency (JICA) and the Association for Overseas Technical Scholarships (AOTS) who provided training in Japan. JSA has been the main provider of technical assistance to the Project. The implementation has been overseen by a TQM Project Committee (TQMC). The chart in Figure 1 shows the structure of the Cooperation Programme, and the position and structure of the Project within this Programme.

4. Implementation of the TQM Project

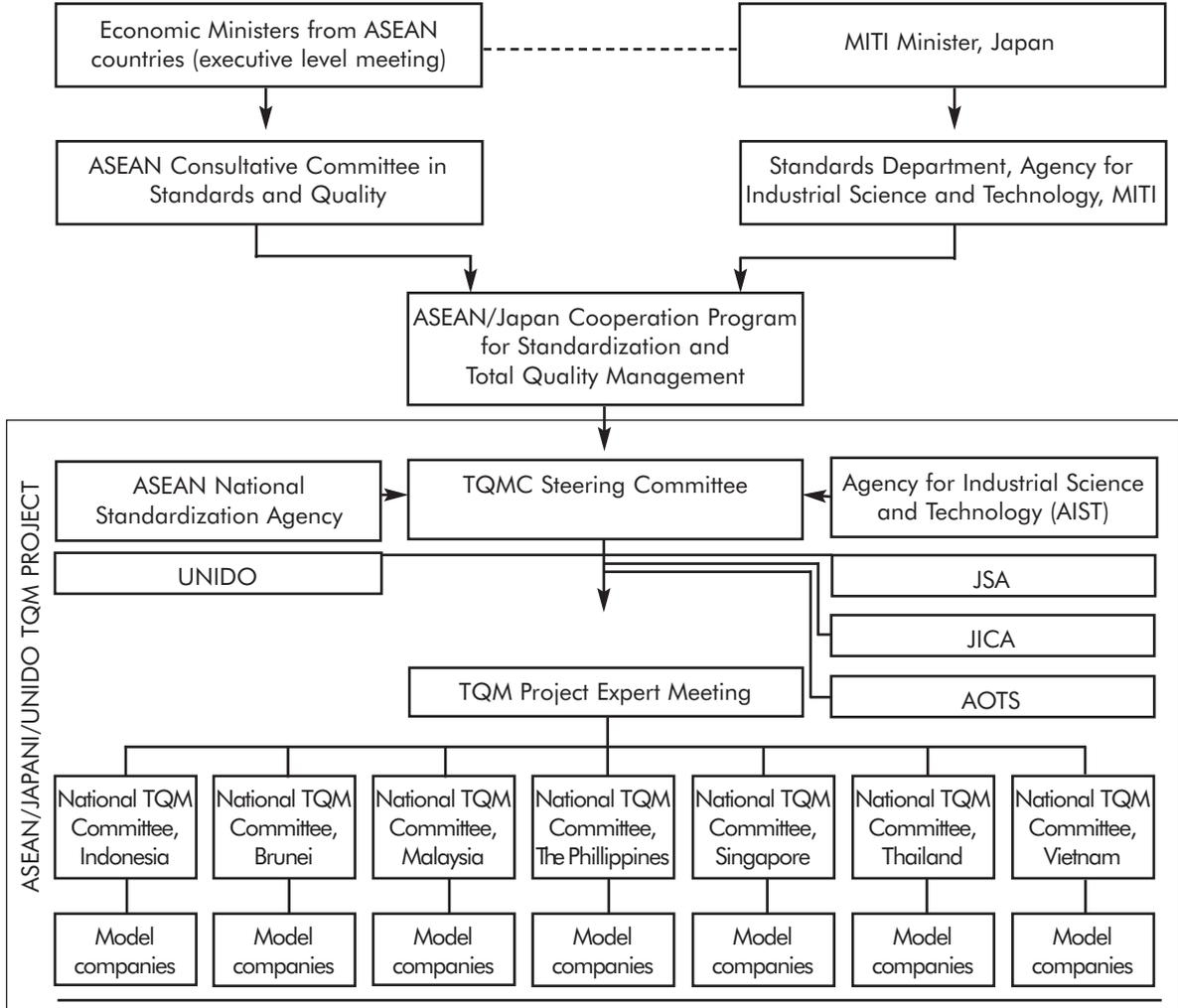
Implementation began with TQM seminars for CEOs from companies in the seven participating countries. TQM is essentially a management-led approach to quality improvement and must have the active engagement of top management. The aim of these seminars was to raise the CEOs' awareness of TQM, help them recognise its relevance to their companies, and gain their commitment to its implementation.

Japanese experts then visited each candidate company and carried out a diagnosis, using check-sheets corresponding to the TQM Handbooks. On the basis of these diagnoses two model companies were chosen to participate in the Project in each of five countries and one each in Brunei and Singapore. A TQM steering committee was formed in each company, usually consisting of Heads of Departments, and a JSA expert came from Japan to initiate the implementation of TQM.

This implementation of the Project in the model companies, and the transfer of technology to them, was based strongly on the TQM Handbooks. The JSA experts began implementation by introducing the first 5 Handbooks in each of the model companies, giving a full day of instruction in applying them. Each company then put these Handbooks into practice. The experts returned at a later stage and used the Handbook-related check-sheets to assess progress. Any problems were identified and guidance given in solving them. On some occasions this would mean that the company would again work through items in this set of Handbooks. Then, when they judged the time right, the JSA experts introduced and gave training in the next set of Handbooks. This cycle of planning what to do, putting it into practice, checking how it has progressed, and incorporating the results of this check into further implementation, is the core TQM methodology of PDCA – Plan, do, check, act – also known as Deming's Wheel. This is presented more fully in *Introduction to TQM in A Roadmap to Quality*.

In addition to this direct on-site training and technology transfer, a series of external seminars and meetings were organised: meetings were held for specialists from ASEAN countries and Japan; education and training in TQM was provided in Japan; and managers from participating companies attended a series of Top Management seminars in different ASEAN countries and AOTS seminars in Tokyo.

Figure 1: Structure of the Japan/ASEAN standardization and quality management cooperation



Note: National TQM Committees are the administrative organization of ASEAN countries composed of their respective national standardization agencies, model companies and specialists.

5. The model companies' experience of TQM

The Case Studies in *A Pathway to Excellence* give detailed accounts of the first twelve companies' experience of the implementation of TQM: the conditions in their companies prior to the Project; the stages that they went through in implementing TQM; the tools that they found most useful; the different problems they faced and, in most cases, the solutions they found. Written in their own words, they provide a fascinating description of the introduction of a management strategy that aimed at, and was significantly successful in, increasing the companies' ability to improve the quality of their products and their international competitiveness.

Most of the companies implemented all of the TQM Handbooks over the period of the Project. One or two had encountered TQM before, but for all of them this was their first experience of systematically implementing TQM. With the assistance of the JSA experts from Japan they successfully took on the challenges of introducing the long-term management of

policy, of motivating staff to take part in QC circle activities, of training suitably skilled employees to write up standard operating procedures (SOPs), and of beginning to transform the attitudes of both managers and employees, and the overall atmosphere of the workplace.

When one reads these case studies one is impressed by the whole-hearted commitment that these companies made to introducing change on such an extensive and long-term scale, and is impressed also by their comments about the value that TQM had for them. Here are some of these comments:

“For the past four years, innumerable changes have been brought about by the growing globalisation process that would have severely threatened our market position had we not adopted the TQM methodology and introduced it into our management system. Borderless competition, customers’ changes in preferences and inflation rates have been making their way into our business.”

Tiongson Industries, Inc., Philippines

“I would like to emphasize that the detailed information contained in the TQM Handbooks provided by JSA and MITI has significantly helped us to overcome the many weaknesses in our production processes, and I feel very grateful for having participated in the TQM Project.”

Michael Khoo, Chief Executive Officer, Interline Roofing Co. Sdn Bhd, Brunei Darussalam

“By applying the concepts of the TQM Handbooks, such as QC, Problem Solving, Daily Management, Production Control and Purchasing, the 8 teams of Executive Group Activities managed to cut down the operations costs by almost RM 1.3 million within six months, and the break-even volume fell dramatically from 8000 car sets to 5000 car sets.”

Ingress Engineering Sdn. Bhd, Malaysia

6. Model companies

The first twelve companies to participate in the ASEAN/Japan/UNIDO TQM Project were:

Countries	Companies
Brunei Darussalam	Interline Roofing Company Sdn. Bhd.
Indonesia	PT. Terang Kita, PT. Bakrie Tosanjaya
Malaysia	Ingress Engineering Sdn. Bhd., Raya Plastik Industri Sdn. Bhd.
The Philippines	First Gem Philippines Electric Company, Tiongson Industries, Inc.
Singapore	Cast Laboratories Pte. Ltd.
Thailand	Federal Electric Corp., Ltd., Siam Cast Iron Works Co. Ltd.
Vietnam	Thieu Nien Tien Phong Company (Tifoplast), Petroleum Mechanical Company

7. Results

The overall results of the Project have been excellent. The great number of lectures, seminars and workshops in each of the ASEAN countries and in Japan have established a widespread awareness of TQM principles. The participating companies of course have benefited most from the programme. Staff have steadily begun to take the programme more seriously, and to recognise the contribution that they themselves can make to the implementation of TQM.

The business success of the implementation of TQM can be seen in the improvement of a number of indicators, including profit, complaints, delays, absenteeism, number of training days, and the ratio of sales to the number of employees. Almost all model companies have said that they regard the introduction of the TQM Handbooks as just the beginning of a long-term process. They know that they face the growing challenges of the new millennium in meeting competition, increasing productivity, and achieving customer satisfaction.

This first phase of the TQM Project has therefore reached a successful conclusion. The first generation of model companies to implement TQM has been established and the national committees have presented strategic plans for the further spread of the know-how they have acquired. They have shown that, through the use of TQM tools, enterprises can survive and grow in the face of competition.

8. The TQM Project's message for SMEs

For the manager in small and medium sized enterprises, the essential message to emerge from the TQM Project is the value of customer focus, continuous improvement and teamwork. Tools and methods do exist to improve every aspect of a product while delivering it at a competitive price. Moreover, this approach to production, as demonstrated in Japan, generates a new form of learning, one that provides the basis of a sustainable competitive advantage in sectors and regions, and ultimately in nations themselves.

9. The way forward

This wealth of experience and expertise is now available online and on CD in *A Roadmap to Quality*. Enhanced by the addition of learning activities, and with the interactivity and ease of access provided by these media, *A Roadmap to Quality* is a comprehensive e-learning package that will enable SMEs to implement TQM themselves – within the limits of their own resources, and by drawing on the capabilities of their own staff.

Glossary



Glossary

4M1E: The 4M are man, machine, method, and material, and 1E is the environment – the physical surroundings. Check these to find the root causes of a problem.

5S activities: These are based on the five Japanese principles of cleanliness and tidiness in the workplace. “5S” is derived from the Japanese words: Seiri (organising), Seiton (keeping things neat), Seiso (cleaning), Seiketsu (cleanliness), Shukanka (make cleanliness a habit). (See Unit 6.2.)

5W1H: These are the questions: who does what, when, where, why and how? These questions must be answered in standardizing instructions, writing reports and preparing plans. They may also be asked in investigations.

A

Abnormality: Anything that emerges in the production process that does not meet the predetermined criteria governing the process. It need not be a defect. It should however always be investigated. An abnormality may also be described as something that turns out different from the plans, or different from other similar products – unexpected features in a product or unexpected results in a process.

Action limit is the limit represented by the highest or lowest value in a quality control chart. If the actual values fall outside these limits, a correction in the process is required and/or the cause of the change in the process must be determined. This may also refer to an arbitrarily defined limit (either by management or workers) and not only to a statistically computed limit.

After-sales field feedback: Information received about a product after it has been sold.

Annual management policy: This is derived from the mid-term and long-term plans. It presents, in an official document, the company’s targets for the fiscal year, with concrete guidelines for achieving these in important areas such as sales, design and development, production, personnel administration, quality and services.

Aptitude test: Used to predict a person’s ability to learn certain skills.

Attendance rate: Ratio of the number of employees at work to the number required.

Authority: Authority is where someone has been officially given the right to do something, to make a decision, or to give instructions. Responsibility is where someone is given the duty of carrying out a task or seeing that it is carried out. Authority and responsibility often go together but not always.

Automatic controller and recorder: An instrument or component that controls and records

an operation automatically. These are commonly installed on modern machines to ease manufacturing operations as well as to provide electronic data collection.

B

Base material: Major raw material or composites used in the initial production process of manufacturing a product.

Boundary samples of a product show the limits of acceptable quality. There are two types of boundary samples: one is the limit of a non-defective unit and the other is the limit of a defective unit. Boundary samples are usually prepared for items that have to be inspected physically by taste, touch, sight, hearing or smell, without any measuring devices, e.g. a piece of cloth showing the limit of the color for non-defective units.

C

Calibration period: The validity period for accurate usage of an instrument from the date of calibration.

Cause-factor check: Identifies the root problem when errors or abnormalities appear.

Characteristic diagram: Shows the relation between a quality characteristic and the factor/s effecting it.

Characteristic quality: Main feature/s of a product or system or service by which customers will normally identify its quality.

Characteristic value: The values defined as the master data of a characteristic.

Check items: The main stages or critical points in a work process that are checked to make sure that it conforms to the standards. To distinguish check items and control items we can say that check items are factors that seem to have a particularly strong effect on work results, while control items are results that are checked to see if jobs are performed according to plans and targets. (See also Control items.)

Claim: A claim is where a customer seeks compensation, repair or replacement of a defective product that has a warranty, or likewise for a service; a complaint is where they express dissatisfaction with a product or service but may or may not demand compensation.

Claim handling rule: A document which clearly describes the in-house procedures for handling product-related claims, and for repairing defective goods.

Complaint (See Claim.)

Confirm results: Check that results are ok.

Continuous supply method: Bringing items continuously into the inventory without disruptions, and based on the production plan.

Control: Watch or monitor how a job, process or operation is going.

Control characteristics represent process results from which we learn the control status of the process.

Control chart: Used to determine whether a process is in a stable condition or not. It consists of a central line (CL) and upper and lower control limits (UCL and LCL). (See Unit 9.8.)

Control criteria: A range of permissible limits in measuring the acceptable level of quality of a product.

Control designation criteria: An assigned range of limits for the establishment of an acceptable level in the quality control criteria of a product.

Control graph: A time-series graph that contains action limits.

Control items: As used in policy management, measurable items used to judge whether or not tasks assigned to departments or sections or individuals have been carried out; if not, necessary action should be taken, e.g. sales, break-even ratios. More generally defined, the specific features of a process or quality that are examined in controlling the process or quality.

Control limit (See Control chart.)

Control point: Predetermined points in a process which can be examined to see if production is continuous and stable.

Correlation: A measure of the relationship between two sets of variable data. In many cases, only the degree of linear relationship is indicated. Positive correlation: when one characteristic increases as the other increases. Negative correlation: one characteristic becomes smaller as the other becomes bigger.

Co-efficient of correlation: The degree of correlation between two characteristics, with a value in the range from -1 to +1. A value close to -1 indicates a strong negative correlation, a value close to +1 indicates a strong positive correlation, and a value close to 0 indicates a weak correlation.

Countermeasures are taken to deal with an out-of-control event or abnormality, and in particular to ensure that it will not occur again. (An out-of-control event is one that is outside the control limits of what is acceptable.)

Cross-functional: Refers to a situation where a process or an activity crosses the boundary between two or more functions. A cross-functional team consists of individuals from more than one organizational unit or function.

D

Dead inventory: Goods or stocks that are not sold or used after the maximum storage time that is allowed.

Defect: The words deficiency, defect, defective are used when an item is incomplete or does not function properly.

Deploy policy: Communicate policy to those who must follow it, or implement it.

Design validation: Confirmation that the design meets the specifications and target requirements.

Discrete value: A value that can be counted, e.g. the number of defects.

Dispersion of data: The distribution of data in a chart around the central tendency of the chart. The central tendency is where most of the data appears. (See Unit 9.7.)

Dispose of: Get rid of.

Document: As a verb, the word document means to record something in writing.

Downstream: The terms downstream, midstream, and upstream indicate where something stands in the production process - upstream being nearer to the beginning of the process and downstream being nearer to the point of sale.

E

Effect-factor check: Used to see if the effects or results of operations – the quality characteristics of the products – satisfy standards.

Emergency actions are taken to eliminate the immediate phenomena, or visible signs of a problem, before investigating the causes, e.g. stop non-conforming products being made.

Equipment maintenance: A generic term for activities like inspection, adjusting parts, replacing material, and carrying out repairs in non-conforming sections.

Evaluation items: The specific items that are evaluated in order to judge whether activities are going as planned or not.

Examination items: The features in a product that are examined or inspected.

External quality assurance: Activities that will convince the customer of product quality.

F

Facility life-cycle cost: The entire costs incurred during the lifetime of a facility and its equipment, from the start of operation to the point of scrapping.

Factor analysis: A statistical procedure that seeks to explain a certain phenomenon in terms of the behavior of a set of predictive factors.

Failure: In the context of maintenance this refers to the loss of facility or equipment functions, or of those functions that are required under given conditions over a prescribed period of time.

FIFO (first-in, first-out) storage: Usually used with inventories where the first items put into the store are the first taken out to be used, to prevent items aging.

Fixed-point method: A method used to determine when to place a purchase order. In this method if the inventory falls to a pre-determined level, then a purchase order for a fixed amount will be placed.

FMEA (failure, mode and effects analysis): A technique for analyzing the types of failure of constituent parts (failure-phenomena) and their effects on higher items (e.g. facilities, equipment machines, tools, parts, and systems). It identifies incomplete designs and latent defects.

Fraction defective: The proportion of minor defects.

FTA method (failure tree analysis): A technique used to analyze the root causes, and ratios of failures by tracing back events and developing a tree-like figure.

G

Given margin: Fixed distance beyond a point, or between two values or points.

H

Histogram: One of the QC tools (See Unit 11.3.2.)

I

Indexes of management: Ways of measuring management.

Industrial engineering (IE): The scientific study of manufacturing operations.

Inspection items: The features in a product that are examined or inspected.

Inspection of causes: Finding out what caused something to go wrong.

Intangible effect (See tangible and intangible effects.)

Interface: Refers to how the work processes and activities of one department may integrate with those of another department.

Internal QC diagnosis: Where management forms a diagnosis team to periodically evaluate the current status of the company-wide quality control system.

Internal quality assurance: Activities that will convince the management of product quality.

Inventory: The quantity of goods or materials in stock.

Inventory management at a glance: A system that allows people to see inventory levels at a glance.

Inversely proportional: The more of one, the less of the other.

J

Job content: What is actually done in the job.

K

Kaizen: The Japanese term that means continuous gradual improvement by doing little things better and by setting and achieving increasingly higher standards.

L

Latent deficiency: A deficiency not yet visible, that could arise.

Lead time: The time interval between the placing of an order and its delivery.

Limit line: The line on a control chart that shows if results are acceptable.

Lux: A unit of illumination equal to 1 lumen per square meter.

M

Management (check) items: Features of a task that can be checked to see how well the task is being done.

Marginal sample: Similar to a boundary sample, this is a sample of a product that shows the limits of acceptable quality. There are two types of boundary samples: one is the limit of a non-defective unit and the other is the limit of a defective unit. Boundary samples are usually prepared for items that have to be inspected physically by taste, touch, sight, hearing and smell, without any measuring devices, e.g. A piece of cloth showing the limit of the color for non-defective units.

Master file: In the context of calibration, these are master records of the correct calibration of measuring equipment.

Master table: In the context of calibration, these are also master records of the correct calibration of measuring equipment.

Matrix chart: A rectangular chart that presents information in rows and columns.

Measurement item: Predetermined items that will be examined or measured during an inspection.

Midstream (see downstream)

Monthly appraisal: The appraisal of policy implementation on a monthly basis using control items. It corresponds to the C (check) and A (act) parts of the PDCA Cycle (plan, do, check and act).

Muda, muri, muda, mura: Japanese terms for negative behaviour in the workplace: unreasonableness, wastefulness and untidiness.

N

Non-conformity: An item that does not meet the required quality standards.

Numerical targets are expressed as numbers. Wherever possible TQM likes to have data presented as numerical data for purposes of analysis and comparison. “Quantitative” is also used with the same meaning.

O

One-point lecture: A supplementary standard that makes it easier to understand the use of equipment, work methods, measuring methods, safety, and other work issues.

Operating condition: The location of an operation, its safety aspects, the equipment, tools, temperature, time etc.

Operating ratio: The number of hours that operations are actually performed during the hours that they could be performed – operating hours divided by actual working hours x 100%.

Operation qualification: A qualification required to do a specific operation.

Out-of-control event: Events in a process or work that are well outside the control limits of what is acceptable.

Outlier: A value, or item of data, that falls well outside the dispersion range of the rest of the data.

P

Parallax: Where an object seems to be in different positions if viewed from different positions.

Pareto diagram: A graph showing stratified items in order of frequency and cumulative total to find out the vital few items that need to be tackled; one of the 7 QC tools. (See Unit 11.3.1.)

PDCA cycle: The TQM management procedure of plan, do, check, act.

Periodic audits of operations: Inspections of operations held at regular intervals.

PERT (programme evaluation and review technique): PERT is a schedule management method for large-scale repair plans and complex repair work. It presents the sequence of repair processes in the form of a network and creates a repair work schedule on the basis of the time required and the distribution of costs.

Phenomenon: That which can be seen – the outward, visible effect or result of a problem, the visible defect.

Policy deployment: Sending (disseminating) annual management policies for the fiscal year to the different internal departments and sections.

Policy management: Developing long-term and mid-term plans based on the company philosophy, translating these into annual management policies, deploying these annual policies down through the organisation, having them implemented, and controlling this implementation to ensure that the policies are achieved efficiently.

Population: In statistics, population refers to the group which is being researched and from which a sample of units is selected. The sample is then studied in order to draw valid conclusions about the whole population. (See Unit 11.2.1.)

Post-use: When a product is no longer used, when it is obsolete.

Process capability: The capability of a production process to produce the same product to the same quality over an extended period of time under normal process conditions (fulfillment of predefined quality requirements).

Process capability index: Uses statistical process control (SPC) methods to evaluate whether a process has the capacity to meet the standard requirements for that process. (See Unit 14.1.)

Process condition: The conditions in which a process is carried out, e.g. location, equipment, temperature, workers.

Process control plan: A document that describes the required characteristics for the quality of a process. (See also QC Process chart.)

Q

QC circles are small groups of workers from the same workplace who meet to discuss work problems and carry out improvement activities. Their value lies in the fact that workers themselves are very familiar with the problems in their own work places. When they form groups, they can do a lot together to solve these problems, and to improve the quality of their work. (See Unit 10.)

QC circle theme: The improvement issue on which a QC circle focuses. It may be a task, a process or a problem that needs to be solved.

QC process chart: A control standard which describes the manufacturing process and the checks that are required in this process. It is a valuable tool for controlling operations and for confirming results. A process control plan is very similar.

QC story: An important TQM problem-solving procedure. (See Unit 9.)

Quality assurance: Often the terms quality assurance and quality control are used interchangeably, to refer to the actions performed to ensure the quality of a product, service or process. One definition of quality assurance is all the planned and systematic activities implemented within the quality system that can be demonstrated to provide confidence that a product or service will fulfill requirements for quality. One definition of quality control is the operational techniques and activities used to fulfill requirements for quality.

Quality audit: A systematic, independent examination and review to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable for achieving the objectives.

Quality characteristic: The features of a product that are used to evaluate whether it is of the right quality e.g. with a piece of clothing, does it keep its color, does it stretch?

Quality control (See quality assurance.)

Quality control diagnosis: Investigation of possible deficiencies in quality control systems. (Also referred to as quality audit. (See Unit 2.6.2.)

Quality control points: Key items that should be carried out properly in a job or an operation if it is to have the appropriate level of quality.

Quality function deployment: Analysis of the customer's requirements of quality, performance and function and their conversion into design and production elements to best meet these requirements.

Quality manual: The basic document used in implementing company-wide quality control. It contains quality control rules, technical standards, inspection rules, product standards, operation standards, and other rules for the assurance, maintenance and management of quality.

Quality policy: The approach that a company takes to quality, as formally expressed by management.

Quality table: A matrix table that shows the quality characteristics and inspection items for a product.

Quantitative assessment method: Assessment method based on items that can be measured or counted.

Quantitative data: Data that is presented numerically.

R

Recurrence prevention measures: Actions taken to prevent similar problems or abnormalities from occurring again.

Reference standard: Official standards that other standards are based on.

Reliability technology: Technology that shows the probability of an item performing a required function under given conditions and in a given period of time.

Reporting route: A systematic procedure for forwarding a report to the different people who should receive it.

Reproducibility experiment: An experiment that reproduces a failure in order to analyse how the failure occurred.

Responsibility (See Authority.)

Rework: To repair or adjust an item so that it can pass inspection.

Root cause: The basic, real cause of a problem.

Rules for job authority: The rules for job authority document the scope of responsibility and authority for the job of every employee of every department throughout the company. They describe how the employees doing each job should be managed, and how to prepare plans and define responsibilities for emergencies.

S

Sample: In statistics, part of a population (a group of items – see population) selected in order to get information about the whole population.

Sampling: Comparing a product with a typical sample of the product that is of the right quality.

Scatter diagram: A diagram used to determine whether a correlation exists between two characteristics.

Schedule control table: Table in which improvement objectives, measures to achieve them and target values are summarized.

Self-management: When employees manage their own work. The term 'self-control' is sometimes used in TQM with the same meaning.

Sensory inspection: An inspection carried out by the senses: touch, taste, sight, hearing, or smell.

SOP: Standard operating procedure.

SPC: Statistical process control – a statistical tool for measuring variation.

Standard: A prescribed way to do a job, carry out an operation, or complete a process. Standards are written up so that everyone will complete jobs, operations or processes in the same way. The verb is to **standardize**. A number of verbs go with standards: **establish or institute standards** means to write up standards and put them into effect; **classify standards** – organize standards systematically in groups using numbers and symbols; **abolish standards** – cancel them; **withdraw standards** - suspend or cancel them; **draft standards** – prepare written standards to be approved; control standards – check that they continue to be valid: **announce standards** – make known that standards are now valid; **file standards** – put them in order for easy access; **review standards** – examine standards and consider whether they need to be changed; **revise standards** – make changes to standards.

Standard sample: Typical sample of a product showing its proper quality characteristics. Compare with boundary samples.

Standard value: The numerical value which is specified in the standard.

Stratify: To divide data into several strata according to the sources of the data in order to find out the real causes of problems, e.g. data could be stratified by machines, by workers or by shifts, to identify the cause of defects. It is one of the 7 QC Tools. (See Unit 11.3.4.)

Subjective evaluation: Evaluation based on subjective factors such as appearance or taste.

SWOT analysis: Method for analyzing the present position of a company. Usually this is used for setting strategy and policy: S: strengths – points to be maintained as advantages or further developed; W: weaknesses – points to be improved; O: opportunities – areas to expand the business; T: threats – to identify threats in advance and set up countermeasures beforehand to reduce negative effects on the business.

T

Tangible and intangible effects: Tangible effects are, for example, a reduction in the time required for delivery, which numerical values can clearly confirm. Intangible effects are, for example, improved teamwork and quality consciousness.

Target quality: The quality of the product that the process is supposed to produce.

Target value: The desired outcomes from a process.

Term-end reflection: Review of policies at the end of each term, usually the end of the year. There are two types of reflection: reflection on results and reflection on processes.

The seven QC tools: Pareto Diagram, Cause and Effect Diagram, Check Sheet, Histogram, Control Chart, Graphic Chart, Scatter Diagram (See Unit 11.3.)

Theme: An item chosen for improvement. It may be a task, a process or a problem that needs to be solved.

Time series graph: Graph that shows changes over a period of time.

Total Preventive Maintenance (TPM): Where everyone from CEOs to frontline workers takes part in maintenance activities. It includes all forms of maintenance.

Traceable: Where it is possible to trace the history, application or location of an item, e.g. in the case of the product, the origin of materials and parts, the processing history and the distribution and location of the product after delivery.

Trend: A change in a certain direction over a period of time that can be seen on a graph, e.g. the number of defects shows a decrease in the first six months of the year.

U

Upstream (See Downstream.)

V

Value added: The parts of the process that add worth from the perspective of the external customer.

Variance: Small differences in the way an operation is carried out.

Value Engineering (VE): A systematic and organised procedural decision-making process that helps people or organisation to creatively generate alternatives to secure essential functions at the greatest worth in relation to costs.

Vision: An all-embracing statement of where an organization would like to be in the future.

W

Waste: Any activity that consumes resources and produces no added value to the product or service a customer receives.

Work instruction: A work instruction is a clear, simple written description of the daily production plans and related information, based on the standards and given to the workers before they begin operations.

Work process table: A table used to manage the progress of production or maintenance.

Work-in-progress (WIP): Work that is still continuing.

Z

Zero defect: A performance standard and methodology developed by Philip B. Crosby that states that if people commit themselves to watching details and avoiding errors, they can move closer to the goal of zero defects.

Unit 1

Chief
Executive
Officer:

Managing
Policy



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Unit summary

The full implementation of TQM requires the commitment of the Chief Executive Officer and senior managers. As CEO you must take personal charge, providing a vision of where your company is going, and the leadership to realise this vision. This requires that you, with your senior managers, define your company philosophy, and develop long-term and mid-term plans based on this philosophy. Then translate these plans into annual management policies, and deploy these policies down through your organisation. This is known as policy management.

1.1 Policy management – an overview

For successful policy management, first of all define your company philosophy, and then prepare long-term and mid-term management plans. From these plans, decide what you want to achieve each year, and the concrete measures required to do this. These are your annual management policies, sometimes also referred to as presidential policies.

Communicate these to your different departments, making sure that they are implemented in a coordinated way and to a coordinated time schedule. Good policy management is essential if your company is to successfully develop new products, improve quality, reduce costs, and strengthen its operations.

1.2 Prepare mid-term and long-term management plans

Long-term plans are normally for five years, and mid-term plans for three years. They are essential if your company is to achieve all that it is capable of achieving. They should be based on your business philosophy, on a good understanding of your management strategies, and on a sound grasp of your corporate strengths.

1.3 Establish annual management policies

At the end of each fiscal year, CEOs agree on their understanding of the long-term management plans, review the policies of the past fiscal year, and draft a plan for formulating annual management policies for the new fiscal year. This draft plan is discussed at a top management meeting, and agreement is reached. Draft policies for the new fiscal year are prepared, and are approved by the president.

1.4 Deploy policies and prepare implementation plans

Your annual management policies must now be deployed down through the organisational levels, from higher level to lower level departments and sections. Those at each level will establish their own policies based on these annual policies, and prepare plans to implement them.

1.5 Control the implementation of policies

Check regularly that policies are being implemented as planned: that departments, sections, and individuals are carrying out the tasks assigned to them. If policies have not been implemented properly, it is important to decide whether the implementation plans were impossible to carry out, or the plans were carried out to schedule but failed to achieve the target.

1.6 Reflect on the policies at the end of the year

Reflect on your annual management policies at the end of each year. This is called term-end reflection and will provide feedback for future improvements. There are two types of term-end reflection: reflection on results, and reflection on processes.

1.7 Carry out a presidential diagnosis of policy implementation

To manage their policies the company president and other CEOs must have a sound grasp of the mechanisms of policy management and they must display leadership. Unless they do so, no company-wide moves will take place, and policies will end up unachieved. They must step out of their office and visit business divisions, regional branches and manufacturing plants where they should hold frank discussions on policy deployment and promotion. This is referred to as the presidential diagnosis of policy management.

Learning tools

The RADAR questions

As you read each text you will discuss how it could be applied in your company. The RADAR questions will help you to focus this discussion:

- R** - Are these ideas **relevant** to my company?
- A** - How would I **apply** each of them in my company?
- D** - What **difficulties** might I meet and how would I overcome them?
- A** - Are there any **additional** actions that I might take that are not mentioned in the text?
- R** - What **resources** would be needed, what would these cost, and how could they be acquired?

There will of course be some discussion points where not all of these questions will be applicable.

The 6-Point Structure

After you have discussed the ideas in the text, you write an action plan in which you present practical proposals for implementing the conclusions you have reached in your discussion. The 6-Point Structure will help you to write your action plan:

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts, tables etc. that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these could be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

1.1 Policy management – an overview

1. For successful policy management, first of all define your company philosophy. Then prepare long-term and mid-term management plans. From these plans, decide what you want to achieve each year, and the concrete measures required to do so. These are your annual management policies, sometimes also referred to as presidential policies. Communicate these to your different departments, making sure that they are implemented in a coordinated way and to a coordinated time schedule. Good policy management is essential if your company is to successfully develop new products, improve quality, reduce costs, and strengthen its operations.
2. The full sequence of actions in effective policy management are:
 - a. First your company defines its business philosophy: what do you aim to achieve, what is important to you, what are your values? On the basis of this philosophy, you develop your long and mid-term management plans.
 - b. At the beginning of each fiscal year the CEOs establish the annual management policies for that fiscal year: their targets for the year, and the concrete measures needed to achieve them. These are sent to the different departments. This is known as deploying the policies, or policy deployment.
 - c. The department managers examine the policies they have received, reflect on the work they have to do in their department, and formulate their own departmental policies - their targets for the year and their concrete plans to implement them.
 - d. The managers deploy their policies (their targets and implementation plans) to the departments and sections below them, who then implement them.
 - e. Implementation has to be controlled. Assign employees to use control graphs (see 1.5.11) and other reference materials to inspect, on a weekly or monthly basis, if:
 - i. The measures in the implementation plans are being implemented as prescribed.
 - ii. These measures are having the anticipated effects.If any abnormalities appear (i.e. any unexpected results of implementing the plans), countermeasures should be taken quickly and the results reported to superiors. If necessary, modify the implementation plans.
 - f. At the middle and end of each fiscal year, section managers, department managers or CEOs make a diagnosis of:
 - i. The status of policy implementation.
 - ii. The achievement level of management items. (Items checked to see how well a task has been carried out.)
 - iii. The status of general quality management.
 - g. At the end of each fiscal year, review what has been implemented during that year. Have summary reports prepared that can be used as a basis for improvement activities e.g. setting up a team to specialise in important quality problems.

Figure 1.1a Flowchart of policy management (page 8)

Discussion

This text gives an introductory overview of policy management. The following questions ask you to think about how the ideas in the text relate to your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1 gives a definition of policy management. How would you describe policy management in your own words? What could it mean in your company?
- b. Parag. 2a: How would you describe your company's business philosophy? What is the value of having a business philosophy? What could be a better business philosophy for your company?
- c. Parag. 2b: Give one or two examples of possible annual management policies for the current or coming fiscal year in your company.
- d. Parags. 2c and 2d: How could you imagine this system working in your company? Give one or two examples of targets and implementation plans that you, as a manager, might decide on. What problems might you have to take into account in relation to these policies?
- e. Parag. 2e: What abnormalities could possibly arise with implementing the plans that you considered in the previous question?
- f. Parag. 2f: How would you go about making a diagnosis of these points in your company?
- g. Parag. 2g: How useful do you feel it would be to review, at the end of each fiscal year, what has been implemented during that year? What specific benefits could this bring?
- h. Look at Figure 1.1a. This is quite a complex flowchart of policy deployment. Identify the steps that have been referred to in this text. Which of the other steps could you relate to your company?

Action plan

This text gives an overview of policy management. As you read and discuss each of the following texts in this unit, you will build up the parts of an action plan – a written proposal for introducing policy management in your company. As a first step, write a short report presenting:

- a. Why your company needs a business philosophy.
- b. A proposed business philosophy for your company.

1.2 Prepare mid-term and long-term management plans

1. Your mid-term and long-term management plans are the basis for your annual management policies. Long-term plans are normally for five years, and mid-term plans for three years. They are essential if your company is to achieve all that it is capable of achieving. They should be based on your business philosophy, on a good understanding of your management strategies, and on a sound grasp of your corporate strengths.
2. The long-term plans should show your major strategies, with control items such as:
 - a. Sales.
 - b. Ordinary profits.
 - c. Per-capita sales.
 - d. Break-even ratios.
 - e. Target values.

(Control items are measurable items used to judge whether or not tasks assigned to departments or sections or individuals have been carried out; if not appropriate action should be taken. See 1.5.8.)

3. Your company may choose to prepare only long-term plans, or only mid-term plans, or both. If it chooses to prepare both, then the long-term plans will present only the basic targets for sales, production volume, plant and equipment investment, and personnel costs etc. It will focus on providing long-term vision and guidelines. Examples are:
 - a. Assume leadership in the XX market by the year YY.
 - b. Develop the capacity to export to country XX in a profitable manner by the year YY.
 - c. Develop the capacity to develop new, marketable products without external assistance by the year YY.

These basic policies are realized through shorter-term concrete policies.

4. The following example from a computer company will show how these basic policies can be achieved through concrete policies:
 - a. Basic policies:
 - i. Cultivate personal computer markets anew, in response to saturation of the market.
 - ii. Develop differentiated products in order to improve our position against competitors.
 - b. To realise these basic policies implement the following concrete policies:
 - i. The office personal computer market consists of individual homes and small business offices, including law firms. Develop the office personal computer market for companies that have already introduced personal computers. Develop the market for additional personal computer installation at the department and section levels.

- ii. In order to cultivate the office personal computer market, develop products for personal use that are easy to maintain, at super low prices, and with high reliability. Establish a new production system.
- iii. Create sales channels for small-scale individual users. Market colour and digital machines as differentiated products to meet a new demand in the existing markets. By introducing these, the company should strengthen its position against competitors.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1: What benefits do you see in having mid and long-term plans? What targets could you include in your long and mid-term plans?
- b. Parag. 2 gives several control items for long-term plans. Would all of these apply in your company? Are there any others you would add? Can you give examples of what any of these might mean in your company?
- c. Parag 4 gives examples of basic and concrete policies. Suggest similar examples from your own company.

Action plan

As you continue reading and discussing the texts in this unit, you will build up the parts of an action plan – a written proposal for introducing policy management in your company. As a second step, write a short report presenting:

- a. Why your company should have better mid-term and long-term plans.
- b. Some examples, or outline suggestions for what these plans might be.

1.3 Establish annual management policies

1. When you have defined your company philosophy, and prepared your mid-term and long-term plans, follow this procedure to establish your annual management policies:
 - a. At the end of each fiscal year, the CEOs look at the long-term management plans, agree on a common understanding of them, and review them at top management meetings.
 - b. Written reflections (known as “term-end reflections”) on the policies of the past fiscal year are presented and discussed at an executive meeting, and a plan is drafted for formulating policies for the new fiscal year.
 - c. This draft plan is presented and discussed at a top management meeting. Once agreement has been reached, draft policies for the new fiscal year are prepared. These will be finalized when they receive the approval of the president.
2. Before finalising the policies:
 - a. Analyse the plans with reference to the business philosophy and the long and mid-term management plans.
 - b. Analyse the plans and results from previous years.
 - c. Consider any recent changes in the business environment in which the company is operating.
 - d. Formulate concrete targets for quality, cost, and delivery.
 - e. Formulate the policies necessary to achieve these targets.

Figure 1.3a. System behind policy establishment

3. The policies should include:
 - a. Policies that will be given priority.
 - b. Concrete guidelines with numerical targets for important items such as sales, design and development, production, personnel administration, and services.
 - c. Specific targets and methods for maintaining and improving quality in each department.
 - d. Control items: Measurable items used to judge whether or not tasks assigned to departments or sections or individuals have been carried out, including methods of evaluating this; if tasks have not been carried out as required, appropriate action should be taken. (See Text 1.5.8.)
 - e. The targets for the year.
 - f. Strategic measures to implement the policies.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1: Consider how a procedure for establishing annual management policies could be introduced in your company:
 - i. Who would be involved in each of these steps?
 - ii. What information would they need?
 - iii. What meetings might they hold?
 - iv. What current questions and issues, about both the present and the future, would they need to look at?
 - v. What difficulties might be met and how could they be resolved?
- b. Parag. 2 presents several actions to be taken before the annual management policies are established. Apply the RADAR questions to each of these. Give examples, where appropriate.
- c. Parag. 3: Give concrete examples of the points in this list that you might include in your annual management policies (Recall the points you discussed in question 2b after Text 1.1).

Action plan

Prepare an action plan for defining a company philosophy, preparing mid and long-term plans and establishing annual management policies in your company. Include the short reports you have prepared after your discussions in 1.1 and 1.2. As you continue with your discussions of texts 1.3 to 1.7, you can add sections on deploying, implementing and controlling these policies. Follow the 6-Point Structure.

1.4 Deploy policies and prepare implementation plans

1. Your annual management policies must be deployed down through the organisational levels, from higher level to lower level departments and sections. Those at each level will establish their own policies, based on these annual policies, and prepare plans to implement them.
2. At each organisational level the policies will be based on:
 - a. The long and mid-term outlook.
 - b. Results from the previous fiscal year.
 - c. Relevant business conditions.In this process of policy deployment, it is essential that information is exchanged through the different levels, and that general agreement is reached.

Figure 1.4a Matrix chart showing target deployment, policy deployment and responses

3. Implementation plans ensure that the policies deployed through the company are implemented properly. When departments and sections have received the annual management policies, each should take the following steps:
 - a. Get a good understanding of the management policy and establish their own concrete policies.
 - b. Examine ways to harmonise departmental policy with the company-wide policy.
 - c. Establish evaluation items and appropriate evaluation scales*.
 - d. Produce written implementation plans.
 - e. Implement these plans in the form of departmental, sectional, and team activities.
 - f. Hold advance discussions on items that are strongly related to other departments and sections.

(*Evaluation items are the specific items that are evaluated in order to judge whether the activities are going as planned or not. Evaluation scales are the measurement system used to make these evaluations.)

4. The plans for implementing the departmental policies should include:
 - a. Achievements and problems from the previous fiscal year.
 - b. Concrete targets for the coming year.
 - c. The schedule for their implementation.
 - d. The individuals responsible, the persons in charge, and any cooperating parties.
 - e. The anticipated effects of the plans.
 - f. Use the "5Ws and 1H" (who will do what, where, when, why and how) method to present these points clearly in the plans.

Figure 1.4b A sample implementation plan

5. Keep the following points in mind:
 - a. It is implementation at the front line that puts higher policies and plans into effect.
 - b. Plans become more concrete as they move down the organisation levels of the company.
 - c. Interdepartmental and intersectional problems should be resolved in a cooperative manner.
 - d. Use the “5Ws and 1H” method to specify how the targets and deadlines are to be met. Make communication and checking methods clear.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any examples referred to in the text, *if* you feel these are relevant to your company.

- a. Parags. 1 and 2 describe the process of policy deployment, and emphasise the need to exchange information and reach agreement between higher and lower level employees, departments and sections. How easy is this in your company. If not, what steps could be taken to make it easier?
- b. Parag. 3 suggests ways of preparing implementation plans. Apply the RADAR questions to these suggestions.
- c. Parag. 4 suggests six items that should be included in the implementation plans. Suggest examples of what you might include for each of these in your company.
- d. Consider the following questions:
 - i. Which departments in your company would policies be sent to first of all?
 - ii. How would they be sent? – In writing or at meetings? How specific would they be? Give concrete examples.
 - iii. What guidelines would they contain for the managers who would then have to prepare implementation plans? How detailed should the implementation plans be?
 - iv. What obstacles might have to be dealt with?
- e. Parag. 5 mentions five points to keep in mind. How true are each of these in your company? How would you apply the 5Ws and 1H method? How useful would it be?

Action plan

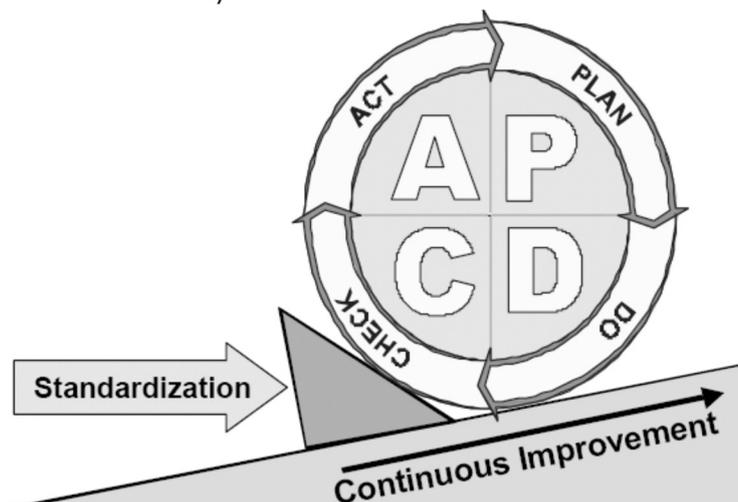
Include your ideas for deploying and implementing annual management policies in the action plan you have already prepared.

1.5 Control the implementation of policies

Introduction

1. Once the implementation of policies begins, you need to check regularly that they are being implemented as planned: that departments, sections, and individuals are carrying out the tasks assigned to them. If policies have not been implemented properly, you will have to decide whether the implementation plans were impossible to carry out, or the plans were carried out to schedule but failed to achieve the target.
2. There are two ways of appraising implementation:
 - a. Appraisal of the results: what results has implementation brought?
 - b. Appraisal of factors: appraisal of the status of the specific activities and processes (implementation items) that are being implemented.
3. Use the PDCA cycle to carry out the appraisal. The PDCA cycle has four stages. As applied to implementing policies these can be described thus:
 - P - Plan:** Set up a concrete implementation plan, as described in Text 1.4, with evaluation items and evaluation criteria; decide how to put it into practice and who will be in charge of each item; prepare a schedule and check that everyone who needs to know about it is informed.
 - D - Do:** Implement the plan exactly as it has been drawn up. Don't implement it partially or casually.
 - C - Check:** Use the evaluation items that were chosen at the planning stage to review and evaluate the results of implementation.
 - A - Act:** Analyse the results that have been evaluated and take concrete countermeasures. If necessary, incorporate the results in a new PDCA cycle. Finally standardize the new procedures. (See the Introduction to TQM for more about the PDCA cycle.)

Figure 1.5a The PDCA cycle



The monthly appraisal

4. Normally you should carry out an appraisal each month. The basic monthly appraisal measures control items and uses control graphs to judge whether the targets have been achieved. This corresponds to the C and A (check and act) parts of the PDCA cycle. Use the procedure described in "Deal with abnormalities " (see parags. 13 to 15) to detect problems, identify the causes and take measures to deal with them.
5. The sources of policy implementation problems will normally be found in:
 - a. Changes in the external environment.
 - b. Failure to implement specific items.
 - c. Failure to carry out the implementation plans properly.
 - d. Delays in carrying out the implementation plans.
6. Approaches to the problems:
 - a. When failed implementation poses problems, investigate the causes, and analyse the root causes and eliminate them.
 - b. When problems lie in specific implementation items, investigate why these were included in the plans and how the plans were prepared, and identify and remove the root causes.
 - c. When problems lie in the implementation plans, then revise the plans.
7. Record immediately whatever actions you take. For reference purposes, write up analyses of the policies that were not successfully implemented, and the actions taken to deal with them. Use monthly follow-up sheets with implementation plan management tables and PDCA sheets. Assessment should not be vague. Results like "more than 95% achievement of targets" are not acceptable.

Figure 1.5b Written plans for and reports on operational implementation

Control items

8. Control items are measurable items used to judge whether tasks assigned to departments or sections or individuals have been carried out; if not, appropriate action should be taken. Three of the most important control items in appraising policy implementation are:
 - a. *Are policies and target values valid?*

Policy management helps to put the policies of higher managers into effect. The policies and target values themselves are therefore control items. They too must be checked.
 - b. *Are any problems identified during the policy deployment stage?*

It is essential to identify and solve any problems that arise at this stage. The question of whether problems are identified and resolved or not is therefore in itself an important control item.
 - c. *What is the progress ratio for implementation plans?*

This is an important point. However if only the progress ratio is considered as an important control item, it becomes difficult to judge whether target values have been achieved, even if the control items themselves have been achieved completely.

Policies and target values must therefore be included as control items. (The progress ratio is the percentage of a task or process that is completed in relation to the complete task or process.)

9. It is impossible to check everything. Select important, high contribution implementation items (items that make an important contribution to achieving the targets) as control items. Always review the usefulness of the control items you have chosen. If you find they are no longer useful, revise them.
10. Note the distinction between control items and control characteristics.
 - a. "Control items" are measurable items used to judge whether or not tasks assigned to departments or sections or individuals have been carried out; if not, appropriate action should be taken.
 - b. "Control characteristics" are characteristics used to judge whether machines, tools, facilities, equipment, processes, and systems are in good condition and for taking action when they are not.

Control graphs

11. Use control graphs to check the progress of implementation plans. These are time-series graphs (graphs that show changes over a period of time) in which action limits are entered. The action limit is the limit represented by the highest or lowest value in a quality control chart. If the actual values fall outside these limits, a correction in the process is required and/or the cause of the change in the process must be determined. Data giving the monthly, or daily, achievements for each control item is plotted on the graph. Any data that falls outside the action limits indicates a failure to achieve the implementation scheduled for that point in time. When this happens action should always be taken. (For more detail on control charts see Text 9.8 in Unit 9.)
12. Use the targets of the implementation plans as action limits, but allow them a certain latitude – a little more or a little less. In other words, the target values (the desired outcomes of a process) plus or minus a little are the action limits. The so-called "banana curve" that construction companies use for schedule management is an example of this. In many cases, target values are allowed to have a latitude of +/- 1:5% or +/- 10%.

Figure 1.5c Table for monitoring the progress of implementation plans

(See Text 9.8 for a more detailed description of control charts.)

Procedure for dealing with abnormalities

13. The term "abnormality" is normally used in TQM to refer to problems, or to indications of hidden or potential problems, but it can also refer to any unexpected outcome. In the context of policy implementation an abnormality can be any result that was not planned – it may be something that has not been done at all, has not been done properly, or has not had the expected result.

14. There are three important actions to take when abnormalities emerge:
 - a. Emergency measures: eliminate the outward effects of the abnormality.
 - b. Recurrence-prevention measures: eliminate the causes.
 - c. Fundamental measures: eliminate the root causes.

15. To detect and deal with abnormalities:
 - a. Specify the control items and prepare a corresponding number of control graphs.
 - b. Collect data every month (or even daily) and plot it accurately on the control graph. Compare the plotted data with the action limits.
 - c. Look for any signs of abnormalities, and confirm at once that they are abnormalities. To do this, break processes down into their different component processes.
 - d. Do not ignore any abnormalities. Assess them accurately. Don't just look for an excuse and decide that the situation "cannot be helped".
 - e. Enter data about any abnormalities on forms which can then be used as abnormality reports and issue these reports to those concerned. Record everything accurately – do not hide or distort any of the abnormalities.
 - f. Take any emergency action required right away – it is important to get rid of the outward effects of problems at an early stage.
 - g. Analyze processes using problem-solving procedures and other means in order to establish the underlying causes. For this reason it is essential to improve problem-resolution skills, especially for sub-section chiefs, team leaders, work site managers, and supervisors. (See Unit 9 Problem Solving.)
 - h. Take actions to eliminate the underlying causes that were established in the preceding steps.
 - i. Record any actions taken to deal with abnormalities in the abnormality reports – both the emergency actions taken to deal with the immediate problems and the recurrence-prevention measures taken to deal with the underlying causes.
 - j. Analyse the abnormality reports once a month, or once every several months, to check that the actions taken have been shown to be appropriate. Confirm their effects, any problems that have been detected, and the corresponding improvements that have been made. (Examine separately the actions taken and the methods used to solve the problem.)

16. Make it very clear which individuals are responsible for all of this. It is management that is responsible for dealing with abnormalities and not QC circles.

Figure 1.5d Written abnormality report

(See Unit 9 for detailed guidelines on dealing with abnormalities.)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any examples referred to in the text, **if** you feel these are relevant to your company.

- a. Parag.1: Which present policies do you find most difficult to implement? Which do you find most difficult to assess? How do you carry out your assessment? How successful do you think your approach is?
- b. Parag. 2: Which of your policy implementations would it be more appropriate to appraise by results? And which by factors?
- c. Parag 3. Examine Figure 1.5a the PDCA cycle. How would you apply it in your company?
- d. Parag. 5 and 6: Have you experienced any policy implementation problems that could fit in each of these four categories? How has your company dealt with them?
- e. Parag. 8 presents three of the most important control items. How important do you think each of these is? How likely is it that problems could be found in each of these in your company?
- f. Parag. 9: In the plans that are already being implemented in your company, or those that you might implement (recall your discussions of earlier texts), what would be the most important implementation items?
- g. Parag. 10 differentiates control items and control characteristics. Give some examples from your own company of control characteristics.
- h. Parags. 11 and 12: Try to draw a control graph for one or two of the implementation plans that you have been discussing. Decide what the action limits should be (i.e. based on the target values plus or minus a little), enter some hypothetical data, and decide on appropriate action to take.
- i. Parag. 14: Can you give some examples of typical abnormalities in your company? And of emergency and recurrence prevention measures that could be taken to deal with them?
- j. Parag. 15 presents a list of actions to take in detecting and dealing with abnormalities. Apply the RADAR questions to these in relation to some typical processes in your company.
- k. Parag. 16: Why should it be management rather than QC circles that are responsible for dealing with abnormalities?

Action plan

Include your ideas for controlling the implementation of annual management policies in the action plan you have already prepared.

1.6 Reflect on the policies at the end of the year

1. Reflect on the annual policies at the end of each term, usually the end of the year, to provide feedback for future improvements. This is called term-end reflection. There are two types of reflection:
 - a. Reflection on results.
 - b. Reflection on processes.It is particularly important to reflect on the processes carried out during the past year.
2. Examples of items that can be reviewed at the end of the term are:
 - a. The activities implemented during that term.
 - b. The results of these activities.
 - c. The causes of failed target achievement during the term.
 - d. Action targets for the next term.
3. The main points to keep in mind are:
 - a. Get a good grasp of the facts by analysing the current situation. Then prepare a term-end review form.
 - b. Write the reviews in the first person ("I"). Writing them in the third person (he, she, they) and attributing causes to the environment and to customers cannot be considered reflection. It is simply making excuses and is unacceptable.
 - c. Provide a lot of space in the term-end reviews for descriptions of the current situation. Make especially sure that these reviews do not contain too many plans for the future.
 - d. Select important problems from the many current issues and make these the focus of actions to be taken during the next term.

Figure 1.6a Written reports on the analysis of unachieved items

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any examples referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: Why is it particularly important to reflect on processes carried out during the year?

- b. Parag. 2: Are there any other items that you feel should be reviewed at the end of the term?
- c. Parag. 3 gives four main points to keep in mind. How important do you think each of these points is?
- d. Parag. 3d: What would you see as the current issues in your company, and what important problems might you select to be taken up during the next term.
- e. Look at Figure 1.6a. How would you apply this report in your company?

Action plan

Include your ideas for holding a term-end reflection on policies in the action plan you have already prepared.

1.7 Carry out a presidential diagnosis of policy implementation

Introduction

1. To manage their policies the company president and other CEOs must have a sound grasp of the mechanisms of policy management and must display leadership. Unless they do so, no company-wide moves will take place, and policies will end up unachieved. They must step out of their offices and visit business divisions, regional branches and manufacturing plants where they should hold frank discussions on policy deployment and promotion. They should find out on-site if:
 - a. Departments and sections are implementing activities based on the annual presidential policies.
 - b. The implementation of policies is producing substantial results.They should draw attention to both good and bad points, make recommendations, and take whatever action is appropriate. This is known as "Diagnosis by the president".

Diagnosis by the president

2. Diagnoses by the president focuses on two areas:
 - a. *Diagnosis of policy management*

Presidents, other top executives, department managers, or section chiefs assume the role of diagnosticians. They periodically carry out a planned inspection of policy deployment, of implementation measures, and of the achievement of targets at the end of each term and during company-wide quality month. They also diagnose how well the plans suit the present conditions and note any improvements in the implementation and appraisal methods. They point out problems, suggest corrective measures and answer questions about any departmental or sectional difficulties.
 - b. *Diagnosis of cross-functional management*

It is impossible to get an accurate grasp of such matters as new product development, quality assurance, and profit management only by carrying out a diagnosis of a narrow range of activities within one company function. Cross functional activities or processes (which cross the boundary between two or more functions) have to be diagnosed from a special company-wide perspective.

Figure 1.7a Sample programme for diagnosis by the president (page 23)

Receivers of diagnosis

3. Those receiving diagnosis should:
 - a. Explain their policies, their implementation methods, and the effects of these, rather than present ordinary business reports.
 - b. Use QC stories for reports and base these stories on concrete data. (See Texts 9.9, 9.10 and 9.11 in Unit 9.)
 - c. Clarify the current problems and their plans for resolving them in the future.

Figure 1.7a Sample programme for diagnosis by the president

No.	Time	Duration (minutes)	Contents	Expositors
1	9:00-9:05	5	Address by the President	
2	9:05-9:20	15	Explanation of Actual Circumstances Surrounding XXXX Department	Manager of XXX Department
3	9:20-9:30	10	Explanation of Actual Circumstances Surrounding YYYY Department	Manager of YYY Department
4	9:30-9:40	10	Sectional Policy Management and Implementation Measures	Section Manager
5	9:40-10:10	30	Questions and Answers	
6	10:10-10:40	30	Comments	Instructors/President

The diagnosticians

4. The diagnostician should pay attention to the following points:
 - a. They should confirm independently whether or not company policies are being deployed and implemented properly.
 - b. They should not limit their diagnosis to results. In addition to inspecting achievement of targets, they should examine how work methods have been changed to achieve targets and whether process improvements actually guarantee better performances.
 - c. They should recognize existing weaknesses as weaknesses and try to overcome them by drawing on the accumulated experience and know-how of many people.
 - d. They should always prioritise actual work sites. They should boost morale by keeping general employees fully informed of the TQM approach, and by keeping in touch with those who manage and direct the actual work sites.
 - e. They should really focus on whatever points are causing problems at work sites, departments and sections. They should not only give directions and point out problems, but should also allocate time for counselling and for really focusing on problems and requests from the diagnosis receivers.
 - f. When a diagnosis has been completed they should give their comments. These comments should be concise and concrete, to ensure that the diagnosis-receiving departments and sections understand the kind of action they must take.
 - g. They should base their diagnosis on the view that human nature is fundamentally good and not fundamentally evil, and should conduct their diagnosis in an objective manner and with a sense of mutual trust. They should highlight any improper practices that they become aware of.
 - h. Diagnosis by the president should take a quality control approach. The basis of the diagnosis should be: constant improvement, management based on facts, prioritized actions, standardization, and a resolve to prevent recurrence.

Follow-up

5. After the diagnosis by the president, the measures suggested should be examined carefully and implemented systematically. Normally the following actions are carried out:
 - a. Diagnosticians:
 - i. Write up the problems and the measures to improve them. These documents are sent to the diagnosis-receiving departments and sections, where they are treated as instructions.
 - ii. Write up minutes of comments, questions and answers that arose during the diagnosis and the contents of the on-site diagnosis. These minutes are distributed to the diagnosis-receiving departments and sections, and to other departments and sections as reference data.
 - b. Diagnosis-receiving departments and sections:
 - i. Map out improvement plans for all the items pointed out in the diagnosis, and report their plans to the department or section in charge of TQM promotion.
 - ii. Carry out improvement plans.
 - iii. Submit interim reports with items that have not been fully improved within three months.
 - iv. Write completion reports once items pointed out in the presidential diagnosis have been fully improved.
 - c. In the next diagnosis the president and CEOs follow up on the items pointed out in the diagnosis.

Figure 1.7b Table of measures to be taken on items pointed out at the presidential diagnosis meeting

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any examples referred to in the text, **if** you feel these are relevant to your company.

- a. Do the president and/or CEOs of your company pay such visits to the different divisions, departments or work sites? If so, how do they conduct them and what are the benefits of the visits? If not, do you think they would be a good idea? How should they best be conducted in your company?
- b. Parag. 1: Do you agree that this is what successful management of policy is about? Is there anything else you would add? (Remember that the subject here is the management of policy.)
- c. Parag. 1: What does “display leadership” mean in your opinion? How important is it that presidents get out of the main office?
- d. Parag. 2a: How easy do you think it would be for the CEO of your company to hold such diagnostic visits? What kind of response do you think he or she would get?
- e. Parag. 2b: Would it be important to have cross-functional activities and processes diagnosed from a company-wide perspective in your company too? Why?

- f. Figure 1.7b: Would this diagnosis programme also be appropriate in your company? Would you make any adjustments to it?
- g. Parag. 3: Can you give concrete examples of information that your departments or sections receiving such a diagnosis might give to the CEO?
- h. Parag. 4 gives a detailed list of points that visiting diagnosticians should pay attention to. Look at each of these, consider how important each is, and to what extent it would apply in your company. What developments would be needed in your company for such a full diagnosis to take place?
- i. Parag. 5: Why is it important to carry out follow-up activities after the diagnosis by the president? What could prevent the measures suggested by the president being carried out?
- j. Apply the RADAR questions to introducing or improving 'Diagnosis by the president' in your company.

Action plan

Complete your action plan for introducing or improving policy management in your company by including proposals for carrying out a presidential diagnosis of the implementation of policies.

Test

Answer these questions using **only** the information given in the text. For each question one, two or all three answers may be correct. Tick the answer or answers you think are correct for each question. Each question carries 3 points – you get one point for each correct answer that you tick, and one point for each wrong answer that you do not tick.

1.1 Policy management – an overview

1. The first step in policy management is that the company:
 - a. Develops its long-term plan.
 - b. Develops its mid-term plan.
 - c. Establishes its business philosophy.
2. When department managers receive the annual presidential policies the first thing they do is:
 - a. Consider the problems that they themselves have to deal with.
 - b. Decide on their own policies and targets.
 - c. Return the policies to the president with their comments.
3. Control graphs are used to check if:
 - a. Countermeasures are being taken to deal with abnormalities.
 - b. The measures in the plans are being implemented as prescribed.
 - c. The measures in the plans are having the anticipated results.
4. At the middle and end of each fiscal year, departmental managers, section managers, or CEOs make a diagnosis of:
 - a. The status of policy implementation.
 - b. The status of general quality management.
 - c. The number of abnormalities.
5. The actions that have been implemented are reflected an at the end of:
 - a. Each month.
 - b. Each half-year.
 - c. Each year.

1.2 Prepare mid-term and long-term management plans

6. Long-term plans are normally for:
 - a. One year.
 - b. Three years.
 - c. Five years.
7. The long-term plans should show your major strategies with control items such as:
 - a. Sales.
 - b. Equipment.
 - c. Target values.

8. If your company chooses to prepare both mid-term and long-term plans, then the long-term plans will present for sales, production volume, plant and equipment investment, and personnel costs.
- a. Basic targets.
 - b. Detailed targets.
 - c. Full cost estimates.

1.3 Establish annual management policies

9. The procedure for establishing policies for the fiscal year includes:
- a. CEOs agree on the long-term management plans and review them with department and section managers.
 - b. Reflections on the policies of the fiscal year just finishing are written-up and discussed.
 - c. A draft plan for policies for the new fiscal year is presented at a top management meeting.
10. The actions to be taken before the annual management policies are finalized include:
- a. Analyze plans and results from previous years.
 - b. Formulate concrete targets for investment in new equipment.
 - c. Consider any relevant recent changes in the business environment.

1.4 Deploy policies and prepare implementation plans

11. When lower level departments and sections receive the annual management policies they will establish their own policies based on:
- a. The long and mid-term outlook.
 - b. Relevant business conditions.
 - c. Results from the previous five fiscal years.
12. When departments and sections have received the annual management policies they should:
- a. Avoid discussion of items that are strongly related to other departments and sections.
 - b. Produce written implementation plans.
 - c. Implement these plans in the form of departmental, sectional and team activities.
13. The implementation plans should include:
- a. Achievements and problems from the previous fiscal year.
 - b. The cost of preparing the plans.
 - c. The schedule for the implementation of the plans.
14. Points to be kept in mind with regard to policy deployment include:
- a. It is implementation at the top that puts higher policies and plans into effect.
 - b. Plans become more concrete as they move down the organization levels of the company.
 - c. Interdepartmental problems should be resolved in a cooperative manner.

1.5 Control the implementation of policies

15. The two types of such appraisal of the implementation of policies are:
- a. Appraisal of people.
 - b. Appraisal of results.
 - c. Appraisal of factors.

16. The monthly appraisal corresponds to:
- a. The P and D part of the PDCA cycle.
 - b. The C and A part of the PDCA cycle.
 - c. The P and A part of the PDCA cycle.
17. The source of policy implementation problems may lie in:
- a. Changes in the external environment.
 - b. Failure to implement specific items.
 - c. Delays in carrying out the implementation plans.
18. The assessment should include:
- a. Prepare written analyses of policies that were not successfully implemented.
 - b. Use monthly follow-up sheets with implementation plan management tables and PDCA sheets.
 - c. Use monthly follow-up sheets with action limit tables.
19. Three of the most important control items are represented in the questions:
- a. Are policies and target values valid?
 - b. What is the progress ratio?
 - c. Are problems identified during the policy deployment stage?
20. An appraisal of the implementation of policies should check:
- a. All items.
 - b. As many items as possible.
 - c. High contribution implementation items.
21. Control are used for judging whether machines, tools, facilities, equipment, processes, and systems are in good condition.
- a. Items.
 - b. Characteristics.
 - c. Features.
22. The of the implementation plans may be used as action limits.
- a. Contents.
 - b. Targets.
 - c. Characteristics.
23. Match the terms with the definitions:
- | | |
|-----------------------------------|----------------------------------|
| a. emergency measure | 1. eliminate the causes |
| b. recurrence-prevention measures | 2. eliminate the root causes |
| c. fundamental measures | 3. eliminate the outward effects |
- a. a-3, b-2, c-1 b. a-2, b-3, c-1 c. a-3, b-1, c-2
24. An abnormality is:
- a. An unexpected outcome in a process.
 - b. A defect in a process.
 - c. An emergency.
25. The detection of abnormalities and the actions to deal with them include:
- a. Specify the control items and prepare a corresponding number of control graphs.
 - b. Collect data every year and plot it accurately on the control graph.
 - c. Enter data about any abnormalities on forms which can then be used as abnormality reports.

26. The detection of abnormalities and the actions to deal with them also include:
- a. Take any emergency action required right away.
 - b. Record any actions taken to deal with abnormalities in abnormality reports.
 - c. Take actions to eliminate the underlying causes first of all.

1.6 Reflect on the policies at the end of the year

27. The primary purpose of term end reflection is to:
- a. Provide feedback for future improvements.
 - b. Remove any remaining problems at the end of the fiscal year.
 - c. Find out who was responsible for any failures to implement policies.
28. Items that can be reviewed at the end of the term include:
- a. Activities implemented during this term.
 - b. Implementation plans for the next term.
 - c. The causes of failed target achievement.
29. The main points to keep in mind regarding term end reflection include:
- a. Pay particular attention to causes in either the environment or customers.
 - b. Provide a lot of space in the term-end reviews for descriptions of the current situation.
 - c. Select important problems from the many current issues and make these the focus of actions to be taken during the next term.

1.7 Carry out a presidential diagnosis of policy implementation

30. The company president and other CEOs should make visits around the company to find out if:
- a. The implementation of policies is producing substantial effects.
 - b. All the managers and section heads agree with their policies.
 - c. Departments and sections are implementing activities based on the annual presidential policies.
31. To manage the implementation of their policies presidents:
- a. Must have a detailed knowledge of all that is going on in their company.
 - b. Must have a sound grasp of the mechanisms of policy management.
 - c. Must display leadership.
32. The items to be diagnosed by the president come in two broad categories:
- a. Diagnosis of policy management.
 - b. Diagnosis of production management.
 - c. Diagnosis of cross-functional management.
33. Those who receive the presidential diagnosis should:
- a. Explain their policies, their implementation methods, and the effects of these.
 - b. Use QC stories to make their reports and base these stories on concrete data.
 - c. Present their regular business reports.
34. In his or her diagnosis the president should:
- a. Confirm whether or not company policies are being deployed and implemented properly.
 - b. Check how work methods have been changed to achieve better targets.
 - c. Keep general employees fully informed of the TQM approach.

35. The president should approach the diagnosis with the view that:
 - a. If people are not carefully controlled they will do as little work as possible.
 - b. Improper practices that have been diagnosed in the workplace should be highlighted.
 - c. Diagnosis is useless in most cases.
36. After the diagnosis by the president, follow-up activities should be carried out to ensure that the measures suggested are:
 - a. Carried out immediately.
 - b. Examined carefully.
 - c. Implemented systematically.
37. Documents written up by the diagnosticians describing the problems and the measures to improve them are sent to the diagnosis receiving departments where they are treated as:
 - a. Instructions.
 - b. Recommendations.
 - c. Requests.
38. Departments and sections receiving the diagnosis:
 - a. Report their improvement plans to the department or section in charge of TQM.
 - b. Submit interim reports with items that have not been fully improved within three months.
 - c. Write completion reports once items pointed out in the presidential diagnosis have been fully improved.
39. The president follows up on the status of items pointed out in the diagnosis:
 - a. At regular intervals.
 - b. Twice yearly.
 - c. In the next diagnosis.

Relationship with ISO

1.1 Policy management – an overview

Relationship with ISO 9001:2000:

- 5.1 Management commitment
- 5.3 Quality policy
- 5.4.1 Quality objectives
- 5.4.2 Quality management system planning

1.2 Prepare mid-term and long-term management plans

Relationship with ISO 9001:2000:

- 5.4.1 Quality objectives
- 5.4.2 Quality management system planning

1.3 Establish annual management policies

Relationship with ISO 9001:2000:

- 5.4.1 Quality objectives
- 5.4.2 Quality management system planning

1.4 Deploy policies and prepare implementation plans

Relationship with ISO 9001:2000:

- 5.4.2 Quality management system planning

1.5 Control the implementation of policies

Relationship with ISO 9001:2000:

- 8.2.3 Monitoring and measurement of processes
- 8.5.2 Corrective action
- 8.5.3 Preventive action

1.6. Reflect on the policies at the end of the year

Relationship with ISO 9001:2000:

- 5.6 Management review
- 5.6.1 General
- 5.6.2 Review input
- 5.6.3 Review output
- 8.4 Analysis of data
- 8.5.1 Continual improvement

1.7. Carry out a presidential diagnosis of policy implementation

Relationship with ISO: 9000:

- 5.1 Management commitment
- 5.6 Management review
- 8.2.2 Internal audit

Unit 2

Chief
Executive
Officer:

Ensuring
Quality



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Unit summary

As Chief Executive Officer, you have a primary role in ensuring that quality is maintained throughout your company. This involves a number of activities, the most important of which are presented in this unit.

2.1 Promote your quality policy

The success of your company depends on delivering products and services of the highest level of quality. As CEO one of your primary functions is to establish a quality policy, to involve your employees in realising this, and to make sure that your suppliers and customers are aware of it.

- a. Present your annual quality policy to your employees, your suppliers and your customers.
- b. Seek to raise quality consciousness among your employees.
- c. Involve your employees in making quality improvements: encourage QC circles and suggestion schemes.

2.2 Establish a clear organisational structure

As CEO you are responsible for the overall organization of your company. This involves four key actions:

- a. Draw up a company-wide organization chart: outline the organizational hierarchy of your company from senior managers to the lowest employees in each department.
- b. Define clearly the tasks to be carried out by each department.
- c. Define the responsibility and authority of each employee.
- d. Set up a company standardization system to establish and maintain standards for all the tasks in the company.

2.3 Deal with critical issues

Identify the critical issues facing your company, and put someone in charge of dealing with each of these. These issues will arise particularly in the planning, design and development of new products, and in production, inspection, sales, and servicing.

2.4 Satisfy your customers

Your company's quality policy will only be meaningful if it satisfies its customers. There are three primary actions to take to achieve this:

- a. Make sure that you really understand what your customers want.
- b. Set up clear procedures for handling customer claims.
- c. Set up a system for analysing customer claims.
- d. Communicate your quality policy to your customers.

2.5 Develop your employees

The environment in which your company does business is constantly changing. To ensure that your employees have the skills to respond flexibly to these changes, and to maintain the highest levels of quality in their work, you need to have a good employee development programme. This should include management training, intrinsic skills training, and

education in quality control. And you should also support quality control education in your partner companies.

2.6 Carry out regular quality audits

If your company is to build up a good quality system, you must carry out regular quality audits to determine whether:

- a. The quality activities are being carried out as planned.
- b. They are achieving the planned results.
- c. They are being carried out as effectively as possible.
- d. They are suited to achieving their objectives.

2.7 Carry out a periodic internal quality control diagnosis

To have a good understanding of the status of your company-wide quality control system, you need to carry out a periodic internal quality control diagnosis of each department. Form a top-management team to visit each department and check:

- a. Whether the department understands the basic concepts of quality control.
- b. Whether it has implemented them in its daily tasks.
- c. What has been achieved.

2.8 Prepare quality control manuals

Quality control manuals are the basic documents that your company will use to implement company-wide quality control. They contain the quality control rules, inspection rules, technical standards, product standards, operation standards, and other rules and standards for the assurance, maintenance and management of quality.

2.9 Establish quality control in non-manufacturing departments

Quality control is not just for manufacturing departments. If you are to have real company-wide quality control it must also be introduced in non-manufacturing departments, e.g. sales, administration, and research and development.

2.10 Cooperate with universities and research organizations

Your company may decide that it wants to develop new products or materials, but may lack the basic technology, testing and measurement facilities, and engineering employees, that are needed to do so, especially by a given target date. However, you still have one option: to cooperate with outside research organizations and universities in joint research and development.

2.11 Strengthen your international competitiveness

With increasing trade liberalisation, the countries of the world, both industrialised and developing, are producing similar products and services. In this international market it is essential that you be competitive in quality, cost and delivery time.

Learning tools

The RADAR questions

As you read each text you will discuss how it could be applied in your company. The RADAR questions will help you to focus this discussion:

- R** - Are these ideas **relevant** to my company?
- A** - How would I **apply** each of them in my company?
- D** - What **difficulties** might I meet and how would I overcome them?
- A** - Are there any **additional** actions that I might take that are not mentioned in the text?
- R** - What **resources** would be needed, what would these cost, and how could they be acquired?

There will of course be some discussion points where not all of these questions will be applicable.

The 6-Point Structure

After you have discussed the ideas in the text, you write an Action Plan in which you present practical proposals for implementing the conclusions you have reached in your discussion. The 6-Point Structure will help you to write your Action Plan:

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts, tables etc. that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these could be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

2.1 Promote your quality policy

Introduction

1. The success of your company depends on delivering products and services of the highest level of quality. As CEO one of your primary functions is to establish a quality policy, to involve your employees in realizing this, and to make sure that your suppliers and customers are aware of it. To do so:
 - a. Present your annual quality policy to your employees, your suppliers and your customers.
 - b. Seek to raise quality consciousness among your employees.
 - c. Involve your employees in making quality improvements: encourage QC circles and suggestion schemes.

Present your quality policy

2. Your long-term management policy must include your quality policy, in which your company clearly sets out its approach to quality. Deploy your quality policy throughout your company, to suppliers of parts and materials, and to customers and other stakeholders. Have each department establish and implement its own quality policy on the basis of this policy.
3. To present your quality policy:
 - a. Prepare a clear statement of your basic quality policy.
 - b. Hold meetings with question and answer sessions to explain this policy to your own employees and to those of your partner companies, and make sure that everyone understands it. Pay special attention to employees in sales and services, since they are the front-line people who present the image of the company.
 - c. Give all employees cards with the basic points of the quality policy, which they can carry around for easy reference.
 - d. Promote QC Circles and other study meetings to teach concrete methods for deploying the policy.
 - e. Communicate the quality policy clearly to customers in order to gain their long-term confidence.
 - f. Seek to create the kind of workplace where everyone is motivated to put the quality policy into practice.

Figure 2.1a Drafting a long-term management policy and an annual policy

(See Unit 1 for more detailed guidelines on developing and deploying policies.)

Raise quality consciousness among employees

4. To raise quality consciousness among your employees, there are a number of further actions that you can initiate:
 - a. Have your quality policy expressed in slogans that employees will easily understand, and put these up in locations where everyone can see them.

- b. Encourage employees to think up mottos for quality improvement, and present prizes for the best at a meeting of all the employees. Subcontractors and cooperating factories may also create mottos.
- c. Host frequent meetings in each factory and worksite to announce achievements in quality improvement.
- d. Participate in these meetings, and thank the employees personally. Always listen to what everyone has to say, and stay till the end of the meeting.
- e. Combine the improvement proposal system with other quality improvement activities in the workplace. This means that the effects of quality improvement can be evaluated in monetary terms.
- f. Encourage employees to participate in national events as a way of increasing both their quality consciousness and their confidence in their quality activities.
- g. Consider awarding more prize money to QC groups than to individuals for those proposals which lead to improved quality.

Involve employees in making improvements: encourage QC circles and suggestion schemes

5. QC circles are an effective way not only for employees to raise their quality consciousness, but also to put it into practice. QC circles are small groups of front-line employees who meet regularly to try to improve the quality of their work. In general their approach is problem-based. They identify problems in their workplace, usually related to product quality and referred to as “themes”, and together they set about finding a solution. They use quality control concepts and techniques, and try to be creative in seeking solutions. They can be a very good source of quality improvements, and should be actively encouraged.
 - a. Establish a promotional secretariat to recognize and encourage QC circle activities.
 - b. Participate in company-wide quality control meetings, QC Circle conferences, case study presentations, and QC presentations outside the company; listen to the employee presentations, ask questions, make comments and provide encouragement.
 - c. Always stay to the end of any conferences you attend.
 - d. Keep up to date with QC activities and have their achievements displayed, preferably numerically so that the extent of improvement can be clearly recognized.
 - e. Contribute articles to in-house journals on quality control, speak positively about quality control in interviews, and comment or give awards at quality control conferences.

6. In addition to the specific problems that QC circles seek to solve, the circles can also be a source of more wide-ranging suggestions for improvement. To facilitate this, set up a suggestion scheme in which employees can put forward proposals for improvement in the areas of workplace safety, and quality and productivity improvement. Adopt whatever good suggestions are put forward. To introduce a suggestion scheme:
 - a. Treat the suggestion scheme as an official company system.
 - b. Establish a company-wide secretariat to promote the suggestion scheme.
 - c. Assess suggestions at least once a month, award prizes, and implement good suggestions.

Figure 2.1b Example of a suggestion sheet

(See Text 4.6 and Unit 10 for more detailed guidelines on QC circles and Text 4.5 for suggestion schemes.)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 2: If your company already has a quality policy, how adequate do you think it is? If you do not have one, what benefits do you think such a policy would bring?
- b. Parag. 3: Apply the RADAR questions to these guidelines for presenting your quality policy.
- c. Parag. 4: How aware are your employees of the importance of quality? To what extent do you feel this awareness needs to be raised? Give some examples of areas where there is a need for greater quality consciousness.
- d. Parag. 4: Apply the RADAR questions to these suggestions for increasing quality consciousness.
- e. Parag. 5: Do you have QC circles in your company? If so, do your managers encourage QC circle activities? What benefits would it bring if they were to participate more actively in QC circles?
- f. Parag. 5: Apply the RADAR questions to these ways of encouraging QC circle activities.
- g. Parag. 6: Does your company have a system that allows employees to make suggestions for improvement? If so, how successful is it? If not, how useful do you think such a scheme would be?
- h. Parag. 6: Apply the RADAR questions to these proposals for introducing a suggestion scheme.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

2.2 Establish a clear organizational structure

Introduction

1. The CEO is responsible for the overall organization of the company. This involves four key actions:
 - a. Draw up a company-wide organization chart: outline the organizational hierarchy of the company from senior managers to the lowest employees in each department.
 - b. Define clearly the tasks to be carried out by each department.
 - c. Define the responsibility and authority of each employee.
 - d. Set up a company standardization system to establish and maintain standards for all the tasks in the company.

Draw up a company-wide organization chart

2. The company-wide organization chart should show the functions and responsibilities of everyone from senior managers to the lowest employees in each department, and the instructional and procedural routes that connect them. To prepare an organizational chart:
 - a. Management instructs the personnel department to draft an organization chart. The personnel department does so, obtains approval of the draft chart from the board of directors, and makes the chart available to all the different departments.
 - b. The departments give the personnel department their feedback. The personnel department then revises the chart, gets it approved by the president, and issues it with the president's approval stamp and the date of issue.
 - c. The chart shows clearly the names of those responsible in each department.
 - d. Any organizational changes affecting the chart should be communicated quickly and accurately to all employees, and a record kept of these changes.
 - e. Remember that the inspection department and the quality assurance department assure quality to customers on behalf of the president. These departments are often independent of the manufacturing, engineering and design departments and are supervised directly by the president.
 - f. The format of the chart should be one that outsiders can easily understand, so that it can be presented to stockholders and customers, and used as public relations materials.

Figure 2.2a Organization chart

Define the tasks to be carried out by each department

3. The tasks of every department in the company must be clearly defined: task criteria must be established that specify the scope of the task and the procedures to be followed. Some of these task criteria will be common to all the tasks carried out in the company, e.g. giving attention to safety, while others will be specific to a particular task.

4. To draft task criteria:
 - a. Management clarifies in writing the basic policies which will determine the task criteria. (See Unit 1 for guidelines on developing and implementing policies.)
 - b. Management specifies in writing the tasks of each department, with their task criteria (both the criteria common to all tasks and the criteria specific to each task).
 - c. Each department checks that its specified tasks match the actual tasks in its workplace.
 - d. If the department is not doing these tasks, or if it is doing other tasks which are not specified, it should submit a report requesting a correction.
 - e. The scope of the tasks should be specified in writing as clearly as possible.
 - f. Any work-related matters that are needed to implement the tasks should also be put in writing: instructions and orders, judgements, and the drafting of reports.
 - g. The procedures for carrying out random checks, and periodic reviews and revision of task criteria should be determined.
 - h. The personnel concerned should check for duplication and omission of interdepartmental tasks.
 - i. The task criteria should be simple and easy for employees to understand.

5. When deficiencies are found in the task criteria they should be revised and updated:
 - a. The personnel concerned consult with each other and quickly carry out revisions. The revisions are then approved by the related departments and distributed.
 - b. Department managers quickly communicate the revisions to subordinates to ensure that they know what exactly their tasks are.

Establish rules for the periodic review and, when necessary, revise task criteria; always keep written records of changes.

Define the responsibility and authority of each employee

6. Each employee must know exactly what authority and responsibility they have. Management should draw up rules which will clearly define this for the job of every member of every department. They should also prepare plans and define responsibilities for emergencies.

(Authority is where someone has been officially given the right to do something, to make a decision, or to give instructions. Responsibility is where someone is given the duty of carrying out a task or seeing that it is carried out. Authority and responsibility often go together but not always.)

7. The rules for job authority are drafted in two different documents. One gives the general rules which apply to the whole company. The other gives the department specific rules which differ according to position and workplace. These may be integrated in smaller companies. The general company-wide rules may be introduced by the general administration department. The rules are subject to consultation and review by the related departments, and are approved by the board of directors before being enforced. Rules should be reviewed periodically.

8. The rules for job authority document the scope of responsibility and authority for the job of every employee of every department throughout the company. They describe how the

employees doing each job should be managed, and prepare plans and define responsibilities for emergencies.

Figure 3.3b Rule for job authority

Figure 3.4a Rule for job authority: acceptance inspection

Figure 3.4b Rule for job authority: soldering work

9. Management should check from time to time whether the rules for job authority are being enforced correctly. It should put the results in writing and distribute them to the personnel concerned. A special audit should be made of certain functions, especially finance, personnel management, safety, preventing public nuisance, and avoiding damage to the environment. When such an audit is requested by inhouse employees or outside stakeholders it should be carried out promptly, documented, and a report written up.
10. Note in particular that:
 - a. The authority for payment of money should specify the maximum amount that this authority covers.
 - b. The authority for personnel management and for imposing penalties should be minimized in order to maintain good relationships in the workplace.

Set up a company standardization system

11. Company standards set out the correct procedures for the purchase, manufacture, inspection, control, and sale of materials, parts and products. You should set up a company standardization system, managed by a quality control promotion unit, to ensure that standards are established correctly for all the tasks in your company, and that standardization becomes firmly rooted. To do so:
 - a. Establish rules that specify the procedures for writing, reviewing, approving, distributing, and implementing original drafts, and for documenting these in a way that is easy to access.
 - b. Document jobs and tasks in the order of the actual work flow and summarize all the relevant issues. Have these drafts reviewed by a review committee.
 - c. Be sure to harmonize department specific rules with rules of a higher level, such as company-wide rules.
 - d. Establish rules for the periodic review of standards, and revise and abolish those that are no longer appropriate.
 - e. Keep rules and standards as simple as possible, and the number of them as low as possible.

Figure 2.2b Organization for standardization

(See Unit 8 for detailed guidelines on standardization.)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: Does your company already have an organization chart? If so, draw an outline of it and show it to the members of your discussion group. How useful is it? How could it be improved?
- b. Parag. 2: Apply the RADAR questions to these guidelines for drafting an organization chart.
- c. Parag. 3: Are the tasks of every department in your company clearly specified? Does every employee have clear instructions as to what they should do? If not, how would introducing task criteria help your company or department?
- d. Parag. 3: Give a few examples of what could be typical task criteria common to all tasks in your company.
- e. Parags. 4 and 5: Apply the RADAR questions to these guidelines for drafting and revising task criteria.
- f. Parag. 6: Would you say that every employee in your company knows exactly what authority they have and what they are responsible for? Is there any need for improvement in this area?
- g. Parag. 7: What would you include in a sample rule for job authority for a typical job in your company?
- h. Parag. 7: Is your company of such a size that the general rules and the department-specific rules can be integrated?
- i. Parag. 9: Apply the RADAR questions to these guidelines for enforcing the Rules for Job Authority.
- j. Parag. 10: Are these two points also applicable to your company? Why?
- k. Parag. 11: Does your company already have a company standardization system? If not, what benefits do you think it would bring? If it does, where do you feel it could be improved?
- l. Parag. 11: Apply the RADAR questions to these guidelines for drafting company standards.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

2.3 Deal with critical issues

1. Identify the critical issues facing your company, and put someone in charge of dealing with each of these. These issues will arise particularly in the planning, design and development of new products, and in production, inspection, sales, and servicing. They will cover a wide range of business activities and will all be related to improving quality.
2. Ensure that control problems in particular are reported and handled correctly. Make clear the authority of those responsible for solving these problems so that there will be no conflict between different departments.
3. To identify, fully understand and deal with important issues, take the following actions:
 - a. When various indexes of management (ways of measuring management) are found to be worse than those of other companies in the same industrial sector, investigate the possible causes and plan countermeasures.
 - b. Compare your company with foreign companies as well as with domestic companies. In this age of trade liberalization, it is important that you compare your levels of quality and prices to those in the international marketplace.
 - c. Use specific points of comparison, e.g. in sales, compare the results of each salesperson with their counterparts in the competing companies, rather than compare the achievement of the whole company with other companies. Compare and analyse the positive and negative factors to see if there are any problems.
 - d. Hold periodic meetings of senior managers from each department, consider everyone's opinion and get all the relevant information.
4. When you are appointing someone to be in charge of an issue:
 - a. Choose someone with leadership and decision-making skills.
 - b. Give them clear instructions, and delegate appropriate authority to them. Pass these instructions on to everyone involved, and not just to those you have appointed.
 - c. Establish and document procedures for handling and reporting any abnormal situations which fall outside the designated scope of authority. Management must always be alert for quality-related issues wherever they may arise in the market.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any examples referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: What are the major issues in your company? What general approach does your company take to dealing with major issues? Where do you feel there may be need for improvement here?
- b. Parag. 2: What are the main control problems that your company has to deal with? How well are they dealt with? Is there a need for improvement?
- c. Parag. 3: Apply the RADAR questions to these guidelines for dealing with the important issues.
- d. Parag. 4: Apply the RADAR questions to these guidelines for putting someone in charge of important issues.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

2.4 Satisfy your customers

Introduction

1. Your company will only be successful if it satisfies its customers. There are three primary actions to take to achieve this:
 - a. Make sure that you really understand what your customers want.
 - b. Set up clear procedures for handling customer claims.
 - c. Set up a system for analysing customer claims.
 - d. Communicate your quality policy to your customers.

(A claim is where a customer seeks compensation, repair or replacement of a defective product that has a warranty, and likewise with a service; a complaint is where they express dissatisfaction and may or may not make a demand for compensation.)

Understand what your customers want

2. Customers' needs change. You must keep up to date with what they really want. Find out how satisfied they are with your products, what new products you ought to develop, and where you need to improve your after-sales service. Establish a system that will keep you continuously aware of customers' needs:
 - a. Periodically survey how satisfied your customers are with your after-sales service and claim handling, evaluate the results, and improve your services.
 - b. Use the issuing of warranties and the records of after-sales service as sources of information.
 - c. Use statistical techniques to gather and analyze market information.
 - d. Calculate the percentage of total sales taken by new products developed over the past two years. Record this data every year and identify the trends. This will help you with your decision-making.

Set up procedures for handling claims

3. Customer claims are inevitable. What is important is that your company handles them as quickly and reliably as possible. Prepare a claim-handling rule – a document which clearly describes the in-house procedures for handling product-related claims, and for repairing defective goods. You or your senior management should periodically check what the customers' claims are about, and the progress of countermeasures to ensure that such claims will not arise again. And remember that some customers do not complain when they are frustrated. Always be alert for the possibility of such latent dissatisfaction.

Analyse customer claims

4. The continuous analysis of customer claims will help your company to identify the causes of defects. This will allow you to improve the quality of your products, and, quite often, to reduce your costs. The analysis will also help you to spot long-term trends in market conditions. Set up a system to analyze customer claims:

- a. The department in charge of handling claims should use statistical techniques to compare and analyze data for each 6-month period, and should explain its long-term strategy to related departments.
- b. The analysis of this data should be used at meetings on new product development, to ensure that the insights gained from customer claims are included.
- c. After improvements have been introduced, confirm that the effects are acceptable, and record them. Then display the results of the improvements, as numerically as possible. Show the increased yield and productivity, reduced costs and any other good outcomes.
- d. Managers should always show a positive interest in the successes of good customer claim handling: hold meetings at which you can be told directly about the results of improvement.

Communicate your quality policy to your customers

5. Include clear customer-related objectives in you quality policy, to show that you are customer oriented, and are determined to offer the goods and services that customers want – and of course, communicate your quality policy to your customers:
 - a. Set objectives for such areas as customer satisfaction and service systems.
 - b. Set objectives for reducing the percentage of defects in the market.
 - c. Set a numerical target for reducing customer claims.
 - d. Set a numerical target for increasing the efficiency of your after-sales service.
 - e. Set a numerical target for improving quality in manufacturing and process inspection.
 - f. Show clearly how inspection quality in the factory affects quality in the market. If necessary, improve the inspection methods and change the check items.
 - g. If necessary, set objectives for pollution, safety and other areas of social quality.

Figure 2.4a Example of basic quality policy

(See Texts 19.3 and 19.4 for more detailed guidelines on processing claims from customers.)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 2: Does your company really understand what your customers want? Where do you feel there is a need for improvement?
- b. Parag. 2 d: What percentage of your company's total sales are taken by new products? How would it help your management decision-making to calculate this percentage accurately?
- c. Parag. 2: Apply the RADAR questions to these suggestions for getting a good understanding of what your customers really want.

- d. Parag. 3: How effective would you say that your company's handling of customer claims is? Where do you feel there is need for improvement?
- e. Parag. 4: Do you analyze customer claims? If yes, what useful results do you get? Where do you feel there is room for improvement in your analysis methods? If you do not carry out such an analysis, what benefits do you think you may miss by not doing so?
- f. Parag. 4: Apply the RADAR questions to these suggestions for analysing customer claims.
- g. Parag. 5: Apply the RADAR questions to these suggestions for including a clear customer focus in your quality policy, and communicating this policy to your customers.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

2.5 Develop your employees

Introduction

1. The environment in which your company does business is constantly changing. To ensure that your employees have the skills to respond flexibly to these changes, you need to have a good employee development programme. This should include management training, intrinsic skills training, and education in quality control. And you should also support your partner companies in providing their employees with quality control education.

Management training and intrinsic skills training

2. Most of your programme will consist of management training for managers and supervisors, and training for each employee in the specific skills of their job.
3. To set up a company-wide education and training programme:
 - a. Designate who is to control company-wide training programmes. This will usually be the personnel and labour departments. The quality assurance department is sometimes designated to look after quality control training.
 - b. Draw up an annual training schedule for all employees, in consultation with the different departments.
 - c. List the training requirements for each job and specify and control the requirements for each employee.
 - d. Examine the functions of the department in charge of employee development. Ensure that they coordinate programmes in such a way that department superiors can allocate time for the training of their subordinates.
 - e. It is expensive to use outside specialists, or to send employees on external seminars, so a company-wide budget is usually allocated for this.
 - f. Plan in the long-term to have in-house instructors teach both management skills and intrinsic technology skills, at least in the beginners' courses. They should also teach QC techniques.
 - g. National qualifications or industrial association qualifications are necessary for some jobs. More than one person should be qualified in each department, so internal and external seminars for such qualifications should be included in the programme.
 - h. For training in intrinsic technologies, establish an in-house qualification system where there are three ranks: middle, upper and general. Such a qualification should be given official recognition within the company.
 - i. Establish a system where those who are trained and qualified are designated as house leaders in the in-house qualification system.

Figure 2.5a Example of education and training plan

(See Unit 12 for more detailed guidelines on education and training.)

Quality control education

4. Employee development should also include quality control education. Everyone from top management to general employees needs to have a good understanding of the basic quality control concepts and to be able to apply these in their work. Use both lectures and OJT (on-the-job training) to teach the basic concepts, statistical techniques, and problem-solving methods.
5. Use the following procedures to plan and implement quality control education:
 - a. The personnel and quality assurance departments plan and implement quality control education company-wide. The production, sales, research and development, accounting, administration and other departments should plan and implement their own programmes.
 - b. Follow an annual schedule, with an emphasis on OJT in addition to lectures and seminars. OJT includes workshop briefing sessions, training in quality control, skills development, and sessions where work achievements are presented. Include outside training.
 - c. Use group sessions to teach items common to everyone in the company, and, preferably, individual tuition for department specific items. The more practical the training the more effective it will be.
 - d. Provide a separate programme at each organizational level to meet the needs of that level. The fewer levels that you use, however, the more effective this education will be. Three to five levels are optimal, derived from these groupings:
 - i. Managing directors.
 - ii. General division managers, factory managers, directors of sales offices.
 - iii. Department managers and section managers.
 - iv. First line managers and supervisors.
 - v. General employees.
 - vi. Specialized trainers in quality control.
 - e. Teach each level as follows:
 - i. Teach senior managers a correct understanding of quality control. They need to be able to play a positive leadership role in quality control activities.
 - ii. Teach middle managers the correct guidance procedure for QC circle activities and statistical techniques so that they can provide basic education in these.
 - iii. Teach general employees how to use QC techniques through OJT so that they can use these techniques to solve problems in their workplace.
 - f. The quality control promotion committees and other groups should study the curriculum at each organizational level.
 - g. Train in-house auditors to conduct internal quality audits.
 - h. Keep records of the implementation of the programmes, and the educational results of each employee and each group. Evaluate these results and take them into account in planning future programmes.
6. Include the programmes in quality control in the annual budget. Discuss the direct and the indirect costs during the planning stage, and allocate funds for each department. This budget should be included in each department's annual budget. Those in charge in each department should be encouraged to be present at these meetings.

Educate and support your partner companies in quality control

7. The final quality of your products will be determined by the quality of the input you receive from your subcontractors and cooperating or affiliated companies. You need to ensure that their level of quality control is as high as yours. Your company should provide your partner companies with continuous guidance and education in quality control.
8. To provide this support to your partner companies:
 - a. Send specialists to teach quality control techniques and intrinsic technology, and to provide systematic education and on site guidance in control, supervision and processing.
 - b. Instruct your partner companies to submit QC process charts of their manufacturing processes, and confirm that their quality assurance rules, standards and records are complete. (A QC process chart describes the manufacturing process and the checks that are required in this process. It is a control standard. See Text 14.1 for more details.)
 - c. Check their quality control system and insist that they carry out whatever improvements are needed.
 - d. When problems occur, instruct them to immediately draw up concrete improvement plans. Nominate someone to be in charge of solving the problem and insist that improvements are fully implemented.
 - e. Send them a monthly written report on the quality of their products when you receive them. This report should give the quantity of acceptance lots, the quantity of defective lots, the total quantity inspected, the quantity of defective items, the minor defective items and the nature of the defects. If there are any problems, attach a letter requesting improvement, and instruct them to submit their improvement plans.
 - f. Periodically, or at times agreed upon by both of you, examine their quality control system and make recommendations.
 - g. Provide them with guidance and support when they hold seminars about establishing a quality control system, or seminars to study QC techniques, or promotion procedures for QC circle activities.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions - you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

- Note:** Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.
- a. Parag. 1: Do you feel that the environment in which your company does business is constantly changing? If so, what challenges does this bring to your management and your employees? How are you dealing with these?
 - b. Parag. 1: Which aspects of your employee development programme needs to be improved?

- c. Parag. 3: Apply the RADAR questions to these procedures for setting up a company-wide education and training.
- d. Parag. 4: Does your company already have any form of quality control education? If yes, which aspects do you think could be improved. If not, how important do you think it is to have such a programme?
- e. Parag. 5: Apply the RADAR questions to these procedures for planning and implementing education in quality control.
- f. Parag. 6: How do you allocate your employee development budget? Where do you feel this may need to be improved?
- g. Parag. 7: Does your company take an interest in improving quality control in your partner companies? Do you feel you should take a more active interest?
- h. Parag. 8. Apply the RADAR questions to these proposals for educating and supporting your partner companies.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

2.6 Carry out regular quality audits

1. If your company is to build up a good quality system, you must carry out regular quality audits to determine whether:
 - a. The quality activities are being carried out as planned.
 - b. They are achieving the planned results.
 - c. They are being carried out as effectively as possible.
 - d. They are suited to achieving their objectives.

2. To get full benefits from the quality audits you should hold regular meetings to discuss reports on the following items, and to outline improvements:
 - a. The establishment of annual quality targets.
 - b. The extent to which quality targets have been achieved.
 - c. The results of the internal quality audit.
 - d. The results of the assessment of the quality management status of subcontractors and other partner companies.
 - e. Out-of-control situations in processes and how the examination of recurrence prevention measures is progressing.
 - f. Non-conforming products and how the examination of recurrence prevention measures is progressing.
 - g. Reports on process changes and early warning systems.
 - h. Revisions of quality manuals, regulations, and rules.
 - i. Any other quality assurance activities.

(ISO 8402 defines a quality audit as a systematic, independent examination to determine whether quality activities and related results comply with planned arrangements, whether these arrangements are implemented effectively and whether they are suitable to achieve their objectives. ISO 8402 defines a quality system as the organizational structure, procedures, processes and resources necessary to implement quality management.)

3. The ISO 9000 series prescribes that internal quality audits be conducted as follows:
 - a. Suppliers must carry out audits to assess the effectiveness of their quality system, and confirm that quality activities are carried out according to plan. The results of the audit should be recorded. Those responsible for the areas that have been audited must then take appropriate actions. These actions should then be verified in follow-up audits.
 - b. Auditors must be individuals with no direct responsibilities for activities in the areas that they are auditing. This stipulation in the ISO 9000 series clearly confirms that the audit must be independent. Audit results provide good indicators of where improvements should be made in the quality system. They are also useful as reference data in conducting management reviews.

- c. Internal quality audits, based on objective evidence and activating the PDCA (plan, do, check, action) cycle of the quality system, should confirm the following points:
 - i. Do elements of the quality system conform to items required in the ISO 9000 series?
 - ii. Are activities in the quality system implemented according to plan?
 - iii. Is the quality system functioning effectively?
 - iv. Have points raised in the previous audit, and the effectiveness and efficiency of the system been improved?
- d. Internal quality audits should be conducted by co-workers who are familiar with the characteristics of the products and the realities of managing them. When the CEOs have reviewed the internal audit system the system should be upgraded. Improvements in quality should follow. The internal audit system is the key to improving the efficiency of the quality assurance system.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on what is relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 2 presents recommendations for how often the CEO should review the company's quality system, and the specific points that he should hold meetings to discuss. Apply the RADAR questions to these recommendations.
- b. Parag. 3: Apply the RADAR questions to this ISO 9000 prescription for carrying out internal quality audits.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan that draws on your discussion of several texts.

2.7 Carry out a periodic internal quality control diagnosis

1. If you are to have a good understanding of the status of your company-wide quality control system, you must carry out a periodic internal quality control diagnosis of each department. Form a top-management team to visit each department to check:
 - a. Whether it understands the basic concepts of quality control.
 - b. Whether it has implemented them in its daily tasks.
 - c. What has been achieved.When the diagnosis is complete the team gives the department concrete instructions for improving and refining quality.

2. Procedures for top management's quality control diagnosis:
 - a. The secretariat (typically from the quality assurance department) sends advance notice to each department that is to be examined, and informs it of the items to be examined for that fiscal year.
 - b. Each department then conducts a self-diagnosis for each of these items, and evaluates and documents this, and prepares the criteria, specifications, QC process charts and reports that they will use to explain their findings to the management diagnosis team.
 - c. When the team arrives, it first examines the department's documents. The person in charge at each workplace explains the self-diagnosis on the basis of these documents. The team asks questions about the content of the documents, and confirms the results of the report.
 - d. Then the team conducts an on-site examination of the workplace, following the order in the QC process chart. They examine whether quality control and quality assurance are being implemented as set out in the documents.
 - e. The team then evaluates and scores the examination items quickly (taking about an hour).
 - f. If any items are found to fall below a certain level, the team makes written comments and gives concrete reasons for bad scores.
 - g. The team instructs the department to submit concrete proposals for improving these items.
 - h. If possible the same examination items should be used each fiscal year. This will enable each department to recognise whatever progress they have made since the previous year.
 - i. In carrying out this diagnosis, the team should do its best to find and praise good points.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: What benefits do you think that such an internal quality control diagnosis by top management would bring to your company?
- b. Parag. 2: Apply the RADAR questions to these procedures for a QC diagnosis by top management.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

2.8 Prepare quality control manuals

1. Quality control manuals are the basic documents that your company will use to implement company-wide quality control. They contain the quality control rules, inspection rules, technical standards, product standards, operation standards, and other rules and standards for the assurance, maintenance and management of quality. Simple, practical manuals will allow your company to deploy company-wide quality control activities in which all employees can cooperate to create an environment that assures quality.
2. Procedures for preparing quality control manuals:
 - a. Each department provides documentation describing all its tasks, and the circumstances in which these tasks are carried out.
 - b. The department in charge of the quality system summarizes the documented quality systems of each department into a description of a company-wide quality system.
 - c. A committee with members from different parts of the company prepares the first draft of the manual. This should be a practical document that can actually be used, rather than an ideal one.
 - d. A first draft is presented to the departments, who examine it to see if its implementation could bring any problems. Departments then submit concrete proposals for improving the draft. This will ensure that the departments cooperate in achieving company-wide quality control.
 - e. The manual should specify:
 - i. The interfaces of all the departments in the company.
 - ii. The rules for the sales, research, engineering, finance, personnel, and other departments. All of these departments are directly related to quality assurance.
 - iii. The rules for departments which are sometimes not recognized as being directly related to quality.
 - f. Inter-departmental rules and standards should be harmonized. In particular, values in design and engineering standards should be harmonized with values in manufacturing and inspection standards.
 - g. A company-wide Manual Review Committee should check whether standards and rules are harmonized between departments. It will coordinate between departments and make sure that nothing is overlooked.
 - h. Management should establish an internal audit system to assess the implementation status of quality control.
 - i. It is important to create a simple quality manual which suits the actual situation of task activities.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: Does your company already have quality control manuals? If yes, how adequate do you think they are? Where do you feel there is need for improvement? If you do not have them, what benefits do you think such manuals would bring?
- b. Parag. 2: Apply the RADAR questions to these procedures for preparing quality control manuals.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

2.9 Establish quality control in non-manufacturing departments

1. Quality control is not just for manufacturing departments. If you are to have real company-wide quality control it must also be introduced in non-manufacturing departments, e.g. sales, administration, and research and development. Work in these departments may be thought of as intangible software that should be continuously improved and refined just as much as the quality of products. Establish numerical targets wherever possible, set an evaluation scale for improvement, and draw up an improvement schedule.
2. To establish quality control in non-manufacturing departments:
 - a. Get a good understanding of the actual work conditions. As far as possible, describe these numerically in terms of work procedures and the time required to complete specific tasks. See if it is possible to establish a framework for making a numerical analysis of different quality control issues.
 - b. Since the work in non-manufacturing departments is often done individually, it can be difficult to solve problems or to set targets using a teamwork strategy such as a QC Circle. It is much easier to set common themes such as improvement of office work handling, or of methods of communication. In fact, the individual nature of this work also means that improving the exchange of information and other forms of communication will bring useful benefits.
 - c. Work in the research and development department is typically new and non-repetitive. Implement QFD (quality function deployment) and quality engineering techniques in this department. (QFD: Analysis of the customer's requirements of quality, performance and function and the incorporation of these requirements into design and production in order to best satisfy the customer.)

Evaluate the efficiency of office work by using a scale that can objectively measure such achievements as the standardization of office work, or the reduction of office expenses.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

- Note:** Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.
- a. Parag. 1: Has your company already deployed quality control in non-manufacturing departments? Which special challenges have you encountered in this, or which would you expect if you were to do so?
 - b. Parag. 2: Apply the RADAR questions to these proposals.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

2.10 Cooperate with universities and research organizations

1. Your company may decide that it wants to develop new products or materials, but may lack the basic technology, testing and measurement facilities, and engineering employees, that are needed to do so, especially by a given target date. However, you still have one option: to cooperate with outside research organizations and universities in joint research and development. If you make this choice, follow these procedures:
 - a. Define the theme of joint research as concretely as possible and document it.
 - b. Draft a joint research agreement covering confidentiality, handling patent issues, and expenses. Both parties should sign this and exchange the signed agreements as official documents.
 - c. Establish an effective system, such as a direct telephone line, for regular communication.
 - d. Plan in advance for any delay in the schedule.
 - e. Decide in advance, and confirm in a contract, how research achievements are to be shared. This should specifically cover inventions and discoveries made during the research and development. The sharing of rights should also be decided.
 - f. Decide in advance how temporary and additional expenses are to be shared.
 - g. When carrying out joint research with foreign organizations, take measures to prevent problems arising from differences in languages, customs and culture, and also in practical matters such as drawing methods.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Does your company develop new products and materials? If yes, does it cooperate with outside research organizations and universities? How successful is this? Where do you feel there is room for improvement? If it does not, what benefits do you think such cooperation would bring?
- b. Apply the RADAR questions to these procedures for joint research with outside organizations.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

2.11 Strengthen your international competitiveness

1. With increasing trade liberalization, the countries of the world, both industrialized and developing, are producing similar products and services. In this international market it is essential that you are competitive in quality, cost and delivery time.
2. To strengthen your international competitiveness:
 - a. Assess your company's competitiveness in the following fields: product and service quality, manufacturing systems, control systems, manufacturing machinery and equipment, employee development, information control, financing, new technologies, and new product development.
 - b. Identify items that need to be strengthened to be competitive in international markets. Plan and implement ways of strengthening these items.
 - c. Make concrete plans for each item which requires such action. Give clear instructions for investment in whatever technology, funding and human resources may be needed.
 - d. Consider at the design and development stage any safety and public nuisance issues in the products to be exported. Check out the safety regulations of the destination countries in advance.
 - e. Establish a system where patent, design, and physical distribution issues are completely checked out in advance. Consider how not to avoid problems in the destination country's markets.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: Do you feel that your company is competitive enough in international markets? If not, in what areas do you feel there is a need for improvement?
- b. Parag. 2. Apply the RADAR questions to these suggestions for improving your company's international competitiveness.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to include these ideas in one of your earlier action plans.

Test

Answer these questions using **only** the information given in the text. For each question one, two or all three answers may be correct. Tick the answer or answers you think are correct for each question. Each question carries 3 points – you get one point for each correct answer that you tick, and one point for each wrong answer that you do not tick.

You can choose to answer all questions, or just those for the text or texts you have been working on.

2.1 Promote your quality policy

1. To present its quality policy, management should:
 - a. Prepare a clear statement of its basic quality policy.
 - b. Give all employees cards with the basic points of its quality policy.
 - c. Hold meetings with question and answer sessions.
2. Management should aim to increase the quality consciousness of:
 - a. Their employees.
 - b. Their suppliers.
 - c. Their partners.
3. To increase the quality consciousness of employees managers should host frequent meeting at each worksite to:
 - a. Announce company awards.
 - b. Announce achievements in quality improvement.
 - c. Announce national awards.
4. To actively encourage QC circle activities, managers should:
 - a. Contribute articles to national journals on quality control.
 - b. Take up whatever suggestions are made.
 - c. Always stay to the end of any meetings they attend.
5. To have an effective suggestion scheme:
 - a. Treat the scheme as an unofficial company system to encourage more employees to make suggestions.
 - b. Establish secretariats in each department to promote the scheme.
 - c. Assess suggestions at least once a month, and award prizes.

2.2 Establish a clear organizational structure

6. The company-wide organization chart should show the functions and responsibilities of everyone from:
 - a. Senior managers to junior managers.
 - b. Senior managers to supervisors.
 - c. Senior managers to the lowest employees.
7. The organization chart should be drafted by:
 - a. Senior managers.
 - b. The personnel department.
 - c. The quality assurance department.

8. Task criteria should be revised and updated:
 - a. Annually.
 - b. Twice yearly.
 - c. When deficiencies are found in them.
9. The highest level at which the company-wide rules of job authority should be approved before being enforced is:
 - a. Managers.
 - b. Senior managers.
 - c. Board of directors
10. Department-specific rules:
 - a. Should always be harmonized with company-wide rules.
 - b. Need not be harmonized with company-wide rules.
 - c. Should be harmonized with company-wide rules whenever possible.

2.3 Deal with critical issues

11. Important issues referred to in the text include those in:
 - a. Planning, design and development of new products.
 - b. The storage of raw materials.
 - c. Quality.
12. To gain a really good understanding of sales issues:
 - a. Compare the results of the sales department with that of the sales departments in competing companies.
 - b. Compare the results of individual salespersons with their counterparts in competing companies.
 - c. Compare the achievement of the whole company with that of competing companies.
13. When appointing someone to be in charge of an issue, establish and document procedures for handling:
 - a. Only abnormal situations that fall inside the designated scope of authority.
 - b. Also abnormal situations that fall outside the designated scope of authority.
 - c. Only normal situations.

2.4 Satisfy your customers

14. To get a good understanding of customer needs:
 - a. Use information gained in the issues of warranties.
 - b. Use records of after-sales service.
 - c. Try out newly developed products in the market.
15. To use customer claims information to improve products:
 - a. Use statistical techniques to compare and analyse customer claims data for each 6-month period.
 - b. Use data from the analysis of customer claims at meetings on new products.
 - c. Establish a system to explain the company's long-term strategy to customers.
16. To have a customer related focus in your quality policy set numerical targets for:
 - a. Improving customer satisfaction.
 - b. Reducing customer claims.
 - c. Showing how inspection quality in the factory affects quality in the market.

2.5 Develop your employees

17. The procedures for setting up a development programme include:
 - a. List the training requirements for each job.
 - b. Have at least one person in each department who has national or industrial association qualifications.
 - c. Specify the training requirements for each employee.
18. Which of the following should be regarded as at the same levels for quality control education?
 - a. Factory managers and department managers.
 - b. First line managers and supervisors.
 - c. Factory managers and directors of sales offices.
19. General employees should be taught the correct way of using QC techniques through:
 - a. Lectures.
 - b. OJT.
 - c. External seminars.
20. Keep records of the educational results of:
 - a. Each employee.
 - b. Each group of employees.
 - c. Each supervisor.
21. To support quality control in your partner companies send them a monthly written report on the quality of their products at acceptance showing:
 - a. The quantity of defective lots.
 - b. The quantity of acceptance lots.
 - c. The quality improvements needed.

2.6 Carry out regular quality audits

22. The CEO should hold regular meetings to discuss:
 - a. The establishment of annual quality targets.
 - b. The results of the internal quality audit.
 - c. Revisions of quality manuals, regulations and rules.
23. Internal quality audits are aimed at confirming the following points:
 - a. Are activities in the quality system implemented according to plan?
 - b. Have points raised in the previous audit been improved?
 - c. Do abnormalities no longer occur?

2.7 Carry out a periodic internal quality control diagnosis

24. In the top management's internal quality control diagnosis:
 - a. The team arrives in each department without any warning to see what is really happening.
 - b. The department conducts its own diagnosis before the team arrives.
 - c. The department sends its own diagnosis to the team some days before they arrive.
25. If possible the examination items used each year should be:
 - a. The same.
 - b. Different.
 - c. Half the same and half different.

2.8 Prepare quality control manuals

26. The quality control manuals should be first drafted:
- a. By each department.
 - b. By the quality assurance department.
 - c. By a committee drawn from different parts of the company.
27. The manual should specify:
- a. The interfaces of all the departments in the company.
 - b. The rules for the sales, research, engineering, finance, personnel, and other departments.
 - c. The rules for departments which are sometimes not recognised as being directly related to quality.

2.9 Establish quality control in non-manufacturing departments

28. To deploy QC activities in non-manufacturing departments:
- a. Set targets using a teamwork strategy.
 - b. Set common themes.
 - c. Focus on the improvement of individual employees.

2.10 Cooperate with universities and research organizations

29. To carry out joint research with outside organizations, decide in advance:
- a. How any delays in the schedule should be dealt with.
 - b. How unexpected expenses should be shared.
 - c. How research achievements should be shared.

2.11 Strengthen your international competitiveness

30. To strengthen your company's international competitiveness:
- a. Consider safety issues of products to be exported as soon as they are ready for shipping.
 - b. Establish a system where patent, design and physical distribution issues are completely checked out in advance.
 - c. Give clear instructions for investment in technology, funding and human resources.

Relationship with ISO

2.1 Promote your quality policy

Relationship with ISO 9001:2000:

- 5.3 Quality policy
- 6.2 Human resources
 - 6.2.1 General
 - 6.2.2 Competence, Awareness, and Training
- 5.5.3 Internal Communication
- 8.5.1 Continual Improvement

2.2 Establish a clear organizational structure

Relationship with ISO 9001:2000:

- 5 Management responsibility
 - 5.5.1 Responsibility and authority
- 4 Quality management system

2.3 Deal with critical issues

Relationship with ISO 9001:2000:

- 5 Management responsibility

2.4 Satisfy your customers

Relationship with ISO 9001:2000:

- 5.2 Customer focus
- 7.2 Customer – relate process
 - 7.2.1 Determination of requirements related to the product
 - 7.2.3 Customer communication
- 7.5.1 Control of production and service provision
- 7.5.2 Validation of processes for production and service provision
- 7.5.3 Identification and traceability
- 8.2.1 Customer satisfaction
- 8.4 Analysis of data
- 8.5.2 Corrective action
- 8.5.3 Preventive action

2.5 Develop your employees

Relationship with ISO 9001:2000:

- 6.1 Provision of resources
- 6.2 Human resources
 - 6.2.2 Competence, awareness and training
- 7.4 Purchasing
- 8.5 Improvement
 - 8.5.1 Continual improvement

2.6 Carry out regular quality audits

Relationship with ISO 9001:2000:

- 5 Management responsibility
- 5.1 Management commitment
- 5.5.1 Responsibility and authority
- 5.5.2 Management representative
- 5.6 Management review
- 5.6.1 General
- 5.6.2 Review input
- 5.6.3 Review output
- 8.2.2 Internal audit
- 8.2.3 Monitoring and measurement of processes

2.7 Carry out a periodic internal quality control diagnosis

Relationship with ISO 9001:2000:

- 5 Management responsibility
- 5.1 Management commitment
- 5.5.1 Responsibility and authority
- 5.5.2 Management representative
- 5.6 Management review
- 5.6.1 General
- 5.6.2 Review input
- 5.6.3 Review output
- 8.2.2 Internal audit
- 8.2.3 Monitoring and measurement of processes

2.8 Prepare quality control manuals

Relationship with ISO 9001:2000:

- 4.2.2 Quality manual
- 4.2.3 Control of documents
- 8.2.3 Monitoring and measurement of process
- 8.5.1 Continual improvement

2.9 Establish quality control in non-manufacturing departments

Relationship with ISO 9001:2000:

- 4 Quality management system
- 4.2 Documentation requirements
- 5 Management responsibility
- 5.3 Quality policy
- 5.4 Planning
- 5.4.1 Quality objective
- 5.4.2 Quality management system planning
- 5.5.1 Responsibility and authority
- 5.5.3 Internal communication
- 6.2.2 Competence, awareness and training
- 8.5.1 Continual improvement

2.10 Cooperate with universities and research organizations

Relationship with ISO 9001:2000:

- 5.1 Management commitment
- 5.3 Quality policy
- 5.4.1 Quality objective
- 5.5.1 Responsibility and authority
- 6.2.2 Competence, awareness and training
- 7.1 Planning of product realization
- 7.3 Design and development

2.11 Strengthen your international competitiveness

Relationship with ISO 9001:2000:

- 5 Management responsibility
- 6.2.2 Competence, awareness and training
- 8.5.1 Continual improvement

Unit 3

Managers:

Managing
Systems



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Unit summary

All that you do as a manager will have an impact on quality, but several of your functions are especially important in ensuring a high level of quality in your own department and in the company as a whole. The functions included in this unit have to do with establishing, implementing and monitoring work systems, while those in Unit 4 present ways of supporting the contribution your employees can make.

3.1 Implement your company's annual management policy

If your company is to successfully improve quality, and reduce costs, it must formulate and implement mid-term to long-term plans, and develop annual management policies based on these plans. This is the responsibility of the CEO. Your responsibility as a manager is to receive the CEO's annual management policies, examine them carefully, and implement them in your department as your department policies. To do so you need the involvement and commitment of your employees.

3.2 Clarify the extent of your department's responsibility for quality assurance activities; clarify policies

The journey from the receipt of an order to the final delivery of the product often goes through a lot of different departments. Each department is responsible for quality assurance activities at different stages in this journey. It is important that your department knows where its responsibility for quality assurance begins and ends.

3.3 Define jobs, responsibilities and authority

Before you can manage your department effectively, your company must clearly define the jobs, responsibilities and authority in each of its departments. These definitions are known as job assignments. When your company has done this for all the departments, your primary task, as a department manager, is to set out your concrete policies and objectives on quality, quantity, and cost for your department, and to communicate these clearly to your employees.

3.4 Ensure that your employees understand and carry out their job assignments correctly

To ensure that your employees understand and carry out their job assignments correctly, you, as a manager, should:

- a. Consider carefully how to give job assignments.
- b. Communicate your superiors' instructions clearly to your employees.

3.5 Monitor how well management tasks are being carried out.

You need to have a system for checking that the management tasks in your department have been completed correctly. One system is to use management check items. These are items in a task that can be checked to see how well the task is being done.

3.6 Monitor the quality of the work in your department

There are a number of statistical and observational methods that you can use to monitor the quality of the work in your department.

3.7 Deal with defects

No matter how well you run your department things will always go wrong. You may find yourself having to deal with defects, that is, where an item – product, part, equipment etc. – is incomplete or does not function properly.

3.8 Be alert for abnormalities when you revise any of your production processes

Production processes are sometimes revised in order to improve quality. This is a time when abnormalities can easily arise. An abnormality is anything that emerges in the production process that is not as it is supposed to be.

3.9 Keep work records

If your department, and your company as a whole, are to maintain and improve quality, you need to know how well your department is doing. For this it is essential that you keep records of all that is done.

3.10 Take a systematic approach to making improvements

Whether ideas for improvement come from suggestion schemes, QC circles or elsewhere, you should take a systematic approach to selecting themes for improvement, monitoring their progress and quantifying the results: use statistical techniques and introduce the PDCA cycle.

3.11 Keep everyone informed of how the department is doing

All your employees, and indeed the company as a whole, should be kept informed of how your department is performing. Present this information in graphs or other visual forms, since people find it easier to grasp visual information.

3.12 Establish report-writing procedures

Managers have to do a lot of writing. It is particularly important that you:

- a. Use the proper format in writing reports.
- b. Keep records of communications with other departments.

Learning tools

The RADAR questions

As you read each text you will discuss how it could be applied in your company. The RADAR questions will help you to focus this discussion:

- R** - Are these ideas **relevant** to my company?
- A** - How would I **apply** each of them in my company?
- D** - What **difficulties** might I meet and how would I overcome them?
- A** - Are there any **additional** actions that I might take that are not mentioned in the text?
- R** - What **resources** would be needed, what would these cost, and how could they be acquired?

There will of course be some discussion points where not all of these questions will be applicable.

The 6-Point Structure

After you have discussed the ideas in the text, you write an action plan in which you present practical proposals for implementing the conclusions you have reached in your discussion. The 6-Point Structure will help you to write your action plan:

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts, tables etc. that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these could be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

3.1 Implement your company's annual management policies

Introduction

1. If your company is to successfully improve its quality and reduce costs, it must formulate and implement mid-term to long-term plans, and develop annual management policies based on these plans. This is the responsibility of the CEO. Your responsibility as a manager is to receive the CEO's annual management policies, examine them carefully, and implement them in your department as your department policies. To do so you need the involvement and commitment of your employees. You should:
 - a. Discuss the implementation of the annual policies with your employees.
 - b. Make sure that they have a clear grasp of the objectives and methods needed to implement your departmental policies.
 - c. Work closely with your employees to solve any problems that arise in implementing the policies.

(See Unit 1 for more detailed guidelines on planning and implementing annual policies.)

Discuss the implementation of the annual policies with your employees

2. Both you and your employees must have a good understanding of the company's long-term and medium-term plans. When you receive the annual management policy from your superiors, discuss it fully with your employees, and work out with them what is needed to implement this policy as your department policies.
 - a. Evaluate the work in your department this year with reference to the work of the previous year.
 - b. Select development themes for the coming year that should lead to the implementation of the policies. A theme may be a task, process or target that you want to improve in some way.
 - c. Check carefully whether the selected themes fully satisfy the long-term and medium-term company plans. If they do not, then adjust them.
 - d. Review with your employees how to implement these themes.
 - e. Review the job assignments of those who will be implementing them.
 - f. Plan and implement a training programme, based on evaluation tables of individual job skills (tables that present evaluations of the skills of individual employees.)

Make sure that employees have a clear grasp of the objectives

3. Make sure that your employees have a good grasp of the specific objectives and methods needed to implement your department policies:
 - a. Use quantitative values to define each objective. In other words, measure the objective numerically.

- b. Encourage your employees to make suggestions about how the objectives could be achieved – and then summarise these suggestions.
- c. Use graphs and charts to show how the achievements of your department can contribute to the overall achievements of the company.
- d. Devise quantified indexes (indexes expressed numerically) that will enable you to monitor the progress of policy implementation,

Figure 3.1a Full implementation of department policy

Figure 3.1b Presenting department policy

Work with your employees to solve problems that arise in implementing the policies

4. Problems may arise during the implementation of the policies. Work closely with your employees to solve these. This will create a sense of partnership with them:
 - a. Tell them to:
 - i. Check and report periodically on the progress towards each objective.
 - ii. Report back to you whenever there is a serious change or a delay.
 - b. But don't just wait for reports of problems to come to you. Go to the workplaces and check things out yourself - and listen to what the operators have to say.
 - c. When problems are found, call in whoever is in charge, investigate the causes and examine possible countermeasures. Never lay the responsibility on an individual operator. Rather, motivate them to solve the problems themselves, using their own initiative.
 - d. When you have to request help from other departments, make sure that it is well co-ordinated.
 - e. If a problem is serious, report it to your superiors.

Figure 3.1c Procedure for problem solution

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Does your company develop effective mid-term and long-term plans? If it does, how involved are you in implementing them? If it does not, what benefits would it bring to do so?
- b. Do you discuss your company's policy with your employees? Can you see any advantages in doing so?
- c. Parag. 2. Apply the RADAR questions to these suggestions.
- d. Parag. 3: Apply the RADAR questions to these suggestions.
- e. Parag. 4. Apply the RADAR questions to these suggestions.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

3.2 Clarify the extent of your department's responsibility for quality assurance

1. The journey from the receipt of an order to the final delivery of the product often goes through a lot of different departments. Each department is responsible for quality assurance activities at different stages in this journey. It is important that your department knows where its responsibility for quality assurance begins and ends.
2. There are five primary areas where quality assurance activities are implemented, and where authority for their implementation must be defined:
 - a. Product design – define who has the authority to decide the functions and the quality level of a product, and who is responsible for examining/processing the results.
 - b. Process design – define who has the authority to decide on the base materials, parts, facilities, equipment, processes and jobs that turn the design into a quality product, and who is responsible for examining/processing the results.
 - c. Manufacture – define who has the authority to manufacture the product according to the process that has been designed; to maintain facilities, equipment and tools; to inspect and assess the base materials and the in-process quality characteristics of semi-finished products; and who is responsible for examining/processing the results of all these activities.
 - d. Inspection – define who has the authority to inspect and assess the quality of manufactured goods; who has the authority to process defective products and decide whether to dispose of them, keep them in reserve or adapt them; and who is responsible for examining/processing the results of all these activities.
 - e. Packing and transporting manufactured goods – define which departments and sections have the authority and responsibility for packing and transporting the finished products to customers.

Figure 3.2a Contents of jobs, and departments and sections in charge

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1. Does each department in your company know where its responsibility for quality assurance begins and ends, in relation to other departments?

- b. Parag. 2: Apply the RADAR questions to these guidelines for defining authority for the implementation of quality assurance activities.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

3.3 Define jobs, responsibilities and authority; clarify policies

1. Before you can manage your department effectively, your company must clearly define the jobs, responsibilities and authority in each of its departments. These definitions are known as job assignments. When your company has done this for all the departments, your primary task, as a department manager, is to set out your concrete policies and objectives on quality, quantity, and cost, and to communicate these clearly to your employees.
2. Authority is where someone has been officially given the right to do something, to make a decision, or to give instructions. Responsibility is where someone is given the duty of carrying out a task or seeing that it is carried out. Authority and responsibility may often be used interchangeably but not always.
3. To define job assignments, your company should:
 - a. Specify all the jobs in each department, including managerial functions like planning, developing strategies, coordinating the functions of the company, and promoting the company.
 - b. Define the authority and responsibilities that go with each job.
 - c. Define the responsibilities and authority of each employee.
 - d. Define the procedures to be followed in carrying out each job correctly.
 - e. Allocate jobs to each department.
 - f. Make sure that the jobs to be done by each department are documented and that rules are established for assigning work within the department.
 - g. Make sure that jobs to be carried out by more than one department will flow smoothly.
 - h. Identify quality characteristics of jobs as numerically as possible, using control charts and control graphs.
 - i. Decide who should draft all these documents, who should approve them and who should implement them.
4. It is important that everyone knows who has the responsibility and authority for defining job assignments, so that company-wide work will be done without one department duplicating the work of another. Look at the example of a job assignment for the quality assurance department in Figure 3.3a (page 12).

Figure 3.3b Rule for job authority

Figure 3.3c Sample list of authority common to managers

Figure 3.3d Responsibility and authority of major personnel who affect quality

5. Once your company has defined all the job assignments, your primary task, as a department manager, is to clarify your concrete policy and objectives on matters of quality, quantity, and cost, and to communicate these clearly to your employees. To do this you should:
 - a. Know the extent of your authority – how your department interfaces with other departments, especially the next processing department.
 - b. Clarify the quality control points of your job.
 - c. Understand and control the quality characteristics of the jobs in your department. Use control charts and control graphs to quantify these.
 - d. Make sure that any abnormalities and defects that occur at control points will be identified - establish a system where employees can immediately report any abnormalities and defects they discover.
 - e. Set up a system that will highlight the conditions in which abnormalities and deficiencies occur and will investigate the causes.
 - f. Actively support QC circles and other improvement activities.
 - g. Have a system to check that employees have understood and correctly implemented their instructions.

Figure 3.3a An example of a job assignment for the quality assurance department

“As the department playing a central role in company-wide TQM activity, this department shall be in charge of planning and promoting these activities, and of assuring the quality of products.”

- a. Total planning and promotion of TQM activities.
- b. Promotion of QC circles and QC activities.
- c. Planning and promotion of QC awards.
- d. Assistance for TQM activities in affiliated companies.
- e. Planning of basic quality assurance policy.
- f. Establishment and promotion of quality assurance system.
- g. Planning and implementation of quality assurance and product audits.
- h. Establishment and promotion of product liability prevention (PLP) system.
- i. Comprehensive control of claims related to quality.
- j. Promotion of countermeasures for quality problems company-wide and coordination of action on products already shipped.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Are all the jobs in the different departments in your company clearly defined? Would you like to see them better defined? How would this help you, your department and your company?
- b. What kind of relationships exist between the different departments? Are the relationships between the departments clearly defined? In what ways could you imagine the departmental relationships being better? What benefits would this bring?
- c. Parag. 3 presents proposals for drawing up job assignments for each department. Apply the RADAR questions to these. Draw up some brief job assignments for your own department.
- d. Figure 3.3b gives an example of a Rule for Job Authority. Is there anything you can learn from this example that would be useful in your company?
- e. Parag. 5 presents suggestions for clarifying policies and objectives and communicating these clearly to your employees. Apply the RADAR questions.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

3.4 Ensure that your employees understand and carry out their job assignments correctly

Introduction

1. To ensure that your employees understand and carry out their job assignments correctly, you, as a manager, should:
 - a. Consider carefully how to give job assignments.
 - b. Communicate your superiors' instructions clearly to your employees.

Consider carefully how to give job assignments

2. When you are giving job assignments:
 - a. Always give employees jobs that you know they are capable of carrying out. Be aware of an employee's abilities to carry out different tasks, and keep these in mind when you are assigning jobs and giving instructions. You can judge what they are capable of from records of the seminars that they have attended and from records of their daily work. If necessary, carry out training before operations start.
 - b. Delegate to them a degree of authority appropriate to their abilities so that they can, if necessary, pass on the instructions to others both smoothly and quickly. Remember that the responsibility always remains with you. It cannot be delegated.
 - c. You may sometimes choose to give them jobs that are slightly difficult for them in order to improve their skills. In this case give them full guidance, and praise them when their skills improve.
 - d. Make sure that your work instructions are easy to follow, and clearly specify:
 - i. The purpose of the job.
 - ii. The quantity of work to be done.
 - iii. The delivery deadlines.
 - iv. The work methods.
 - v. The materials and tools needed.
 - vi. The standards to be followed.
 - vii. How to report abnormalities.
 - viii. How to report job completion.
 - e. Take a consultative approach:
 - i. Explain the objectives and improvement targets, and invite them to give their opinion.
 - ii. List as many potential problems as you can and discuss the preventive actions that could be taken.
 - iii. Write a summary of any decisions made in this discussion, and see that they are carried out.
 - iv. If procedures have to be revised, devise methods for doing so, and check the results of the newly implemented procedures with the employees.

- f. Highlight the important points and help them to get a feeling for the best way to do the job. Include lessons learned from past mistakes.
- g. Check that they really understand the instructions. If an employee spends a lot of time questioning the same point, this is usually a sign that he or she really wants to understand the problem.
- h. Instruct them on how to follow the company's communication procedures.
- i. Standardize instructions in documents, preferably using the "5WH" questions (who does what, where, when, why and how).
- j. Provide education and training in advance to ensure that they follow the standards. Then observe the actual operations carefully so that you can judge whether they are able to perform them as described in the operation standards. If any problems arise, retrain them. (See also Text 4.1 and Unit 8 for more detailed guidelines on using standards.)

Figure 3.4a Rule for job authority: acceptance inspection

Figure 3.4b Rule for job authority: soldering work

Figure 3.4c Directions of manufacturing conditions

Communicate your superiors' instructions clearly to your employees

3. When you receive instructions from your superiors to be passed on to your employees:
 - a. Make sure that you understand them correctly.
 - b. Consider how they fit in with the responsibilities and capabilities of your department.
 - c. Devise a plan to implement them based on company policy.
 - d. Clearly communicate the instructions to your employees, specifying the concrete work objectives and target values (the desired outcomes from a process). Give them examples.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. How do you normally give job assignments to your employees? What problems, if any do you meet in doing this? In what ways do you think you could improve it?
- b. Consider also these questions:
 - i. How do you normally give instructions to your employees?
 - ii. Do your employees always understand and carry out your instructions in the way that they are supposed to? If not, where do you think the problem lies? What could be done about it?
 - iii. Do you have a good idea of your employees' ability levels in relation to the jobs that you have to assign to them? If not, how can you find out?

- iv. Is it difficult to fit your instructions to what they are able to do? If this is a problem, how can you deal with it
- c. Parag. 2: Apply the RADAR questions to these proposals for assigning jobs to your employees. Include figures 3.4a, 3.4b and 3.4c in your discussion. If you feel it useful devise similar tables for one or two jobs in your department
- d. When you receive instructions from your superiors do you normally check how they fit in with the responsibilities and capabilities of your department? If not, would it be a good idea to do so?
- e. Parag. 3: Apply the RADAR questions to these proposals for passing on your superiors' instructions.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

3.5 Monitor how well management tasks are being carried out

1. You need to have a system for checking that the management tasks in your department have been completed correctly. One system is to use management check items:
 - a. Specify the actions that have to be taken to complete each task.
 - b. Identify an item in each of these actions that can be measured to show if the action has been completed correctly. This item is called a management check item (or simply a management item.)
 - c. Have documents written up that specify the management check items for each task.
2. Management check items are simply indicators that can be checked to see how well a management task has been carried out. For example:
 - a. Management task: reduce manufacturing costs.
 - b. Management check item: the cost of one product unit, or the amount of electricity used each month in the manufacturing process.

Figure 3.5a List of management items for a manufacturing section head

3. The main areas where management check items should be used are:
 - a. Jobs.
 - b. Production processes, including administrative procedures and tasks.
 - c. Interdepartmental tasks, e.g. interdepartmental activities for quality management, such as standardisation, and the processing of complaints.
 - d. New business operations, and policy planning and management.
4. Monitor especially the factors that most affect business performance. Select these as priority management check items and monitor them carefully. Make sure that both your superiors and your subordinates know what they are. Record data about them regularly, and put it on display where everyone can see it.
5. To put this into practice you should:
 - a. Select management check items that indicate business results (output).
 - b. If it becomes clear that these items will take a long time to confirm, select alternative items that can be checked quickly.
 - c. As far as possible, use discrete values and variables to indicate acceptable levels of task completion. If this is not possible use boundary samples.
 - d. Use graphs and other charts to provide a 'time series' examination of the results.
 - e. Analyse factors that appear to affect management check items as early as possible, so that measures can be taken quickly to deal with them.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1: Give some examples of management tasks in your department. Do you have a system for checking if your management tasks have been carried out properly? If yes, where do you feel it may need to be improved, if at all?
- b. Parag. 3: Are these also the main areas where you would use management check items? Are there any other areas where you would use them? Identify management check items for some of the typical tasks that you are responsible for.
- c. Parag. 4: Make out a list of your priority management check items.
- d. Parag. 5: Apply the RADAR questions to the guidelines in this paragraph.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

3.6 Monitor the quality of the work in your department

There are a number of statistical and observational methods that you can use to monitor the quality of the work in your department.

- a. Prepare the Seven QC tools, transitions charts, a process capability index etc. Use numerical data and graphs to show trends in the manufacturing processes. It is extremely useful to look at daily trends over periods of a week or a month, or even twice yearly in order to get a grasp of the work situation.
- b. Instruct employees to inspect designated inspection items (the specific features in a product or process that are inspected). Train them to report quickly when they notice any unusual noise, weight, color, surface roughness or vibration, even if no abnormality appears in the numerical data.
- c. Check their work periodically to see if employees may have deviated from the operation standards.
- d. Thoroughly review any operations that deviate from the operation standards. If appropriate, modify the standards so that employees can follow them more easily. Jobs that require hard physical labour over long periods of time should also be made easier to carry out.
- e. Ensure that employees write proper operation reports – these will include periodic reports on normal operations and special reports on abnormal operations. They should:
 - i. Understand the appropriate control points and evaluation methods, and report periodically on them. (These are the points in a process that can be examined to see if the process is continuous and stable.)
 - ii. Report unusual events quickly on their own initiative.
 - iii. Realise that reporting only favourable items is the same as making false reports.

Figure 3.6a Memo for notice and request

(See Unit 11 Statistical Methods, and Text 16.16 for more detailed guidelines on statistical methods, including the Seven QC Tools.)

(See Unit 8 Standardization, for more detailed guidelines on using operation standards.)

(See Unit 9 Problem solving, for more detailed guidelines on detecting and dealing with abnormalities.)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Are you satisfied with how well you monitor the quality of work in your department?
If not, where do you feel the problems lie, and what could be done about them?
- b. Apply the RADAR questions to these proposals for monitoring the quality of work.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

3.7 Deal with defects

Introduction

1. No matter how well you run your department things will always go wrong. You may find yourself having to deal with defects (especially in production), non-conformities or abnormalities:
 - a. A defect, also referred to as a deficiency, is where an item – a product, part, equipment etc. – is incomplete or does not function properly.
 - b. A non-conformity is any item that does not meet the required quality standard.
 - c. An abnormality in manufacturing is anything that appears in the production process that is different from what it is supposed to be, i.e. it does not meet the predetermined criteria governing the process. An abnormality is not necessarily a defect but it should always be investigated. (See also the next text – 3.8.)

In this text we will be looking at defects but the guidelines also apply to non-conformities and abnormalities. What is critical is how you and your team respond to all three of these.

(See Unit 9 for detailed guidelines on dealing with abnormalities.)

2. There are four actions that you, as a manager, have to take with defects:
 - a. Respond quickly when a defect is reported to you.
 - b. Deal with the defective products.
 - c. Gather information about the causes of the defect.
 - d. Check that the causes of the defect are being properly analysed and acted on.

Respond quickly when a defect is reported to you

3. Your employees should already know the lines of communication to follow when they are reporting any defects they find, and should use short simple reports. More detailed reports can follow later. You should respond quickly when they report a defect to you:
 - a. Make sure you have a clear idea of the situation and the actual products involved.
 - b. Check how the defect occurred.
 - c. Investigate how far the defect affects other processes.
 - d. Find out to what extent other departments are involved, and whether notices need to be sent to them.
 - e. Decide on and prioritise the countermeasures to be taken.
 - f. Decide whether more information is needed.
 - g. Quickly send a defect memo to any related departments informing them of the defect and asking them for their cooperation with concrete countermeasures. Check that they have received the memo. If countermeasures are requested, a report should be forwarded quickly to the person in charge of implementing the countermeasures.
 - h. The defect memo to related departments should include the following:
 - i. Issuing department (issue number, date of issue, issuing section, and person issuing the report).
 - ii. Model, article name, date the defect occurred and the manufacturing process in which it occurred.

- iii. Clear details of the defect and related information – describe it plainly using sketches, etc.
- iv. The countermeasures that have been requested.
- v. A list of the departments to which the report is being sent.
- i. Carry out a full investigation of the causes – but remember that sometimes the first thing to do is to dispose of the defective products.

Figure 3.7a Handling system for external complaint

Deal with defective products

4. Defective products have to be dealt with. There are a number of different actions that should be taken, depending on the circumstances and the nature of the defect:
 - a. Put someone in charge of dealing with the defective products so that they will not be treated casually.
 - b. Decide quickly how to deal with the defective products - to dispose of them, rework them or take some special measures.
 - c. When life or safety-related defects occur, authorise the quality assurance department to stop shipment so that defective products do not reach customers.
 - d. If investigation of the cause reveals that there is no problem in market quality, allow shipments to continue.
 - e. When there are defects that could lead to serious claims against the company, deal with the products first before fully investigating the cause.
 - f. If the products have already been delivered to the customers, assess the seriousness and urgency of the situation, consult the customer, and take active measures to deal with the matter.

Gather information about the causes of the defect

5. To identify the causes of defects, you will need to gather all the information you can. A systematic way of doing this is to ask the 4M questions – is it caused by man, machine, method, or materials:
 - a. Are the operators following the operation standards?
 - b. Have equipment, machine, or tools been changed?
 - c. Were operators or inspectors replaced during the manufacturing process or when the products were in the lot? If not, was the method of operation, the inspection procedure, or the test equipment changed?
 - d. Have any changes taken place in the manufacturing process due to changes in materials and parts? Remember that materials and parts from different makers may differ slightly even though it is claimed they are the same and that they conform to the same standard – this is because machining conditions or quality may differ.

Figure 3.7b Process analysis

Check that the causes of the defect are being properly analysed and dealt with

6. To check that the causes of the defect are being properly analysed and dealt with:
 - a. Check the accuracy of the defect report - go to the workplace and examine the product.

- b. Use stratification (by defects, by model, by manufacturing process, by operator, by time zone, etc.) and other statistical techniques to conduct the analysis. (Stratification is one of the 7 QC tools; see Text 11.3.4.)
- c. Do reproducibility experiments to see if these causes produce the same defects. (This is an experiment that reproduces a failure in order to see how the failure occurred.)
- d. When the causes have been properly analysed, plan and implement countermeasures to prevent recurrence of the defect.
- e. Check the results of these countermeasures.
- f. If necessary review and revise the technical and operational standards and any other standards related to them.
- g. Check processes that are similar to the deficient process and, if a problem is found, review the entire process and re-train the operators.

Figure 3.7c System diagram for countermeasures against deficiencies

Figure 3.7d Analysis of causes

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Do you often have to deal with defects? How do you do so? Could you improve your way of doing this?
- b. Parag. 1. Give one or two examples of defects, non-conformities and abnormalities in your company.
- c. Parag. 3 presents a list of actions to ensure that defects are dealt with quickly. Apply the RADAR questions to these. Include Figure 3.7a in your discussion.
- d. What do you do with the actual defective products in your company?
- e. Parag. 4 presents actions to take with defective products. Apply the RADAR questions to these.
- f. How do you identify the causes of defects? Could your methods be improved?
- g. Parag. 5: Apply the RADAR questions to these suggestions for gathering the information needed to identify the causes of defects. Include Figure 3.7b in your discussion.
- h. Parag. 6 suggests several actions to take in order to check if the analysis of the causes of defects is being conducted properly, and acted on. Apply the RADAR questions to these suggestions. If Figures 3.7c and 3.7d seem relevant to your company include them in your discussions.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

3.8 Be alert for abnormalities when you revise any of your production processes

1. Production processes are sometimes revised in order to improve quality. This is a time when abnormalities can easily arise. There are three critical abnormalities that can emerge when you revise your production processes:
 - a. The quality does not change as planned.
 - b. The quality does change as planned but does not reach the target level.
 - c. The quality changes as planned, but other quality characteristics also change, producing unintended results.

(An abnormality is anything that emerges in the production process that is not how it is supposed to be. Although not always a defect it may indicate a latent problem. See Unit 9 for more detailed guidelines.)

2. To avoid the emergence of such abnormalities, you should have a standardized procedure for these revisions. This procedure should include the following:
 - a. Personnel:
 - i. Specify those responsible for revising process conditions and those who will be in charge of this.
 - ii. Train everyone involved in carrying out the revisions.
 - iii. Make sure that those responsible are there when the revised process conditions are introduced, and that there is adequate supervision.
 - b. Check if:
 - i. Revisions to process conditions are affecting other quality characteristics.
 - ii. Revisions have changed costs.
 - c. Do not:
 - i. Mix up the materials used before and after revisions, unfinished goods, and finished products.
 - ii. Mix up the standards used before and after revisions.
 - iii. Let base material purchasers and suppliers make revisions without permission. Make sure that they follow the instructions of those responsible.
 - d. Complete all other revisions that are related to the process condition revisions.
 - e. Test and inspect finished products and confirm whatever quality changes have taken place.

Figure 3.8a Quality management flow chart for early warning goods

(See Unit 9 Problem solving, for detailed guidelines on dealing with abnormalities.)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: What are some typical abnormalities that have occurred in your department when process conditions have been changed?
- b. Parag. 2: Apply the RADAR questions to this procedure for preventing abnormalities when conditions are changed.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. You might like to use the 6-Point Structure.

3.9 Keep work records

Introduction

1. If your department, and your company as a whole, are to maintain and improve quality, you need to know how well your department is doing. For this it is essential that you keep records of all that is done. In particular you should maintain:
 - a. Achievement records that show how well your department is performing against its targets.
 - b. Work records that will help to build up a picture of the overall situation of the company.
 - c. Daily job results records that will help indicate abnormalities as early as possible.

Achievement records

2. Keep records of what your employees have achieved in the different production processes, and compare these with the plans. Achievement records should include:
 - a. How much work has been done.
 - b. The ratio of defects.
 - c. Records of quality characteristics.
 - d. The cost of the work.
 - e. How successfully deadlines were met.
 - f. The department's safety record.
 - g. The level of employee morale.
3. When your department's actual achievement differs greatly from what it planned to achieve, then corrective action should be taken. Corrective action will be much easier to take if all this data is converted into tables and figures. It is also a good idea to put control charts and graphs on display so that everyone can easily see the level of work achievement and can compare this with the plan.

Figure 3.9a Transitions in quality records

Work records

4. Work records are important to:
 - a. Give a clear picture of the present situation of the company.
 - b. Provide input for decisions about the future direction the company should take.
5. They include:
 - a. The names of products.
 - b. The name of the work and a description of the work.
 - c. The dates when work was started and completed.
 - d. The facilities and equipment that are being used.
 - e. The names of employees.
 - f. The working conditions.

- g. The presence or absence of abnormalities.
- h. The handling of any abnormalities, and the results.

Store all records for a fixed period of time and in fixed locations where they will not be damaged or lost.

6. Work records can be used to assess:
 - a. The company's process and manufacturing capabilities.
 - b. Its quality standards.
 - c. The control limits.
7. These assessments will then help with planning future production, because they will show:
 - a. Optimal manufacturing conditions.
 - b. Factors that affect quality.
 - c. The causes of abnormalities.

Daily job result records

8. Daily job result records are especially useful in helping employees to quickly recognise abnormalities and take immediate action to deal with them. For this purpose, keep the records up to date on a daily basis, and arrange them so that they are easy to inspect.

Figure 3.9b Check sheets

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Do you know how well your department is doing? Do you keep records of what employees have achieved? Or any other kind of work records? If yes, where do you feel your record system needs to be improved, if at all? If you do not keep records, what benefits do you think they would bring?
- b. This text presents three types of records that you can keep. Apply the RADAR questions to all of them, and decide what kind of records would be most useful for you. Consider in particular how:
 - i. Such records would help your department to make these assessments. (parag. 6)
 - ii. These assessments would help you to plan future production. (parag. 7)
 - iii. Daily job results would help you to quickly recognize abnormalities. (parag. 8)

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. You might like to use the 6-Point Structure.

3.10 Take a systematic approach to making improvements

Introduction

1. Whether ideas for improvement come from suggestion schemes, QC circles or elsewhere, you should take a systematic approach to selecting themes for improvement, monitoring their progress and quantifying the results:
 - a. Use statistical techniques.
 - b. Introduce the PDCA cycle.
 - c. Review your approach to improvements.

Use statistical techniques

2. Use statistical techniques, graphs and tables to select themes for improvement, to monitor the progress of improvements, and to quantify the results. This will provide much more effective control of improvements, and will have the added advantage of giving employees a much more concrete sense of what is going on, and of the benefits that improvements will bring.
 - a. To begin with, select improvement themes according to the level of improvement they can be expected to bring. Take into account the balance between the time required for a solution, the costs, and the savings that the improvements are expected to bring. Use characteristic diagrams to make the selection of themes more efficient.
 - b. Stratify the data that is gathered on the theme from various angles, and look for clues that will help to indicate what improvements are needed, and what measures should be taken. Train employees to use statistical techniques such as correlation coefficients, so that they will be able to analyze the stratified data. (Stratification is one of the 7 QC tools; see Unit 11.3.4.)
 - c. Set the improvement objectives, and decide on the concrete measures and the target values (the desired outcomes from a process) needed to achieve them. These are generally summarized in schedule control tables (tables in which improvement objectives, measures to achieve them and target values are summarized).
 - d. Put a person in charge of each concrete measure that is to be taken, and determine the evaluation scale, and the intermediate and final check methods.
 - e. Evaluate the effects of improvements in terms of money or time, since these are objective and should not allow differences of interpretation. Convert subjective evaluations, such as appearance or taste, to a monetary value.

Figure 3.10a Record of improvement

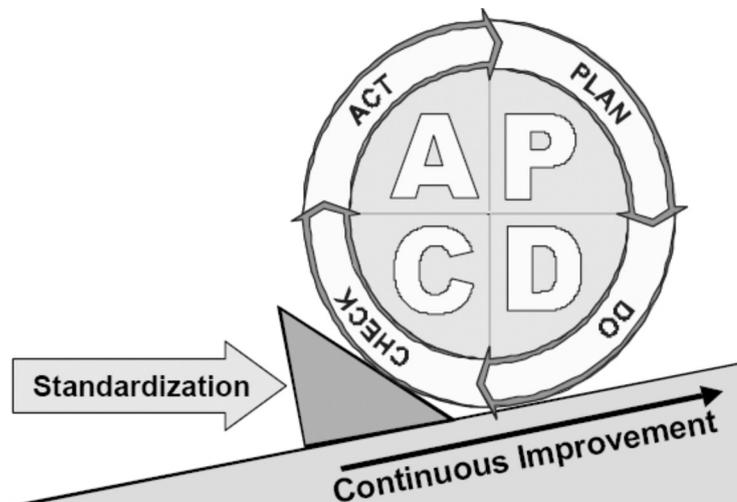
(See Unit 11 Statistical Methods for more detailed guidelines on statistical techniques.)

Introduce the PDCA cycle

3. The PDCA cycle is an effective way of achieving improvements. It has four stages:

- P – Plan:** Set up a concrete improvement plan, choose criteria for evaluating it, decide how to put it into practice and who will be in charge of each item, prepare a daily schedule and check that everyone who needs to know about it is informed.
- D – Do:** Implement the plan exactly as it has been drawn up. Don't implement it partially or casually. Exact implementation is necessary in order to discover any defects there may be in the plan itself.
- C – Check:** Use the evaluation criteria that were chosen at the planning stage to review and evaluate the results of implementation.
- A – Act:** Analyse the results that have been evaluated and take concrete countermeasures and any other action that you think necessary. Ensure that the results are reflected in the next new PDCA cycle. Finally standardize the new procedures.

Figure 1.5a PDCA Cycle



4. The PDCA Cycle was developed by Deming, and is also known as the Deming Wheel. The basic concept is that first you plan what you are going to do, then you do it, then you check the results. If the results are OK, you standardise your plan and put it into regular use. If the results are not satisfactory you make changes to your plan, try it again, and if this time the results are OK you standardize the changed version of your plan, and put it into regular use. The PDCA Cycle can be used for the simplest jobs or for the most complex company activities. It is an excellent system for a manager to use to continuously improve the level of quality in his or her department.
5. When applied to giving work instructions the PDCA Cycle can be summarised as follows:
- a. See that the operations in the department are standardised (Plan).
 - b. Instruct subordinates to carry out these operations (Do).
 - c. Check the results of the operations (Check).
 - d. If any results are unsatisfactory, make changes to the operations, and standardize these changes (Act).

Review your approach to improvements

6. Review the efforts that have been made to improve quality over an extended period. Try to understand what direction they are going in: is the focus on solving problems that have already arisen (e.g. too many rejected products) or on the future (e.g. improving product quality)? Then consider whether this is the best direction to continue.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. How systematic is your approach to deciding what improvements to make in your department and to implementing them?
- b. Parag. 2. Do you already have any experience of using such techniques? How useful do you feel it would be to introduce them in your department or company?
- c. Parag. 2. Apply the RADAR questions to investigating the feasibility of using these techniques in your department.
- d. Parags. 3, 4 and 5. Choose a possible improvement theme for your company, and consider how you would use the PDCA Cycle to implement it. What benefits could it bring? Apply the RADAR questions to the idea of making use of the PDCA Cycle in your department or company.
- e. Parag. 6. What improvements have been carried out in your department in the last few years? How would you analyze them? In the light of your discussion of this text, and previous texts on introducing improvements in your department, what overall approach would you now like to undertake?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

3.11 Keep everyone informed of how the department is doing

1. All your employees, and indeed the company as a whole, should be kept informed of how your department is performing. Present this information in graphs or other visual forms, since people find it easier to grasp visual information.
2. Good graphic methods of displaying this information include:
 - a. Control charts, which will help everyone to understand the current situation, the presence or absence of abnormalities, and any transitions or changing trends in the quality characteristics of important products.
 - b. Transition charts that show changes:
 - i. in actual defect ratios against the targets.
 - ii. in daily performance against targets.
 - iii. in safety records.
 - iv. in the number of improvement proposals.
 - c. Charts that show production volume against planned volume in a cumulative manner.
 - d. Electric signboards that show the gap between actual progress and the progress expected in the standards.

Graphics that show daily or cumulative changes against target values will give a good picture of the present situation and will help with decisions about the future.

Figure 3.11a Management targets

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1: What benefits would you expect from putting this information on public display?
- b. Parag. 2: Which of these methods would be most suitable for displaying this information in your department?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.



3.12 Establish report-writing procedures

Introduction

1. Managers have to do a lot of writing. It is particularly important that you:
 - a. Use the proper format in preparing reports.
 - b. Keep records of communications with other departments.

Use the proper format in preparing reports

2. When you are preparing reports:
 - a. Standardize them as much as possible.
 - b. Use formats that can be completed quickly.
 - c. Itemize the contents in order of importance, putting detailed explanations in appendices at the end.
 - d. To make it easy for the reader, wherever possible present information visually in the form of graphs or reference tables which allow an easy review of the time sequence.
 - e. In addition to the specific content required by the format, include, where appropriate, your own comments and proposals, for example on:
 - i. Actions to prevent abnormalities recurring.
 - ii. The disposal of defective items.
 - iii. The assumed causes and the effects on other departments.
 - f. Write reports in good time and distribute them to the relevant people.

Figure 3.12a A sample of an abnormality report

Keep records of communications with other departments

3. When you are communicating with other departments put everything in writing and keep records:
 - a. Clearly indicate the scope of the matters being discussed, and briefly state what is being requested, the objectives and the targets. Be sure to sign (or stamp) and date the document.
 - b. Itemize the contents in order of importance, putting detailed explanations and numerical information in appendices.
 - c. Keep and exchange minutes of any agreements that are reached.
 - d. If written communication is not enough, arrange a meeting, and discuss beforehand what you want to deal with at the meeting.

Figure 3.12b Sample report format

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. How do you normally give instructions to your employees – in writing or in person, or both? What points do you include? How do you think you could do this better?
- b. Parag. 2: Apply the RADAR questions to these guidelines on preparing written documents. Include the example in Figure 3.12a in your discussion. Could it be a useful model for you?
- c. Parag. 3 presents guidelines for communicating with other departments. Apply the RADAR questions to these. Look at the example in Figure 3.12b. Could it be a useful model for you?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

Test

Answer these questions using **only** the information given in the text. For each question one, two or all three answers may be correct. Tick the answer or answers you think are correct for each question. Each question carries 3 points – you get one point for each correct answer that you tick, and one point for each wrong answer that you do not tick.

3.1 Implement your company's annual management policies

1. To implement company policy effectively:
 - a. Evaluate the work in your department with reference to the previous three years.
 - b. Examine with your employees whether the themes selected for development satisfy long-term and medium-term company plans.
 - c. Review with your employees how to implement these themes.
2. To make sure that your employees have a good grasp of the specific objectives and methods needed to implement the department policies:
 - a. Let your employees decide how the objectives could be achieved.
 - b. Use graphs and charts to show how the achievements of their department contribute to the overall success of the company.
 - c. Use quantitative values to define each objective.
3. When any problems arise during the implementation of the policy:
 - a. Try first of all to solve them yourself.
 - b. Call in the persons in charge, investigate the causes, and examine possible countermeasures.
 - c. If a problem is serious report it to your superiors.

3.2 Clarify the extent of your department's responsibility for quality assurance activities

4. The primary areas where authority for the implementation of quality assurance activities must be defined include:
 - a. Sales.
 - b. Product design.
 - c. Packing manufactured goods.

3.3 Define jobs, responsibilities and authority; clarify policies

5. Job assignments are descriptions of:
 - a. The responsibilities and authority of each department.
 - b. The jobs and responsibilities of each department.
 - c. The jobs, responsibilities and authority of each department.
6. To define the job assignments of each department in the company:
 - a. Specify all the jobs in the department.
 - b. Limit the number of the jobs.
 - c. Identify the quality characteristics of the jobs as numerically as possible.

7. To clarify their policies and objectives and communicate these to their employees, managers should:
 - a. Know how their department interfaces with other departments.
 - b. Understand and control the quality characteristics of the jobs in their department.
 - c. Make sure that abnormalities do not occur.

3.4 Ensure that your employees understand and carry out their job assignments correctly

8. To communicate your superiors' instructions to your employees:
 - a. Make sure you really understand the instructions.
 - b. Consider how these instructions fit in with the responsibilities and capabilities of your department.
 - c. Devise an implementation plan based on your department policy.
9. To ensure that your employees understand and can follow your instructions:
 - a. Provide education and training in advance to ensure that they can follow the standards.
 - b. Never give employees jobs that are even a little above their skills level.
 - c. Get operators to make a habit of immediately reporting when a job is completed.
10. When you are assigning jobs and giving work instructions:
 - a. Always give instructions that are appropriate to the operator's ability.
 - b. Judge what they are capable of from talking to the other operators.
 - c. If necessary, carry out prior training before operations start.
11. In your work instructions clearly specify:
 - a. The purpose of the job.
 - b. How to report that work has started.
 - c. The work methods.
12. To take a consultative approach in communicating your instructions:
 - a. Explain the objectives and improvement targets fully.
 - b. Invite your employees to give their opinion.
 - c. Ask them to write a summary of any decisions reached in your discussion with them.

3.5 Monitor how well management tasks are being carried out

13. To set up a system that will enable him to recognize if the tasks he is responsible for are completed properly a manager must:
 - a. Specify who has to complete each task.
 - b. Specify the actions that have to be taken to complete the task.
 - c. Identify an item in each action that can be measured to show if it has been completed correctly
14. Management check items are indicators that can be checked to see:
 - a. How well the manager has defined the tasks that he is responsible for.
 - b. How well a management task has been carried out.
 - c. How well the performance of the department compares with other departments.
15. A manager should select as priority management check items those factors that most affect:
 - a. Employee morale.
 - b. Cost reduction.
 - c. Business performance.

16. Analyse factors that appear to affect management check items as early as possible so that:
- a. Deadlines can be met.
 - b. Costs can be reduced.
 - c. Measures can be taken quickly to deal with them.

3.6 Monitor the quality of the work in your department

17. To monitor the quality of the work in your department:
- a. Use numerical data and graphs to show trends in the manufacturing process.
 - b. Check workplace operations regularly to see if employees may have deviated from the operation standards.
 - c. Instruct operators to inspect designated inspection items.
18. Ensure that when employees are submitting reports they:
- a. Understand the appropriate control points and evaluation methods.
 - b. Realize that reporting only favorable items is the same as making false reports.
 - c. Report unusual events as soon as they are told to do so.

3.7 Deal with defects

19. To ensure that quick and appropriate action is taken whenever defects occur:
- a. Make sure employees know the communication lines to follow when they are reporting the defects they find.
 - b. Distribute a report to related departments informing them of the defect and asking for their cooperation.
 - c. Distribute a report to related departments informing them of the defect and asking for their cooperation.
20. Take the following actions when you are informed about a defect:
- a. Make sure you have a clear idea of the situation and the actual products concerned.
 - b. Assess how much the defect will cost.
 - c. Decide whether more information is needed.
21. A defect memo sent to another involved department should include:
- a. The issuing department.
 - b. The countermeasures that have been taken.
 - c. A list of the departments to which the report is distributed.
22. When there are defects that could lead to serious claims against the company the first priority is to:
- a. Deal with the products.
 - b. Investigate the causes.
 - c. Take countermeasures.
23. If products that may be defective have already been delivered to the customer:
- a. Recall the products immediately.
 - b. Assess the seriousness of the situation.
 - c. Consult the customer.
24. To gather information about the causes of the defect, ask the following questions:
- a. Are operators following the operation standards?
 - b. Has a new manager been appointed?
 - c. Were operators or inspectors replaced during the manufacturing process?

25. To check that the causes of the defect are being properly analyzed:
- a. Go to the workplace and examine the product.
 - b. Change the standards immediately.
 - c. Draft concrete plans for improvement.

3.8 Be alert for abnormalities when you revise any of your production processes

26. Likely results of the revision of processes include:
- a. Quality changes as planned but does not reach the target level.
 - b. Quality does not change as planned.
 - c. Quality changes as planned, but other quality characteristics also change.
27. To prevent abnormalities when process conditions are revised do not:
- a. Mix up the materials used before and after revisions.
 - b. Mix up the standards used before and after revisions.
 - c. Change the employees before and after revisions.

3.9 Keep work records

28. Achievement records should include:
- a. How successfully deadlines were met.
 - b. The level of employee morale.
 - c. The facilities and equipment that were used.
29. To ensure that everyone can see the level of work achievement it is best to
- a. Ask the supervisors to tell everyone.
 - b. Display the achievement results in control charts and graphs.
 - c. Hold monthly meetings and announce the achievement results.
30. Work records include:
- a. The department's production capability.
 - b. The presence or absence of abnormalities.
 - c. The quality characteristics of the work results.
31. Work records can be used to assess:
- a. The company's quality standards.
 - b. Its cost limits.
 - c. Its process capability.
32. To use job result records to recognize abnormalities keep them up to date on:
- a. A daily basis.
 - b. A weekly basis.
 - c. A monthly basis.

3.10 Take a systematic approach to making improvements

33. Use statistical techniques, graphs and tables to:
- a. Select themes for improvement.
 - b. Monitor the progress of improvement.
 - c. Quantify the results.
34. In selecting improvement themes take into account the balance between:
- a. The time required for a solution.
 - b. The savings that the improvements are expected to bring.
 - c. The techniques that can be used to select them.

35. Evaluate the effects of improvements in terms of:
- a. Subjective evaluations.
 - b. Money.
 - c. Time.
36. Which is the correct sequence of the PDCA Cycle when applied to work instructions:
- a. Make changes to the operations, standardize operations, instruct subordinates to carry out operations, check the results.
 - b. Standardize operations, instruct subordinates to carry out operations, check the results, make changes to the operations.
 - c. Instruct subordinates to carry out operations, standardize operations, check the results, make changes to the operations.

3.11 Keep everyone informed of how the department is doing

37. A control chart will help everyone to understand:
- a. Any trends that are taking place.
 - b. The presence or absence of abnormalities.
 - c. The current situation.
38. Methods of displaying control information include:
- a. Electric signboards that show the gap between actual progress and the progress expected in the standards.
 - b. Transition charts that show daily performance against targets.
 - c. Graphics that show changes in the number of suggestions for improvement.

3.12 Establish report-writing procedures

39. When you are preparing reports:
- a. Standardize them as much as possible.
 - b. Itemize the contents in order of cost.
 - c. Present information visually whenever possible.
40. When communicating with other departments
- a. Clearly indicate the scope of the matters being discussed.
 - b. If written communication is not enough use the telephone.
 - c. Keep and exchange minutes of any agreements that are reached.

Relationship with ISO

3.1 Implement your company's annual management policy

Relationship with ISO 9001:2000:

- 5.3 Quality policy
- 5.4.1 Quality objectives
- 5.5.3 Internal Communication
- 5.6 Management review
- 8.4 Analysis of data
- 8.5.1 Continual improvement

3.2 Clarify the extent of your department's responsibility for quality assurance activities

Relationship with ISO 9001:2000:

- 5.4.1 Quality objectives
- 5.4.2 Quality management system planning
- 5.5.1 Responsibility and authority

3.3 Define jobs, responsibilities and authority; clarify policies

Relationship with ISO 9001:2000:

- 5.5 Responsibility, authority and communication
- 5.5.1 Responsibility and authority

3.4 Ensure that your employees understand and carry out their job assignments correctly

Relationship with ISO 9001:2000:

- 5.5 Responsibility, authority and communication
- 5.5.1 Responsibility and authority
- 5.5.3 Internal communication

3.5 Monitor how well management tasks are being carried out

Relationship with ISO 9001:2000:

- 8.2.3 Monitoring and measurement of processes
- 8.4 Analysis of data

3.6 Monitor the quality of the work in your department

Relationship with ISO 9001:2000:

- 8.2.3 Monitoring and measurement of processes
- 8.2.4 Monitoring and measurement of product

3.7 Deal with defects

Relationship with ISO 9001:2000:

- 8.3 Control of nonconforming product
- 8.4 Analysis of data
- 8.5 Improvement

3.8 Be alert for abnormalities when you revise any of your production processes

Relationship with ISO 9001:2000:

- 6.2.2 Competence, awareness and training
- 7.3.2 Control of design development changes
- 8.5.2 Corrective action

3.9 Keep work records

Relationship with ISO 9001:2000:

- 4.2.4 Control of records
- 8. Measurement, analysis and improvement

3.10 Take a systematic approach to making improvements

Relationship with ISO 9001:2000:

- 8.2.3 Monitoring and measurement of processes
- 8.5.1 Continual improvement

3.11 Keep everyone informed of how the department is doing

Relationship with ISO 9001:2000:

- 8.2.3 Monitoring and measurement of processes
- 8.4 Analysis of data

3.12 Establish report-writing procedures

Relationship with ISO 9001:2000:

- 4.2.3 Control of document
- 4.2.4 Control of records

Unit 4

Managers:

Managing
People



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Unit summary

This unit presents six key actions that you as a manager can take to maximise the contribution of your employees to the success of your department and of your company. Ensure that they follow the standards, train, motivate and delegate, and involve them in making improvements.

4.1 Ensure that your employees understand and follow the standards

A standard is a written description of the best way to carry out a job or a process. It can also refer to the specifications of a product. If your company is to produce quality goods both consistently and efficiently, it is essential that your employees understand and follow the standards.

4.2 Raise your employees' technical skills levels

Manufacturing technology is constantly advancing, requiring ever-higher skills levels. If you are to keep on providing quality products and services, you will have to continuously improve the technical skills of your employees.

4.3 Delegate authority

You may decide to delegate some of your own authority to your employees as a way of educating them. This will also be beneficial for your department, since management efficiency is inversely proportional to the number of items being managed – in other words, the less you have to manage the better you will manage it.

4.4 Motivate your employees

The attitude of your employees to their work can have a major impact on the success of your company. A negative attitude will reduce the efficiency of the production process and the quality of the goods that your company produces, while a positive attitude will create a dynamic workplace where productivity and quality will be high.

4.5 Involve your employees in making improvements: set up a suggestion scheme

Your department will be much more productive, quality will improve, and costs will be reduced if your employees feel that they have a real part to play in achieving these goals. Don't see their role as simply carrying out your instructions. Encourage them to be both problem-conscious and improvement conscious. One method is to set up a suggestion scheme.

4.6 Involve your employees in making improvements: support QC circle activities

A second method is to support QC circle activities. QC circles are small groups of employees from the same workplace who meet to discuss work problems and carry out improvement activities. Employees who participate in QC circle activities usually develop quality consciousness, problem consciousness, a willingness to make improvements, and a sense of quality management.

Learning tools

The RADAR questions

As you read each text you will discuss how it could be applied in your company. The RADAR questions will help you to focus this discussion:

- R** - Are these ideas **relevant** to my company?
- A** - How would I **apply** each of them in my company?
- D** - What **difficulties** might I meet and how would I overcome them?
- A** - Are there any **additional** actions that I might take that are not mentioned in the text?
- R** - What **resources** would be needed, what would these cost, and how could they be acquired?

There will of course be some discussion points where not all of these questions will be applicable.

The 6-Point Structure

After you have discussed the ideas in the text, you write an action plan in which you present practical proposals for implementing the conclusions you have reached in your discussion. The 6-Point Structure will help you to write your action plan:

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts, tables etc. that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these could be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

4.1 Ensure that your employees understand and follow the standards

1. A standard is a written description of the best way to carry out a job or a process. It can also refer to the specifications of a product. If your company is to produce quality goods consistently and efficiently, it is essential that your employees understand and follow the standards.
2. They should first of all recognize the benefits of standards: they integrate and simplify operations and get rid of wasteful and inefficient processes, they improve work efficiency, and they provide a basis for further improvement.
3. Explain the work standards to your employees:
 - a. Make sure that employees recognize the purpose of having work standards.
 - b. Explain clearly to each employee the standards relevant to their work, and check that they fully understand them.
 - c. Explain clearly each employee's responsibilities in using the standards – both to the employee and to his/her supervisor.
 - d. Make sure that the tools and equipment required by the work standards are available.
4. To ensure that employees follow the standards and rules:
 - a. Establish a control system to check that the work standards are being followed, clarify the procedure to those in charge and train them to use it properly.
 - b. Quickly find the cause of any non-observance and act to prevent its recurrence. This approach will do much to improve the atmosphere of the workplace.
 - c. Where an employee is at fault for failing to follow the standards, make it clear to him or her that the standards must be followed.
 - d. Create an environment in which everyone is willing to follow the standards.
 - e. Standardize the skills levels of skilled employees so that they can see the importance of standards and rules in improving their skills.

(See Unit 8 for more detailed guidelines on using standards.)

Figure 4.1a Benefits of observing standards, as perceived by employees of Company X (page 6)

Figure 4.1b Analysis of causes of failure to observe the standards and rules (page 6)

Figure 4.1a Benefits of observing standards, as perceived by employees of Company X

Benefits	%
1. Makes operations easier to perform	30
2. Improves quality of products	26
3. Improves productivity	15
4. Evens out the workload	10
5. Improves the drive to work	8
6. Reduces production costs	5
7. Improves teamwork	2
8. Improves problem consciousness	2
9. More employees stay with the company	1
10. Improves attendance rate	1

Figure 4.1b Analysis of causes of failure to observe the standards and rules

Cause	%
1. Ignores the work standards in his or her own way	15
2. Not aware of the importance of observing the standards	13
3. Does not understand the standards	12
4. Lacks the necessary tools or equipment	11
5. Thinks the technical level of the standards is too high	10
6. Thinks work in accordance with the standards takes too much time	9
7. Thinks work in accordance with the standards is dangerous	7
8. Does not care about product quality	6
9. Thinks no one would know who has done the job	5
10. Cuts corners because it is easier	4
11. Does not want to get tired. Does not care as no one is watching	4
12. Other causes	4

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Do your employees always follow the standards? If not, what do you think the reasons are? How could you ensure that they do follow them?
- b. Parag 2: Do you agree that standards have all these beneficial effects?

- c. Look at Figure 4.1b. Are there any other causes of failure that would apply in your company? What would you guess the percentage of causes would be in your company?
- d. Look at Figure 4.1a. What would you imagine the percentages of benefits to be for your company?
- e. Apply the RADAR questions to these guidelines for ensuring that employees always follow the standards.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

4.2 Raise your employees' technical skills levels

Introduction

1. Manufacturing technology is constantly advancing, requiring ever-higher skills levels. If you are to continue to provide quality products and services, you will have to continuously improve the technical skills of your employees. To do this:
 - a. Plan your training programmes and encourage employees to participate.
 - b. Encourage employees to improve their work techniques on the job.
 - c. Exchange ideas with other departments and companies.

Plan your training programmes

2. To plan your training programmes:
 - a. Review the jobs in your department and the levels of knowledge and skills needed to perform them.
 - b. Plan long-term training programmes to raise your employees' skills to those levels. The plans should include lists of those who will take part, and the content and duration of the programmes.
 - c. Plan and implement training for individual employees. Be very fair when you are assigning employees for courses. Keep a good balance of daily work and training. Use this plan to control individual training for each year.
 - d. Train operators to gain the specific qualifications that are required for certain operations. Special in-house operations should have a company-specific qualification system. Clarify the methods for acquiring these qualifications, e.g. doing examinations, education courses, in-house training, or OJT training.
 - e. Develop plans for each employee to acquire essential national qualifications, and implement training to help them to achieve these.
 - f. Encourage employees by giving recognition to the higher skills levels that they achieve. Establish criteria for different skills levels, and present certificates that show the skills level they have achieved. Give recognition to those who work productively, as well as to those who improve their technical skills.
 - g. Train employees to follow the work instructions when they begin working on a job for the first time, and whenever new operation standards and work instructions are introduced. You should choose suitable employees from the workforce to give this training.
 - h. Keep records of the training courses that each employee has taken. These records should show the date, the name of the instructor, and the content of the course.
 - i. Make the best use you can of the training potential of QC circle activities. These can focus directly on issues related to the workplace environment, operation methods, and product quality. (See Text 4.6 and Unit 10 for more detailed guidelines on QC circles.)
 - j. Create an atmosphere in which everyone takes it for granted that they should work hard to move up to a higher skill level.

(See Unit 12 for more detailed guidelines on education and training.)

Figure 4.2a List of skills of each operator

Figure 4.2b Classification of skills levels (page 11)

Encourage employees to improve their work techniques

3. As well as providing formal skills training for employees, you should also encourage employees to continuously improve their skills themselves by fine-tuning their work techniques, and developing their own original ideas for doing things better.

Exchange ideas with other departments and companies

4. An interesting way of improving the technical level of your department is to exchange the latest information with other departments. Such an exchange will also help to give you a sense of the skills level in your department. Although with some skills it is important to know your level within the industry as a whole, it is also useful to compare them with those of other departments in your company. One way of doing this is by taking part in technological competitions. After the competition analyze and deal with whatever problems may have emerged.
5. Employees may also be sent to a technically more advanced company to learn the latest skills, which they can then pass on to their colleagues. Alternatively an instructor from a technically more advanced company may be invited to visit your company.
6. A further option may be that employees take a skill-level certificate examination organized by the government or a third-party organization. This can be followed by an attempt to obtain a higher skill-level certificate.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. How easy is it for your company to get the skilled employees you need? Have you tried to raise the skills levels of your employees? How successful have you been?
- b. How willing are your employees to learn new skills on their own initiative? How could you encourage them to be more willing?
- c. What training do you already organise for your employees? In what ways would you like to extend and improve it? What benefits would this bring?
- d. Parag. 2: Apply the RADAR questions to these guidelines for planning a training programme. If you feel it useful, prepare a classification of skills levels in your company similar to Figure 4.2b.
- e. Parag. 3: How capable do you think your employees are of fine-tuning their work techniques? How could you encourage them to do so?

- f. Parag. 4 suggests exchanges with other departments. Apply the RADAR questions to these suggestions.
- g. Parag. 5 suggests sending employees to technically more advanced companies. Apply the RADAR questions to this idea.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

Figure 4.2b Sample of classification of skills levels

Skill	Elementary	Intermediate	Advanced
Sheet metal work	Thick and thin sheet, flat surface	Curved and spherical surfaces	Composite surface and finishing work
Painting	Undercoat, overcoat	Multiple coats, multicolor coat	Finish coat
Welding	Thick and thin plates (electric oxygen)	Spot, seam	Reinforced material, carbon dioxide gas welding, argon gas
Machining	Cutting, drilling	Grinding, polish various cutting tools	Gear cutting, adjustment of
Mold	Manufacturing	Setting	Adjustment, repair
Chemical synthesis	Agitation, mixing	Press feeding, pressurizing, depressurizing	High temperature, and high pressure, reaction
Assembly	Simple product	Complicated product	Test and adjustment of finished product
Measurement	Dimensions, quantity	Precision measurement, correction	Calibration, record data
Test	Material test	Analysis, performance test	Destructive test
Repair of machine and equipment	Simple machine and equipment	Machine tool, chemical machine, fluid machine, compression machine	Precision machine, heavy machine, complicated large-scale equipment
Maintenance of electric machine	Rotary machine transformer	Converter, robot	Control machine regulator
Maintenance of heavy lifting machine	Hoist	Heavy lifting machine	Controller
Maintenance of conveying equipment	Truck, trolley (manual, automatic)	Forklift (battery, engine)	Conveyor, conveying car

4.3 Delegate authority

1. You may decide to delegate some of your own authority to your employees as a way of educating them. This will also be beneficial for your department, since management efficiency is inversely proportional to the number of items being managed – in other words, the less you have to manage the better you will manage it. Delegate some of your authority for making decisions, giving instructions, consulting and giving advice. Take the following steps:
 - a. First clearly define your own policy in the area that you are delegating.
 - b. Make sure that standards are established for the duties you are handing over.
 - c. Make sure standards are established for dealing with any abnormalities that may arise.
 - d. Make sure that the authority to be delegated is not more than the employee is capable of handling.
 - e. Make sure that the employee understands what he or she is supposed to do.
 - f. Require the employee to report on the progress and results of the work he or she is responsible for.
 - g. Provide guidance.
2. Delegation is not a simple matter, though. As manager you always remain responsible for whatever your subordinate does, but at the same time, you must leave the subordinate free to get on with it, and not interfere.

Figure 4.3a Organization and division of duties

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. What is your experience of delegating authority? What problems have you met? What benefits have you gained? Do you find it easy to let go, or do you tend to interfere too much?
- b. Apply the RADAR questions to these guidelines for delegating authority.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

4.4 Motivate your employees

Introduction

1. The attitude of your employees to their work can have a major impact on the success of your company. A negative attitude will reduce the efficiency of the production process and the quality of the goods that your company produces, while a positive attitude will create a dynamic workplace where productivity and quality are high. You should:
 - a. Be alert for signs of a negative attitude, especially in attendance and punctuality.
 - b. Take steps to motivate your employees.
 - c. Try to maintain a balanced workforce.

Be alert for signs of a negative attitude, especially in attendance and punctuality

2. You may find signs of a negative attitude in how your employees interact with each other and in how they dress. Most of all you will recognize negative attitudes in the levels of absenteeism, especially when superiors are not told in advance, and in poor punctuality. These present you with two challenges:
 - a. The immediate problem of ensuring that production is not disrupted by poor attendance and punctuality.
 - b. The underlying need to improve employee attitudes.
3. To keep production on schedule, you need to know the attendance rate in advance so that you can plan for other employees to substitute for those who will be absent. (The attendance rate is the ratio of employees at work to the number of employees required for the work.) You should:
 - a. Introduce a Request for Leave Form that employees can use to request leave in advance.
 - b. Educate employees on the effect that unrequested absences can have on production.
 - c. On the longer term, train employees in several skills so that they can easily substitute for absentees.
4. When your employees are often unpunctual, you should:
 - a. Analyze the reasons for employees arriving late or leaving early, and take appropriate action.
 - b. Educate employees on the effects that unpunctuality can have on the stability of production.
 - c. Reward employees who have not arrived late or left early for an entire year, perhaps with a cash bonus.

Figure 4.4a Request for leave form

Figure 4.4b Request to come late/leave early

Figure 4.4c Reasons for coming late (page 16)

Figure 4.4d Reasons for leaving early (page 16)

Take steps to motivate your employees

5. A positive attitude among employees can be reflected in:
 - a. A willingness to take part in teamwork.
 - b. Confidence in acting on their own initiative.
 - c. Drive and energy.
 - d. A sense of responsibility.
 - e. Willingness to try to find improvements in their work.
 - f. Appropriate dress.

6. There are several actions that you can take to motivate your employees:
 - a. Give a good example:
 - i. Give your supervisors and employees a good example in your own positive attitude.
 - ii. Make sure that they can see the value of any rules you introduce.
 - iii. Encourage them to feel free to come and talk openly to you, and to their supervisors, about any troubles and worries they may have.
 - b. Provide support:
 - i. Support them in raising their skills levels. (See Text 4.2.)
 - ii. Carefully observe, in your daily management, what they are doing, and help them do it better.
 - iii. Schedule regular meetings of supervisors so that they can improve their communication with each other, and so become more effective in identifying and solving problems.
 - c. Encourage initiative:
 - i. Ensure that your employees understand the content of their jobs, and the importance of what they are doing.
 - ii. Encourage them to discover problems in their work and find their own original solutions. One of the great motivators is to show what you can do, while it is quite de-motivating to work in an atmosphere where everyone does only what they are told.
 - iii. Hold competitions and campaigns to encourage them to come up with inventive ideas. Set up a suggestion scheme, and a system to evaluate their ideas and implement the good ones. (See Text 4.5.)
 - iv. Introduce QC circles. (See Text 4.6.)
 - d. Challenge them:
 - i. Give them jobs that are slightly above their ability level, whenever it is appropriate to do so.
 - ii. Select themes for improvement which interest and challenge them.
 - iii. Give them appropriate guidance when they take on these challenges.
 - iv. Hold meetings where they can present their achievements to larger audiences.
 - v. Make sure that their achievements are recognised in a company award system.

Try to maintain a balanced work force

7. A further, more long-term, way of improving the attitudes of employees is to ensure that there is an even distribution of employees of different ages and different years of service. This distribution should be balanced in the following categories:
 - a. The total number of employees.
 - b. The number of employees of each sex.
 - c. The number of employees in each job.

First, work out how employees are presently distributed with reference to the criteria of age, sex and years of service. Then map out a long-term plan that will give a well-balanced distribution. Visual aids, such as a histogram, will be helpful in doing this.

Figure 4.4e AAA Manufacturing Co.: distribution by age (page 17)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1: Do you agree that the attitude of employees can have such an impact on the success of the company? How would you describe the attitudes of the employees in your company?
- b. Parag. 2: Do you agree that these four factors can indicate the attitude of employees to their work? What would these factors indicate in your company?
- c. Parag. 3: Is the employee attendance rate a problem in your company? If it is, apply the RADAR questions to these suggestions. Include Figure 4.4a, The Request for Leave Form, in your discussion.
- d. Parag. 4: Is punctuality a problem with your employees? If it is apply the RADAR questions to the ideas presented here. Include Figure 4.4b, Request to Come Late/leave Early, in your discussion.
- e. Figures 4.4c and 4.4d compare the frequency of reasons that employees give for coming late or leaving early. What are the most frequent reasons that your employees give?
- f. Parag. 5 presents five indicators of a positive attitude among employees. Would these also apply to your employees? Are there any other indicators that you would add?
- g. Parag. 6 looks at ways of motivating employees. How motivated would you say that your employees are? What success have you already had in motivating them? What factors tend to raise and lower their levels of motivation?
- h. Parag. 6. Consider first how you would feel about taking each of these sets of actions to motivate your employees, and how effective you imagine they would be in your department. Then apply the RADAR questions to putting into practice those that you feel would be effective.
- i. Parag. 7 suggests that when the workforce is balanced according to age, sex and years with the company, employee attitude is better. What is the balance like in your company? How does it compare with the balance in Figure 4.4e? Would it be worthwhile to try to change it in this way?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

Figure 4.4c Reasons for coming late

Reasons	%
Overslept	20
Traffic congestion	15
Did not feel well	10
Something urgent happened at home	10
Do not like job	9
Too tired and discouraged	8
Uncomfortable relationship with people at work	7
The job is too dangerous	7
Criticized for my work yesterday	6
Went to see doctor	4
Other reasons	4

Figure 4.4d Reasons for leaving early

Reasons	%
Personal (requested permission in advance)	20
Something urgent happened	15
Did not feel well	15
Tired due to overwork and did not feel like working	10
Did not feel like working because of uncomfortable relationships with people at work	10
Do not like the job, and have lost motivation	10
Criticised for a mistake, and felt demoralised	8
The job is too dangerous	5
Other reasons	7

Figure 4.4e Manufacturing Co.: distribution by age

BBB Plant, AAA Manufacturing Company

Distribution by Age

Age		Number of Employees			
			20	40	60
20-29	1995	38			
	1996	42			
	1997	45			
30-39	1995	29			
	1996	29			
	1997	35			
40-49	1995	55			
	1996	60			
	1997	55			
50-59	1995	32			
	1996	38			
	1997	39			
60-65	1995	11			
	1996	8			
	1997	14			

4.5 Involve your employees in making improvements: set up a suggestion scheme

Introduction

1. Your department will be much more productive, quality will improve, and costs will be reduced if your employees feel that they have a real part to play in achieving these goals. Don't see their role as simply carrying out your instructions. Encourage them to be both problem-conscious and improvement conscious. There are two key actions you can take:
 - a. Set up a suggestion scheme.
 - b. Support the activities of QC circles. (This is presented in Text 4.6.)

Set up a suggestion scheme

2. Set up a suggestion scheme, and encourage your employees to make suggestions for improving quality, efficiency, and productivity, for reducing costs and for improving safety. Evaluate the suggestions periodically, implement the good ones and financially reward those who suggested them. Take the following steps:
 - a. Set up a suggestion scheme that all employees can actively participate in.
 - b. Ensure that employees understand that the purpose of the scheme is to make work better, easier, safer, or quicker.
 - c. Distribute simple suggestion forms to each section, prepare a sample showing how to fill them in, and leave out post-boxes to receive them.
 - d. Set concrete goals for suggestions in each workplace.
 - e. Create a work atmosphere in which members are willing to make suggestions, and show a real interest in receiving suggestions.
 - f. Evaluate suggestions fairly and quickly, and let each employee know what you think of his/her suggestion. When you have to reject a suggestion, tell the employee why.
 - g. Select suggestions which will really have an impact on improvement.
 - h. Display those you have selected on bulletin boards, or other places where everyone can see them. Put up graphs showing the number of proposals that have been received. When they have been implemented put up graphs that show the amount of money they have saved. This will encourage the different sections to be competitive in coming up with good suggestions.
 - i. Implement accepted suggestions as quickly as possible. Some may of course take time to implement: they may require changes in equipment or products, or may involve other departments.
 - j. Once the suggestions have been implemented, and their positive effect has been confirmed, standardize them. Then integrate them into the production control system:
 - i. Establish a procedure to control the new or improved process.
 - ii. Inform all employees of the new control procedure.
 - iii. Place an employee in charge of control, and educate and train him or her.

Figure 4.5a Tips for evaluating and giving commendations (page 20)

Figure 4.5b Examples of suggestions (page 20)

Figure 4.5c Proposal Sheet

3. Suggestions for improvement may come from individuals or groups. Once the QC circles get going, most suggestions will come from them. These circles will lead to cooperation and therefore to more and better suggestions. Once employees are aware of the contribution they can make to product quality, they will be motivated to look for ways of improving their work processes. You will often find at the planning stage that the opinions of employees in the workplace will be useful both in gaining an understanding of the problems and in implementing the plans.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your Action Plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1. How willing are employees in your company to make suggestions for improvements? Are they encouraged to do so? Can you give any examples of useful suggestions that they have made?
- b. Parag. 2 presents guidelines for setting up a suggestion scheme. Apply the RADAR questions to these.
- c. Figure 4.5b gives examples of suggestions for improvements over a three-year period. Examine these and identify one in each of the eight categories that would be most attractive to achieve in your company. Then make out your own list of desirable improvements in each category.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

Figure 4.5a Tips for evaluating and giving commendations

1. Do not use only monetary incentives to encourage employees. Monetary incentives work better where the control system is inadequate. In addition, incentives may not work where QC activities are in full operation.
2. These evaluations and commendations relate to the achievements of those who make suggestions (individuals or groups) and are not part of performance ratings.
3. Consider how much employees have studied and to what extent their skill levels have improved. It is important to evaluate employee progress.
4. Consider the autonomy, cooperation, and willingness of employees to participate.
5. The evaluation must lead to giving due praise.
6. The evaluation and commendation must be conducted in such a way that the members can make the most of them in future activities.

Figure 4.5b Examples of suggestions

Details of suggestions	Year	Number of suggestions
Quality: Reduce the number of defective products; improve quality; and minimize complaints, problems, and variability in quality.	1995 1996 1997	40 50 60
Manufacturing: Improve operations, prevent careless mistakes, use foolproof devices, and encourage observance of work standards.	1995 1996 1997	25 23 26
Control: Establish control items, devise a method of standardization, and establish a system for preventing the recurrence of problems.	1995 1996 1997	30 40 35
Cost: 1995 Reduce costs, reduce man-hours, conserve materials, reduce the inventory, and put time to effective and efficient use.	15 1996 1997	 20 18
Efficiency: Streamline procedures, reduce delivery time, improve efficiency, reduce downtime, mechanize processes, and use more jigs and tools.	1995 1996 1997	20 25 23
Equipment and facility: Map out a maintenance plan, prevent malfunctions, improve the plant layout, introduce automation, improve jigs and tools, and reduce labor requirements.	1995 1996 1997	10 15 13
Enthusiasm and determination: Improve relationships with others, increase employees' motivation to improve, encourage suggestions, and improve the attendance rate.	1995 1996 1997	25 28 20
Environment and safety: Implement the 5-S house-keeping campaign, improve sanitation, reduce overworking, and prevent accidents and environmental pollution.	1995 1996 1997	30 40 35

4.6 Involve your employees in making improvements: support QC circle activities

Introduction

1. QC circles are small groups of employees from the same workplace who meet to discuss work problems and carry out improvement activities. Their value lies in the fact that employees themselves are very familiar with the problems in their own work places. When they form groups, they can do a lot together to solve these problems, and to improve the quality of their work. Over a period of time they can make valuable contributions to product quality, productivity levels, cost reduction, facility maintenance and safety procedures. (See Unit 10 for detailed guidelines on QC circles.)
2. It has been found that employees who participate in QC circle activities usually develop quality consciousness, problem consciousness, a willingness to make improvements, and a sense of quality management. There are a number of ways that you can encourage QC circles in your department.

Become familiar with QC procedures and techniques

3. You will find details of these in Unit 10. Here, briefly, is the QC problem-solving procedure:
 - a. Select a theme.
 - b. Get a full understanding of the present situation and set targets.
 - c. Prepare an action plan.
 - d. Analyze the key factors to get to the causes of the problem.
 - e. Work out countermeasures to solve the problem and implement them.
 - f. Evaluate the effect of the countermeasures.
 - g. Review and revise the standards, and integrate them into the control system.

Figure 4.6a Sample QC themes (page 24)

Take an active interest in QC circles

4. QC circles are more likely to bear fruit where management is flexible and open. However, you should not leave them to do as they like. You should keep in touch with the leaders and members, and take a close interest in their activities. In fact, if you set up such groups without taking an interest in what they do, the groups will not produce very positive results. Performance may even deteriorate.
 - a. Encourage all employees to participate: make it clear that QC circle activities have an important function in your company.
 - b. Keep up to date with what the QC circles in your department are doing. Talk directly to the circle leaders and keep records: how many circles are there and how many

- members; what themes are they working on; how long will it take to solve them and what method of control is being used?
- c. Visit the workplace at least once a week to see how the QC circle activities are progressing. This will only take about 5 minutes per circle. Give advice if it is needed, and give assistance to QC circles in other departments whenever you are asked.
 - d. Advise on QC themes when you are requested and be quite clear about what you expect from the activities.

Encourage QC group leaders

5. Encourage QC group leaders to:
 - a. Keep members motivated: encourage suggestions, make the most of their sense of competition and their eagerness to improve, and show appreciation of what they have done.
 - b. Begin with simple, specific, immediate problems, or those common to all members, or pertaining to company policy, and then move on to more difficult problems. If it takes too long to solve a problem, members may lose interest. It is best to begin with a problem that can be solved in less than three months, and later move on to more long-term issues.
 - c. Schedule meetings carefully: if meetings are held outside working hours, this should be at a time that suits as many members as possible.
 - d. Do not allow preparation of presentations to cause work performance to suffer, even if this is for important circle presentations.

Evaluate the progress of QC circle activities

6. Generally speaking you should evaluate QC circle activities in terms of:
 - a. The number of sessions per month.
 - b. The number of hours per session.
 - c. The number of problems solved per year.
 - d. The number of presentations per year.
 - e. The participation ratio: the number of participants to the number of employees.
 - f. The money saved annually by improvements.

Maintain the momentum of QC circles

7. QC circle activities should be ongoing. When one problem is solved the members must identify and tackle the next one, setting a goal of two to four problems a year. With your supervisors and QC group leaders, create an atmosphere in which members want to keep on taking part in the activities:
 - a. Encourage groups to identify and tackle a series of new problems.
 - b. Encourage members to take on new jobs or roles in the QC activities.
 - c. Encourage recreational activities as an occasional change from the normal activities.
 - d. Encourage members to participate in national and international QC circle conferences. These will also provide an opportunity to let others know of your achievements and for your employees to hear what they have achieved.

Figure 4.6b. Conceptual illustration of QC circle structure

Figure 4.6c Typical times for holding meetings (page 25)

Support employee self-management

8. When employees, acting in groups, show that they are capable of managing a lot of daily jobs themselves, and on their own initiative, transfer authority for these jobs to them. Such jobs may then be described as self-managed. Self-management through such groups as QC circles will improve the quality of work, and at the same time will leave you free to concentrate on more important jobs. You should of course maintain a keen interest in how the groups are doing.

Figure 4.6d QC circle levels

Figure 4.6e Organizational chart

(See Unit 10 for more detailed guidelines on QC circles.)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parags. 1, 2 and 3. What experience, if any, do you have of QC circles? Or of other small group activities aimed at solving problems and introducing improvements? If you do, how helpful do you find them? If you have not yet had any such experience, what do you imagine it would be like: what benefits could such activities bring and what challenges would they raise? What demands would they make of you as a manager?
- b. Figure 4.6a presents sample themes for QC circle activities. Could any of these be useful themes for groups in your company to adopt? Identify any other themes that would be useful for your department to adopt. Make your own list of ten priority themes from this list and/or your company list.
- c. Parags 4, 5 and 6 and 7 present sets of guidelines for how you, as the manager of a department, can make the most of QC circle activities. Apply the RADAR questions to these.
- d. Parag. 8: How do you feel about encouraging your employees to manage some of their own work?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

Figure 4.6a Sample QC circle themes

	Theme	Details
1	Quality	Reduce the number of rejected products, improve product quality, minimize complaints, reduce problems, seek consistent quality, work toward fool-proofing the manufacturing process, and improve operations.
2	Service	Seek improved customer satisfaction (in the following production process as well) and reduce the number of complaints.
3	Mistakes	Prevent careless mistakes, errors in inspections, and the dissemination of incorrect information.
4	Control	Make standardization efforts, follow work standards (manuals), perform systematic troubleshooting, list control items, prevent the recurrence of problems, and carry out thorough control.
5	Cost	Reduce costs, put time to effective and efficient use, conserve materials, reduce man-hours, reduce work in progress and inventory, improve yield, reduce the necessary amount of materials per product unit, and increase profit.
6	Efficiency	Increase turnout and sales, use time efficiently, improve the timing of processes, reduce delivery time, streamline processes, improve operating procedures and the plant layout, minimize downtime, mechanize processes, and use more jigs and tools.
7	Machines equipment	Prevent malfunctions, introduce automation, improve jigs and tools, and improve the plant layout, automate the office (OA) and plant (FA), and reduce labor requirements.
8	Safety and environment	Reduce overworking, tidy up the workplace and keep it clean, create a better work environment, improve sanitation, prevent accidents, help improve the image of factory work, and prevent environmental pollution.
9	Morale	Improve relationships with colleagues: raise morale, hold discussions with colleagues, superiors, and those from other departments, encourage suggestions, improve the attendance rate, and enhance communication.
10	Management of QC circles	Select an appropriate QC theme, plan better arrangement of each circle, and improve the way in which meetings are organized (encourage all employees to join in and consider the ratio of men to women, the age makeup of circle membership, and the shift system), enhance communication, organize gatherings and presentations, and tackle problems involving part-time and temporary employees.
		Improve the means of organising meetings, gain a full understanding of the general concepts of QC and QC techniques, and devise a means of developing special and own skills, enhancing communication, inspiring leadership in members, improving relationship with others, and developing the skills of individuals.
11	Other	Define the role of the QC circle, gain a full understanding of immediate problems, the status quo, and the relationship between the ideas of circle members and the policies of superiors, and discuss problems involving taking leave.

Figure 4.6c Typical times for holding meetings

Time	%
During work	32.0
During break	12.1
Downtime	6.3
Morning or evening gatherings	5.7
Beginning or end of shift	1.6
Others	1.7
<i>Within working hours</i>	59.4
After work	31.4
Before work	4.3
Holiday	3.6
Others	1.3
<i>Outside working hours</i>	40.6

Test

Answer these questions using **only** the information given in the text. For each question one, two or all three answers may be correct. Tick the answer or answers you think are correct for each question. Each question carries 3 points – you get one point for each correct answer that you tick, and one point for each wrong answer that you do not tick.

4.1 Ensure that your employees understand and follow the standards

1. To ensure that the production process runs efficiently managers must:
 - a. Encourage employees to be more creative in their work.
 - b. Ensure that they understand the work standards.
 - c. Ensure that they follow the standards and rules.
2. To encourage employees to follow the standards managers should:
 - a. Make the employee's responsibilities clear to both the employee and his or her supervisor.
 - b. Create an atmosphere in which everyone feels they must follow the standards and rules.
 - c. Make each employee's responsibilities clear to all his or her colleagues.
3. Work standards are important because:
 - a. They show which employees are inefficient.
 - b. They improve work efficiency.
 - c. They provide a basis for further improvement.

4.2 Raise your employees' technical skills levels

4. Employee skills need to be improved:
 - a. To achieve improvements in quality.
 - b. To fill the workplace.
 - c. Because of advances in technology.
5. To educate and train your employees systematically in the skills they need for their jobs:
 - a. Review the jobs in the department and the levels of knowledge and skills needed to perform them.
 - b. Plan and implement education and training for individual employees.
 - c. Develop plans for each employee to acquire essential national qualifications.
6. Managers should encourage their employees to improve their own skills by:
 - a. Fine tuning their machines.
 - b. Fine tuning their work techniques.
 - c. Dressing better.
7. A department can raise its overall levels of skills by:
 - a. Exchanging information and ideas with other departments.
 - b. Sending employees to learn skills with companies that are technically more advanced.
 - c. Exchanging managers with other companies.

4.3 Delegate authority

8. The text suggests that:
 - a. The less you have to manage the better you will manage.
 - b. The more you have to manage the better you will manage.
 - c. The more of you there are to manage the better you will manage.
9. When delegating authority a manager must:
 - a. Instruct the person to whom he is delegating to define his policy in the area that is being delegated.
 - b. Make sure that standards are established for the duties he is delegating.
 - c. Make sure standards are established for dealing with abnormalities.
10. A manager is ... responsible for whatever his delegated subordinate does:
 - a. Always.
 - b. Sometimes.
 - c. Never.

4.4 Motivate your employees

11. What impact can the attitude of employees have on the success of the company?
 - a. A major impact.
 - b. A minor impact.
 - c. Little or no impact.
12. A manager may find indications of the attitude of employees in:
 - a. The way they dress.
 - b. Their absenteeism.
 - c. The way they interact with visitors.
13. Poor attendance and punctuality present the manager with two challenges:
 - a. To ensure that production is not disrupted.
 - b. To encourage employees to interact better with each other.
 - c. To improve employee attitudes.
14. The attendance rate is the ratio of employees at work to:
 - a. The number absent.
 - b. The number needed.
 - c. The number on requested leave.
15. When confronted with poor punctuality a manager should:
 - a. Threaten to dismiss any employees who are often unpunctual.
 - b. Educate employees on the effects that poor punctuality can have on production.
 - c. Analyze the reasons for employees arriving late and take appropriate action.
16. To motivate your employees to work to the best of their abilities:
 - a. Make sure that they understand the importance of what they are doing.
 - b. Carefully observe what they are doing and help them do it better.
 - c. Never give them jobs above their ability level.
17. To motivate your employees you can:
 - a. Arrange opportunities for employees to talk to managers and supervisors.
 - b. Try to create an atmosphere where employees feel free to discuss problems with their superior.
 - c. Implement all the suggestions for improvement that employees make.

18. Encourage employees to discover and solve problems in their work managers should:
 - a. Set up a system to evaluate employee ideas.
 - b. Organize courses in creativity.
 - c. Hold competitions for good ideas.
19. Employee attitude can be improved by ensuring that there is an even distribution of employees of:
 - a. Different ages and sex.
 - b. Different ages and years service.
 - c. Different years service and sex.

4.5 Involve your employees in making improvements: set up a suggestion scheme

20. To get useful suggestions from employees:
 - a. Ensure that employees understand that the purpose of an improvement suggestion system is to reduce costs.
 - b. Distribute simple suggestion forms to each section.
 - c. Show a real interest in receiving suggestions.
21. To encourage employees to make suggestions for improvement:
 - a. Take plenty of time to evaluate suggestions.
 - b. Set concrete goals for suggestions in each workplace.
 - c. Create an atmosphere in which members are willing to make suggestions.
22. Suggestions that have been adopted may take time to implement because:
 - a. They require changes in equipment.
 - b. They may involve other departments.
 - c. They need the manager's approval.
23. When suggestions have been implemented and their positive effects confirmed:
 - a. Standardize them.
 - b. Display them in graphic form on notice boards.
 - c. Integrate them into the new control procedure.
24. Once the suggestions have been implemented and their positive effects confirmed, managers and supervisors should:
 - a. Put them through a process of rechecking.
 - b. Standardize them.
 - c. Integrate them into the control system.
25. Most suggestions for improvements will usually come from:
 - a. Individuals.
 - b. Groups.
 - c. QC circles.

4.6 Involve your employees in making improvements: support QC circle activities

26. The first three steps of the problem solving procedure include:
 - a. Select a theme.
 - b. Get a full understanding of the present situation and set targets.
 - c. Work out measures to solve the problem and implement them.
27. QC circles are more likely to emerge where managers:
 - a. Check closely on everything that is going on in their department.
 - b. Are flexible and open.
 - c. Take little interest in what is going on in their department.

28. To support QC circle activities:
 - a. Keep up to date with what the QC circles are doing in your department.
 - b. Visit the workplace at least twice a week to see how the QC circle activities are doing.
 - c. Advise on QC themes when you are requested.
29. For QC circle activities to have a full impact you should:
 - a. Make it clear to members that QC activities have an important function.
 - b. Lead the activities
 - c. Have a good understanding of the activities yourself.
30. The leader of a QC circle should:
 - a. Begin with the most challenging problems.
 - b. Show appreciation of what members are doing.
 - c. Always hold meetings during working hours.
31. To maintain the momentum of QC circle activities:
 - a. Encourage members to keep the same roles and jobs in the QC circle activities.
 - b. Identify and tackle new problems.
 - c. Make sure managers fully understand and support the activities.
32. To make the most of QC techniques:
 - a. Use data to get a full understanding of the facts.
 - b. Train all employees in statistical techniques.
 - c. Use statistical techniques to solve the problems.
33. Managers should transfer authority to groups of employees when:
 - a. They themselves are very busy.
 - b. The employees show that they are capable of managing a lot of daily jobs themselves.
 - c. They have to go on frequent business trips.

Relationship with ISO

4.1 Ensure that your employees understand and follow the standards

Relationship with ISO 9001:2000:

- 6.2.2 Competence, awareness, and training
- 6.3 Infrastructure
- 6.4 Work environment
- 7.5.1 Control of production and service provision

4.2 Raise your employees' technical skills levels

Relationship with ISO 9001:2000:

- 6.2.2 Competence, awareness, and training
- 8.5.1 Continual improvement

4.3 Delegate authority

Relationship with ISO 9001:2000:

- 5.5.1 Responsibility and authority

4.4 Motivate your employees

Relationship with ISO 9001:2000:

- 6.2.2 Competence, awareness, and training
- 6.2 Work environment
- 8.5.1 Continual improvement

4.5 Involve your employees in making improvements: set up a suggestion scheme

Relationship with ISO 9001:2000:

- 5.5.3 Internal communication
- 6.2.2 Competence, awareness, and training
- 8.5.1 Continual improvement

4.6 Involve your employees in making improvements: support QC circle activities

Relationship with ISO 9001:2000:

- 5.5.3 Internal communication
- 6.2.2 Competence, awareness, and training
- 8.5.1 Continual improvement

Unit 5

Disposal and Storage



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Relationship with ISO 36

Unit summary

A workplace that is neat and well organised is always more efficient. It is also more pleasant to work in. The texts in this unit present a number of actions you can take to achieve this.

5.1 Remove unnecessary items from the workplace

Workplaces often have a lot of things lying around that are not needed. There are two categories of unnecessary items:

- a. Those that will never be needed again.
- b. Those that will be needed again at some time in the future.

Dispose of those that will never be needed, and store those that will be needed. This will save space, allow ease of movement for employees and equipment, make operations more efficient, help prevent accidents, and create a more comfortable working environment.

5.2. Remove defective goods from the workplace

If defective items are left in the workplace they can cause a lot of problems. Not only do they take up space, but they can easily get mixed up with non-defective items, making it difficult to maintain accurate stock levels. And of course there is always the risk that defective goods will be shipped out to customers.

5.3. Set up a storage system

A lot of time can be wasted when employees have to search for things they need. An efficient storage system will have everything well arranged, with signs to indicate where different items are stored. Use a first-in, first-out system to ensure that older items do not remain in storage while newer items are taken out and used.

5.4. Set up a good inventory system

A good inventory system is essential if a workplace is to run smoothly and efficiently. The inventory is the quantity of products, parts, WIP (work in progress), indirect materials, packing materials etc. that are kept in stock. Maintaining the right level of inventory means that whatever is needed for the production process is there when it is needed – but not too much, since this would be uneconomical.

5.5. Mark passageways

It is important to mark passageways in the workplace, both for use by employees and for moving goods. Clearly marked passageways will:

- a. Ensure the safety of employees when they are moving about.
- b. Allow a smooth flow of goods and equipment in the workplace.

5.6. Pack and move goods carefully

Pack and move finished products and WIP carefully in order:

- a. Not to damage goods.
- b. Not to include items that are not meant to be included.
- c. Not to risk any danger to the employees handling them.

5.7 Encourage everyone to follow the rules

If all the systems for keeping the workplace neat and well organized are to be effective, everyone, both supervisors and employees, must follow the rules. This requires rules that employees can follow, and manuals that describe them clearly.

Learning tools

The RADAR questions

As you read each text you will discuss how it could be applied in your company. The RADAR questions will help you to focus this discussion:

- R** - Are these ideas **relevant** to my company?
- A** - How would I **apply** each of them in my company?
- D** - What **difficulties** might I meet and how would I overcome them?
- A** - Are there any **additional** actions that I might take that are not mentioned in the text?
- R** - What **resources** would be needed, what would these cost, and how could they be acquired?

There will of course be some discussion points where not all of these questions will be applicable.

The 6-Point Structure

After you have discussed the ideas in the text, you write an action plan in which you present practical proposals for implementing the conclusions you have reached in your discussion. The 6-Point Structure will help you to write your action plan:

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts, tables etc. that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these could be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

5.1 Remove all unnecessary items from the workplace

Introduction

1. A workplace that is neat and well organised is always more efficient. It is also more pleasant. Workplaces, however, often have a lot of things lying around that are not needed. There are two categories of unnecessary items:
 - a. Those that will never be needed again.
 - b. Those that will be needed again at some time in the future.Dispose of those that will never be needed (i.e get rid of them), and store those that will be needed. This will save space, allow ease of movement for employees and equipment, make operations more efficient, help prevent accidents, and create a more comfortable working environment.
2. Be systematic in removing unnecessary items from the workplace. Take the following six steps:
 - a. Establish criteria for judging how necessary things are.
 - b. Mark items that will be needed again, and those that will not.
 - c. Put one person in charge of dealing with all these items.
 - d. Set up storage places for items that will be needed again.
 - e. Establish procedures for disposing of items that will never be needed.
 - f. Keep a record of items that have been disposed of.

Establish criteria for judging how necessary things are

3. Establish criteria for judging how necessary things are otherwise individuals or departments will make their own judgment based only on their own situation or feelings.
4. Unnecessary items can be found in a lot of different categories:
 - a. Finished or semi-finished products, dead inventory, prototypes, product accessories, components. (Dead inventory are items that have not been sold or used beyond their maximum allowed storage or sales time.)
 - b. Raw materials and indirect materials made obsolete by changes in design.
 - c. Jigs and tools.
5. Items may become unnecessary when:
 - a. Machinery or equipment is replaced.
 - b. Production methods are changed.
 - c. Product specifications are changed.
 - d. The customer requests design changes.
 - e. An item reaches its expiry date, or its post-use stage.

Figure 5.1a Sample table of criteria, based on frequency of usage

Frequency of use	Degree of necessity	Storage location
Seldom	Use less than once a year, no future plans.	Dispose of it.
Occasional	Use once every six months.	Store in a storage place outside the factory or building.
Normal	Use once every 1-2 months.	Store inside the factory or building.
Often	Use 1-2 times every week.	Store at a designated location at the job-site.
Very often	Use frequently every day.	Store near workers.

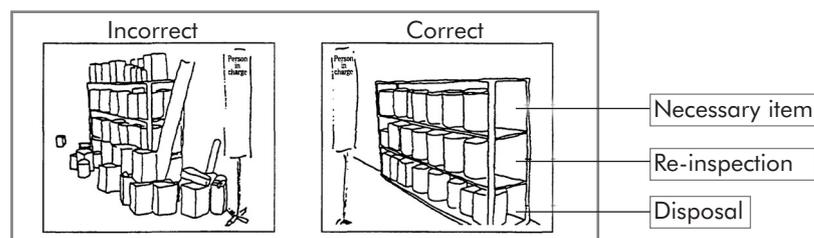
(Source: "Seminar on actual job-site management and improvement – 2 5S" Japanese Standards Association.)

Mark items that will be needed again, and those that will not

6. After you decide whether an item which is unnecessary at present, will be needed again, mark it so that people can see this at a glance. There are different classifications that you can use for marking:
 - a. Mark defects, items to rework, items to re-sort, items to dispose of etc.
 - b. Mark items that are damaged, expired, or no longer used.
 - c. Mark items in batches of a certain number, e.g. batches of 10, 50 or 100.
 - d. Mark items with the name of the section or person that is responsible for them.
 - e. Mark their shelf life or expiry date.

7. There are also various marking systems that you can use:
 - a. By object and colour.
 - b. By attaching labels or plates to them.
 - c. By listing them on a notice board.
 - d. By roping off storage areas.
 - e. By storing them in a certain place.

Figure 5.1b

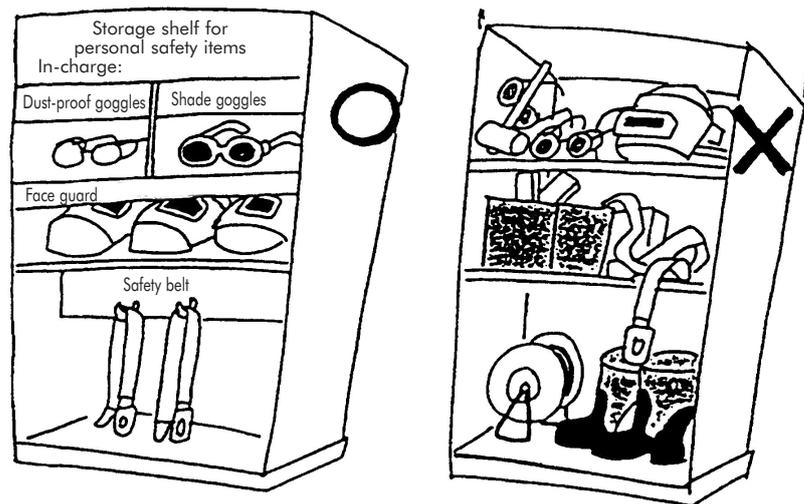


(Source: "Seminar on actual job-site management and improvement – 2 5S" Japanese Standards Association, p. 37.)

Put one person in charge of dealing with unnecessary items

8. It is best to put one person in charge of removing items that are not needed, and for making sure that everyone follows the procedures. His/her name should be put up clearly in the storage areas. This person should decide:
 - a. Which items are not needed.
 - b. Which items to store.
 - c. Which items to dispose of.
 - d. How to classify them into groups by components and sizes.
 - e. Which items should go in which storage places.

Figure 5.1c



(Source: "The 45's at Your Workplace", Tako Kato, Japan Industrial Safety and Health Association, p. 98.)

Set up storage places for items that will be needed in the future

9. Store items that will be needed in the future separately from finished goods, WIP (work in progress), and prototypes. These will come in two main storage categories:
 - a. Items held on a company-wide basis. These may be located inside or outside the building. e.g. machinery that is not needed for the present because of a change in layout, large jigs, empty cans etc.
 - b. Items held by different departments, divisions, sections, sub-sections, teams. e.g. prototypes, defective goods, jigs and tools, parts, and indirect materials.

Establish procedures for disposing of items that will not be needed again

10. To establish procedures for disposing of items that will not be needed again:
 - a. Classify such items according to type and characteristic as in paragraph 4. above.
 - b. Request approval for their disposal from the departments concerned.
 - c. Confirm the procedures and criteria for disposing of these items.
 - d. Disable semi-processed goods or finished components before disposing of them so that they will not be reused by a third party.
 - e. Keep a record of the items disposed of.

Keep a record of items that have been disposed of

11. A record of items that have been disposed of will ensure that assets are controlled correctly. Although an item may no longer be needed, it must be dealt with properly as a company asset, following the normal accounting procedures.
 - a. Decide what to keep records of:
 - i. Machinery and equipment: sale, transferral to an outside company or to other departments, or disposal.
 - ii. Raw materials, inventory, WIP, packing materials, and components: transferral or disposal.
 - b. Decide on the format of an Asset Disposal Request Form:
 - i. For machinery and equipment.
 - ii. For raw materials, inventory, WIP (work in progress), packing materials, and components.
 - c. Carry out disposal in accordance with the request form as follows:
 - i. The department making the request fills in the form.
 - ii. It gets the approval of related departments.
 - iii. It carries out the procedure in accordance with the contents of the form.

Figure 5.1d Asset Disposal Request Form (page 11)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of these ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

Introduction

- a. Is your workplace neat and tidy? If not, why not? What steps could be taken to get it well organized?
- b. What items do you have in your workplace that are unnecessary at present, but could be needed again sometime in the future? What problems, if any, do they cause?
- c. Parag. 1 suggests several benefits of having storage places for unnecessary items. How many of these benefits would you experience if you stored unnecessary items away from the workplace?

Establish criteria for judging how necessary things are

- d. Parag. 3. What can happen if there are no guidelines for judging if things will be needed again? Could this happen in your workplace? Would it be a problem if it did?
- e. Look at the table of criteria. Apply these to some items in your workplace.
- f. How useful would this table be for you? Would you modify it in any way?

- g. Parag. 4: How many of these categories could contain items not needed at present in your company? Are there any other categories that you would add?
- h. Parag. 5 gives five situations where items could become unnecessary. Which of these situations could arise in your workplace? What other similar situations could arise for you? When might these items in your workplace become necessary again?

Mark items that will be needed again and those that will not

- i. Parag. 6: Five marking classifications are suggested. How many of these would be appropriate for your workplace? What others would you add?
- j. Parag. 7: Five ways are suggested for marking items. Which of these would be most appropriate for different items in your workplace?

Put one person in charge of dealing with unnecessary items

- k. Parag. 8: It is suggested that the person responsible for dealing with unnecessary items should make five main decisions. Apply the RADAR questions to these.

Set up storage places for items that will be needed in the future

- l. Parag. 9: Give some examples of unnecessary items in your workplace that should be stored on a) a company-wide basis, and b) by department, section etc.

Establish procedures for disposing of items that will not be needed again

- m. What do you do with items in your workplace that you will seldom if ever use again? What problems do you have in disposing of such items? How do you solve these problems?
- n. Parag. 10: There are five steps in the procedure for disposing of items that will not be needed again. Apply the RADAR questions to these.
- o. Give an example of how each of your own list of steps could be applied to some items in your workplace that you would want to dispose of.

Keep a record of items that have been disposed of

- p. Do you keep a record of items that have been disposed of? If so, what are the benefits of doing this? If not, what problems do think you may have as a result of not doing so?
- q. Parag. 11: Three main steps are recommended for disposing of these items. Apply the RADAR questions to these.
- r. An example of an Asset Disposal Request Form is given in Figure 5.1d (page 11). Could this be used in your company? If so, what changes would you make to it?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

Figure 5.1d Asset Disposal Request Form

Asset Disposal Request Form

Year/Month/Day _____

Factory Manager	Factory Assistant Manager	Manager	Production Engineering		Requesting Department		
			Manager	Asset Supervisor	Manager	Supervisor	Asset Supervisor

Unit: Yen/Revised on Nov. 1, '94

	Type	Asset ID Number Serial Number	Name (type)	Acquisition	Acquisition Value	Book Value		Building
Main Unit	F	M		-				
Accessories				-				
				-				
				-				
				-				
				-				
				-				
				-				
				-				
Reason for Disposal	<p>1. What do you want to do with the asset? Discard Transfer Sell other ()</p> <p>2. Reason for Disposal (explain in detail the reasons for disposal)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>3. Used in (area) of (location) _____</p> <p>4. Current Location: _____ Transfer Destination: _____</p> <p>5. Production Disposition: _____</p>							
Plan for Use	Yes If yes No							
Wear and Tear	A: Accuracy is fine and can be used as is B: Simple replacement of equipment or components will render usable C: Total overhaul will render usable D: Unusable							

Fixed Asset HP31 176.4 Control

5.2 Remove defective goods from the workplace

Introduction

1. If defective items are left in the workplace they can cause a lot of problems. Not only do they take up space, but they can easily get mixed up with non-defective goods. This makes it difficult to maintain the right stock levels. And of course there is always the risk that defective products will be shipped out to customers. Take the following three steps to deal with defective goods:
 - a. Establish standards that specify the quality features of goods, so that defective goods can be easily identified.
 - b. Set up a system for removing defective goods from the workplace.
 - c. Establish procedures for dealing with any abnormalities that emerge.

Establish standards that specify the quality features that should be examined for defects

2. Everyone should know which features of an item to examine for defects. These are known as the quality features. Establish clear standards that specify the quality features to be examined in finished products, WIP, indirect materials, jigs and tools - everything, in fact, in the production process from raw materials to finished products. Examples of quality features are:
 - a. The material and its composition.
 - b. Size, shape and accuracy.
 - c. Appearance – are there any deformations, eg. dents, rust etc.
3. The standards should also specify the signs to be used to indicate any defects that are found, for example:
 - a. Standing signboard.
 - b. Hanging signboard.
 - c. Display plate, article plate.
 - d. Coloured tape.
 - e. Label attached to box or article.
 - f. Paper type, size, colour.

Figure 5.2a Immediate notice of occurrence of abnormality (page 15)

Set up a system for removing defective goods from the workplace

4. This should include the following steps:
 - a. Mark defective goods in red, either with a red “defective product” plate, with a red colour, or by attaching red tape etc.
 - b. Provide a box or location for goods to be disposed of, either by product or by component.

- c. Mark the box or location in red letters, or paint it red.
- d. Separate or dispose of defective goods as soon as they are identified.

Establish procedures for dealing with abnormalities

6. As well as dealing with defective goods, you also need to have a system for dealing with abnormalities. An abnormality is any item or event in the production process that is different from what it should be. Not all abnormalities are defects, but mostly they are, and they must always be seen as indicating that something may be wrong. It is essential to establish procedures to identify and deal with any abnormalities that may occur. You will find a full description of dealing with abnormalities in Unit 9. For the moment, here are some brief guidelines.

7. Set up the following procedures, so that any abnormalities can be dealt with when they emerge:
 - a. A procedure for identifying an abnormal product.
 - b. A procedure for checking the quality of an abnormal product: the quality features that should be examined, such as shape, size, accuracy, and appearance.
 - c. A procedure for reporting abnormalities: the steps to be taken by the employee who sees and reports the abnormality, and the steps to be taken by the superior who receives the abnormality report.
 - d. Procedures for:
 - i. Checking the machine or production process where the abnormality occurred, and verifying product quality.
 - ii. Checking, when necessary, the production processes immediately before and after the process in which the abnormality occurred.
 - iii. Checking initial production after the manufacturing process has started again.
 - e. A procedure for restarting operations again, and returning to the normal production process:
 - i. The instruction that is to be given to return to normal production.
 - ii. The method of informing the production processes before and after: hanging plate, call buzzer, patrol light, or verbal communication.
 - iii. The method of verifying that operating status and quality are now OK.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1. Do you often have defective finished goods in your workplace? Give some examples. How do you distinguish them from non-defective goods? Do they cause any problems with keeping accurate stock levels? Do you ever ship defective products?

- b. Parag. 2: The text suggests some types of quality features that could be examined for defects and marked. Which of these would apply in your workplace? Give some examples. Are there any other quality features that you would add to the list?
- c. Parag. 3: Several kinds of display material are suggested. Which of these would be useful in your workplace? For which objects? Which other types of display might you add to the list?
- d. Look at the sample form in Figure 5.2a for reporting the occurrence of a defect. Would this be useful in your company. How would you fill it in for a typical defective item? Would you follow a similar reporting route?
- e. Parag. 4. Apply the RADAR questions to this system for removing defective items from the workplace.
- f. Parags. 5 and 6: Five procedures are suggested for dealing with abnormalities. Apply the RADAR questions to these. (This may be a long discussion!)

Action plan

Draw up a detailed and concrete action plan for removing defective items from your work place. (If you feel it useful, also include suggestions for dealing with abnormalities).

Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

Figure 5.2a Immediate notice of occurrence of abnormality

Responsible Department	Immediate Notice of Occurrence of Abnormality (II)				No.
Abnormality Level (X,Y,Z, etc.)	Defect Category				
	Number			Mark	
	Department when directory was made			Quantity of Defective items	
	Discovery Date	Month/Date/Time		Number Inspected	
	Individual who discovered			Lot Size	
		(Assumed) Defect Rate	%		
<p>In what state was the defect? How was the defect discovered?</p> <p>1. What kind of defect occurred in what quantity? Standard</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>2. At what point in the production process (at what location and position)?</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>3. How was the discovery made?</p> <p>.....</p> <p>.....</p>					
Responsible Department				Strategy Report	Yes/No
Treatment of the actual item	Temporary treatment				
				
Routed	Discovered	QC		Responsible	
				Supervisor	Manager

Note: The form is red and is prepared in quadruplicate, attached to the article, and routed in the following order.

- i. Department where the defect was identified
- ii. Department where the defect occurred (item marked)
- iii. QC Quality Assurance Department
- iv. Production Planning Department

5.3 Set up a storage system

Introduction

1. A lot of time can be wasted when employees have to search for things. An efficient storage system will have everything well arranged, with signs to indicate where different items are stored. Use a first-in, first-out system to ensure that older items do not remain in storage while newer items are taken out and used. Take the following steps:
 - a. Establish criteria for deciding how different items will be stored.
 - b. Establish rules and procedures for arranging and managing items in storage.
 - c. Use a first-in, first-out system.

Establish criteria for deciding how different items will be stored

2. Establish criteria that will make it easy to decide how inventories, WIP (work in progress) and defective products are to be stored. These criteria should specify:
 - a. Which items are to be stored.
 - b. How many are to be stored.
 - c. How they are to be stored.
 - d. Where they are to be stored.
 - e. How long they are to be stored.
 - f. How quality is to be maintained during storage.
 - g. Who is to be in charge of storage.
 - h. When inventories are to be taken (i.e. checks of inventory contents).

Establish rules and procedures for arranging and managing items in storage

3. People who are completely unfamiliar with the storage system should be able to find what they want right away. Prepare a manual with the rules, procedures and standards for arranging and managing the different items in storage. This manual should specify:
 - a. How to neatly arrange storage space.
 - b. The different storage areas for:
 - i. Components, jigs, tools, WIP etc.: designate a location and position within the actual workplace.
 - ii. Finished products: designate a location and position according to shipment lot or destination.
 - c. The different storage methods: container type, by lot etc.
 - d. Which marking method to use, for example:
 - i. Signs (standing or hanging).
 - ii. Letters.
 - iii. Separating with lines, ropes etc.
 - iv. Designated shelves.
 - e. That the name and number of items that are needed frequently, such as jigs, be displayed especially clearly.
 - f. That storage areas can be easily controlled by address and shelf number.
 - g. That the storage system uses a first-in, first-out method (FIFO).
 - h. How to dispose of unnecessary and defective items.

Note: Try to get those who are doing the actual work to participate in writing up the standards and manuals.

Use a first-in, first-out system (FIFO)

4. It is especially important to organize storage so that items that were produced or purchased first are used first. This is the first-in, first-out system (FIFO). This will:
 - a. Prevent items being stored until they are too old.
 - b. Ensure that items are stored in their proper lots and are easily traceable.
5. To set up an FIFO system:
 - a. Put someone in charge.
 - b. Establish a procedure to ensure that items entered into storage first are also the first to leave.
 - c. Clearly mark items with their serial number, part number, production date, quantity, and date of entry into storage.
 - d. Make clear the order in which items have arrived. You can, for example, classify goods by putting them in boxes according to the order received.
 - e. Clearly mark their storage location and position.
 - f. Establish a separate entrance and exit for raw materials.
 - g. Place heavy goods, such as steel plates, in rows rather than stacking them.
 - h. When storing important components, number each component sequentially and use them in order.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 2 presents criteria for storing items. How would you apply these criteria in your workplace. Be as specific as possible.
- b. Parag. 3: Is your storage system easily accessible to people who are unfamiliar with it? Where do you think there is room for improvement?
- c. Parag 3 presents a number of rules and procedures for storing goods. Apply the RADAR questions to these.
- d. Do you already have a first-in, first-out storage system? If not, do you have any problems with items being stored until they are too old?
- e. Parag. 5 gives several suggestions for setting up an FIFO system. How would you apply these in your workplace?

Action plan

Go over the notes of your discussion. Then draw up a detailed and concrete action plan for improving the storage system in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

5.4 Set up a good inventory system

Introduction

1. A good inventory system is essential if a workplace is to run smoothly and efficiently. The inventory is the quantity of products, parts, WIP, indirect materials, packing materials etc. that are kept in stock. Maintaining the right level of inventory means that whatever is needed for the production process is there when it is needed – but not too much, since this would be uneconomical.

(Text 13.5 in Unit 13 Production Control provides more specific guidelines on maintaining a product inventory, components and raw materials inventories, and a WIP (work-in-process) inventory.)

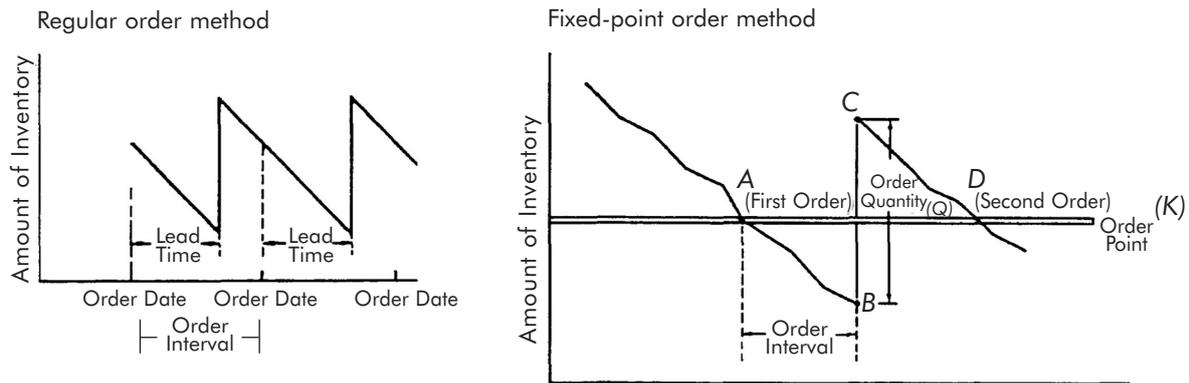
2. To set up a good inventory system take the following steps:
 - a. Decide on appropriate inventory levels, and set up procedures to maintain these levels.
 - b. Carry out regular reviews that these inventory levels continue to be appropriate.
 - c. Carry out periodic inventories (i.e. checks of what is in the inventory – note this slightly different meaning of the word inventory) and keep records.
 - d. Set up an efficient storage system for the inventory.
 - e. Ensure that inventory levels can be seen at a glance.
 - f. Establish a system for moving items into and out of the inventory.

Decide on appropriate inventory levels and set up procedures to maintain them

3. To decide on and maintain appropriate inventory levels:
 - a. Keep a note of when items will be required by departments, customers, internal process points, etc.
 - b. Be aware of changes in use: daily, seasonal, or by product.
 - c. When you place an order, check the delivery date.
 - d. Keep a note of when incoming items are expected.
 - e. Check the possibility of receiving alternative items if the required items are not available.
 - f. Establish standards specifying the right levels.
 - g. Decide on a method to order refills or replacements, either the regular ordering method or the fixed-point ordering method.
 - h. Appoint a person to supervise the inventory.

(Fixed-point ordering method: if the inventory falls to a pre-determined level, then a purchase order for a fixed amount will be placed. Regular ordering method: goods are ordered regularly at set times.)

Figure 5.4a Regular and fixed point ordering methods



Source: "Introduction to Inventory Control", Yukio Mizuno, The Union of Japanese Scientists and Engineers (JUSE) Press, 1983, pp. 7, 49.

Carry out regular reviews that these inventory levels are still appropriate

4. Production conditions and customer requirements are always changing, and the inventory levels may also need to be changed too, so you should review them regularly. To do this, take the following steps:
 - a. Put two people in charge:
 - i. A person to be in charge of inventory review: this person will observe changes in market demand.
 - ii. A person to be in charge of inventory control: this person will control what is actually in the physical inventory.
 - b. Decide the timing of the review. This may be:
 - i. When a production lot is completed.
 - ii. When a shipping plan is decided on.
 - c. Review the criteria used to calculate maximum and minimum inventory levels.
 - d. Give special attention to reviewing costly inventory levels.
 - e. Respond immediately to changes in demand.
 - f. Remind the departments of the importance of maintaining appropriate inventory levels, and keep them informed of factors that have an impact on the inventory levels.

Carry out periodic inventories and keep records

5. There may sometimes be discrepancies between the quantity of goods actually held in the inventory, and what is shown in the accounting records. Carry out periodic inventories (checks of the inventory) to find any such discrepancies.
6. Periodic inventories should be taken at the following intervals:
 - a. Machinery and equipment, and accessories for equipment: about once a year, using the asset control ledger.
 - b. Finished products, WIP, and product accessories: once or twice every fiscal year, using the production control ledger.

c. Products or components: monthly or according to a regular cycle, using the production control ledger.

In addition to the periodic inventories, take an inventory of machinery and equipment any time something is replaced, or something new is installed, and keep a record of this.

7. Before carrying out these periodic inventories decide on the following:
 - a. Which items to include:
 - i. Machinery and equipment.
 - ii. Finished products, WIP, and product parts.
 - iii. Components.
 - iv. Indirect materials, jigs and tools.
 - b. The inventory documentation for each item:
 - i. Ledger (or control list).
 - ii. Inventory control tags.
8. The periodic inventory should include the following actions:
 - a. Conduct the inventory according to the "5W 1H" principles (Who does what, where, when, why and how).
 - b. A specialist with technical knowledge takes the inventory at the job site using the asset control ledger.
 - c. If a discrepancy is discovered, contact related departments immediately and direct them to take appropriate action.
 - d. Be creative. For example, use shelf identification tags and labels, and use different colours to separate items.
9. Set up a system for keeping records of the periodic inventories. These records should include inventory control tags which can be used to track (by type, name, number, or component type) any discrepancy between the quantity in the ledgers and the quantity actually found in the inventory.

Figure 5.4b WIP tracking tag (page 24)

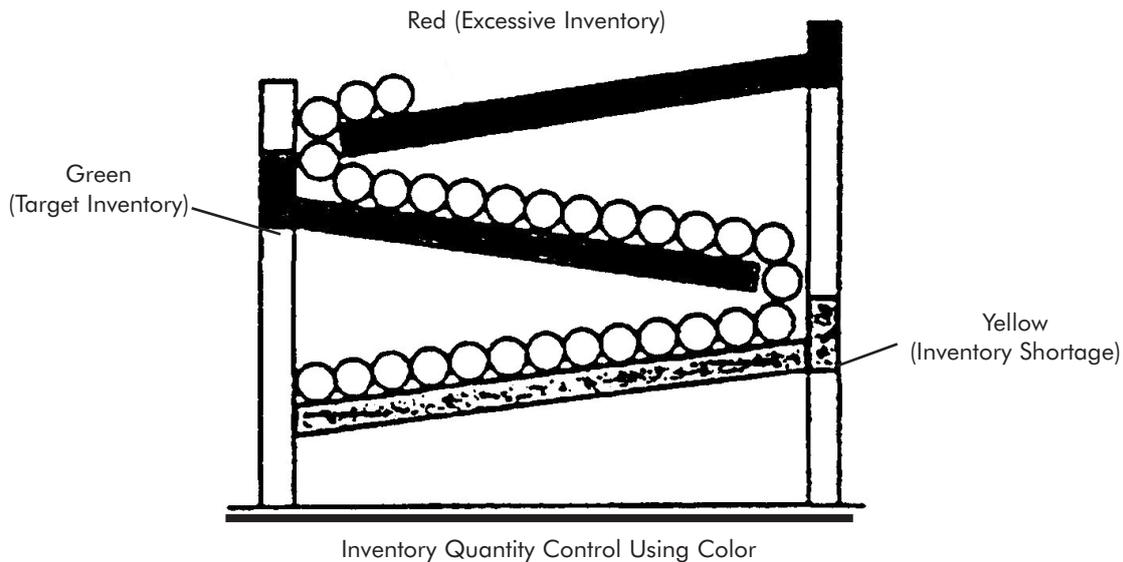
Set up an efficient storage system for the inventory

10. An efficient storage system will allow easy inventory control as well as prevent unnecessary items being stored in the workplace. Decide on:
 - a. Different storage areas for different types of item.
 - b. The maximum and minimum quantities of each item to be stored.
 - c. The conditions in which items are stored.
 - d. The format of documents: incoming and outgoing invoices, and shelf tags (by item, lot, etc.)
 - e. A different person to be responsible for each storage section

(See Text 5.3 for more detailed guidelines on storage.)

Figure 5.4c Criteria for storing and maintaining materials

Figure 5.4d Inventory quantity control using color



(Source: "Absolutes in Quality Control for the Manager", Kazuo Ozeki, Japanese Standards Association, p.53, 1987.)

Ensure that inventory levels can be seen at a glance

11. To make sure that shortages and excesses do not occur, display information about the inventory in such a way that people can recognise the inventory levels at a glance. To establish such a system:
 - a. Decide which items in the inventory are to be managed in this way, and the quantities.
 - b. Decide what inventory data should be displayed so that people can quickly see:
 - i. The standard amount, and the minimum and maximum amounts.
 - ii. The amount used and the balance remaining.
 - iii. The refill orders that have been sent off, and the date of the incoming delivery.
 - c. Decide on the method for displaying this data:
 - i. PC screen.
 - ii. Signs, standing plates, tags on articles.
 - iii. Using different colours.
 - d. Develop and standardize detailed measures for setting up and running the system.

Establish a system to control the movement of items into and out of the inventory

12. The workplace can easily become crowded if items are supplied before they are needed. Establish procedures for making sure that the right amount of items go to the right place at the right time. This includes materials, components, WIP, accessories, packing materials, etc. Decide on:

- a. The method for bringing items into the inventory: it is best to use a continuous supply method based on the production plan.
- b. The point at which items are to be brought into the inventory.
- c. The method by which the next production process comes to collect items.
- d. The method for submitting requests for items from the inventory: in person or sending an invoice.
- e. The times when items will be supplied to the workplace and the amount for one shift or one day, plus standards that specify both the times and the amount.
- f. Standards for the supply of packaging and indirect materials based on the standardized inventory.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

Introduction

- a. Parag. 1: Does your workplace often run short of things that are needed for the production process, or does it sometimes have too much in stock? If so, what problems does this cause, and what steps could be taken to improve the situation?

Decide on appropriate inventory levels, and set up procedures to maintain them

- b. Parag. 3: Apply the RADAR questions to these guidelines for deciding on inventory levels, and maintaining them.

Carry out regular reviews that these inventory levels are still appropriate

- c. Parag. 4: Do your production conditions and customer requirements often change? What inventory problems does this cause for you?
- d. Parag. 4 presents guidelines for reviewing inventory levels. Apply the RADAR questions to these.

Carry out periodic inventories and keep records

- e. Parag. 5: If you already carry out periodic inventories, how often do you carry them out? What do you include in them? How do you carry them out?
- f. Parag. 5: Are there often discrepancies in your company between the goods in inventory, and those shown in the accounts? If so, how do you know and what do you do about it?
- g. Parag 6 suggests certain intervals for taking periodic inventories. Would these be suitable for your company? If not, what intervals would you suggest?
- h. Parag. 6: Do you agree that it is a good idea to take an inventory of machinery and equipment whenever something is installed or replaced? Why?

- i. Parag 7: Which items would you include in your periodic inventories, and what documentation would you use?
- j. Parag. 8: Read these guidelines, and then decide how you would carry out a periodic inventory in your company.
- k. Parag. 9. What kind of system would you set up to keep records of periodic inventories? Could the sample WIP Tracking Tag in Figure 5.4b be used or adapted by your company?

Set up an efficient storage system for the inventory

- l. Parag. 10: Five decision points are presented for setting up a system for storing the inventory. Apply the RADAR questions to these.
- m. Look at the example in Figure 5.4c of criteria for storing and maintaining materials. It includes steps to be taken for receiving and storing goods. Make out a similar document for some typical goods that you receive.

Ensure that inventory levels can be seen at a glance

- n. Parag. 11: How would you apply these guidelines in your workplace? Give examples. What difficulties might you face, and how would you overcome them?

Establish a system to control the movement of items into and out of the inventory

- o. Parag. 12: Are items often supplied before they are needed in your workplace? If so, what problems does this cause? How do you deal with them?
- p. The example in Figure 5.4d shows an inventory quantity control system using colour. Could this be used, or adapted for use, in your company?
- q. Parag. 12 suggests a number of decision points for setting up a system to move things into and out of the inventory. Apply the RADAR questions to these.

Action plan

Go over the notes of your discussion. Then draw up a detailed and concrete proposal for improving the inventory system in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

5.5 Mark passageways

1. It is important to mark passageways in the workplace, both for use by employees and for transporting goods. Clearly marked passageways will:
 - a. Ensure the safety of employees when they are moving about.
 - b. Allow a smooth flow of goods and equipment in the workplace.
2. Decide which types of passage you need:
 - a. Passages for employees between machines.
 - b. Passages between work stations.
 - c. Passages for transport vehicles and motorized vehicles.
3. Use the following guidelines to measure passages:
 - a. The passages for employees between machines should be at least 800 mm wide.
 - b. The main passages between workstations should be at least 1500 mm wide. They should allow movement throughout the workplace but avoid dangerous areas, e.g. where machinery or equipment is moving.
 - c. Passages for transport vehicles should be at least 2.5 times the width of the vehicles that use them. There should be no obstacles less than 1.8 meters above the floor of the passageway.
 - d. The lines that mark passages should be 80-100 mm wide.
 - e. The corners of the intersections should be rounded off by at least 600 mm.
4. Mark the passages clearly with white or yellow lines, and paint the surfaces a different colour from the workplace floor, using a non-slip coating. Install mirrors to ensure safety.

Discussion

Apply the RADAR questions to these guidelines for setting up, measuring and marking passageways in the workplace.

Action plan

Draw up a written proposal for improving the passageways in your workplace. Alternatively you may choose to prepare one action plan for when you have discussed several texts. You might like to follow the 6-Point Structure.

5.6 Pack and move goods carefully

1. Finished products and WIP should be packed and moved carefully in order not to damage goods, not to include items that are not meant to be included, and not to risk any danger to the employees handling them. There are three key decisions to make:
 - a. How to pack goods.
 - b. How to move goods.
 - c. How to handle goods.
2. How to pack goods:
 - a. Pack individual items in a bag, or do not pack them at all.
 - b. Use boxes: cardboard box, wooden crate, steel drum, steel-mesh basket, etc.
 - c. Use pallets.
 - d. Indicate the weight of an individual item or package on the cover.
3. How to move goods:
 - a. Automatic conveyor used between machines.
 - b. By hand or using mobile equipment e.g. trolley, pushcart etc.
 - c. Conveyor (belt, roller, etc.)
 - d. Motorized vehicle e.g. motorized truck, forklift, etc.
 - e. Manually by one or two individuals.
 - f. At the most suitable times.
4. How to handle goods:
 - a. Stack goods so as to prevent objects from falling down.
 - b. Limit the height of stacking levels to ensure a clear view.
 - c. Keep to weight limits for items that individuals move alone, so as to avoid back strain and fatigue.
 - d. Safeguard product quality.

Examples of criteria for stacking

5. These stacking criteria specify the stacking height for product boxes and pallets. Their purpose is to protect workers who stack boxes and pallets, and people who work near them, from falling objects. The criteria are based on two key considerations:
 - a. The height should ensure that workers have an unobstructed view even when carrying boxes and pallets or transporting them with a forklift. (Follow the forklift operation rules for each workplace.)
 - b. If pallets are stacked, they should not be stacked at such a height that workers have to work in a high location to check their contents from above.
 - c. "Stacked pallets" refer to the condition below. Although the height may be lower than the height in the above table, try to bundle pallets when they are unstable. When bundling stacked pallets, be sure to bundle pallets one by one.

Figure 5.6a Examples of criteria for stacking

Condition \ Object	When full		When empty	
	Height from the floor	Stacked pallet	Height from the floor	Stacked pallet
Box	1.5 m or less (including the pallet height)	More than 1.5 m and less than 3.0 m (need to be bundled)	1.7 m or less (including the pallet height)	More than 1.7 m but less than 3.4 m (need to be bundled)
Pallet			1.3 m	2.6 m (designated location)



Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- Parag. 1 mentions three things that can go wrong if goods are not properly packed and conveyed. Have any of these problems arisen in your workplace?
- What methods do you use for packing and conveying finished goods and WIP? Where do you feel there is a need for improvement?
- Parag. 2, 3 and 4 present three sets of decision points related to packing and conveying. How would you apply these in your workplace. Include in your discussion the example table of criteria for stacking.
- Parag. 5: How could you improve your system of stacking?

Action plan

Write up a proposal for improving your procedures for packaging, handling and conveying finished goods and WIP. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

5.7 Encourage everyone to follow the rules

1. If all the systems for keeping the workplace neat and well organized are to be effective, everyone, both supervisors and employees, must follow the rules for:
 - a. Organising and arranging items throughout the work process.
 - b. Storing materials and finished products.
 - c. Removing environmental factors that may adversely affect product quality.
2. It is particularly important to educate employees in these rules and to encourage them to follow them, especially when:
 - a. New employees arrive in the workplace.
 - b. New equipment is installed.
 - c. The workplace is disorganised.
3. Employees however cannot be expected to follow the rules if they are impossible to follow or if the manuals are difficult to read. If either of these is the case, everyone should be willing to point this out, and make suggestions for improvement. Managers and supervisors should then act on these suggestions.
4. Here are some examples of rules for frequently used tools:
 - a. The person who takes a tool must hang his nameplate on the peg for that tool.
 - b. When he is finished with the tool he takes his nameplate off the peg, and puts the tool back on.
 - c. At the end of each day, the person in charge of the tools for that week checks the number of tools and their condition.
 - d. When any items are missing, all the members of the group must look for them until they are found.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Do employees in your company follow the rules for keeping the workplace neat and well organized? If not, why not?
- b. Parag. 3: Are some of your rules impossible to follow, or your manuals difficult to read? If yes, what could be done about this?
- c. How useful would the example of rules for tools be in your workplace? Are there any other methods that you already use, or that you could introduce?
- d. Discuss how you might encourage employees to follow the rules better.

Action plan

Prepare a short proposal for encouraging employees to follow the rules. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

Test

Answer these questions using **only** the information given in the text. For each question one, two or all three answers may be correct. Tick the answer or answers you think are correct for each question. Each question carries 3 points – you get one point for each correct answer that you tick, and one point for each wrong answer that you do not tick.

5.1 Remove unnecessary items from the workplace

1. Having a storage space for items that are unnecessary now but may be needed in the future will:
 - a. Allow ease of movement for employees and equipment.
 - b. Create a more healthy working environment.
 - c. Make operations more efficient.
2. Items may become unnecessary when:
 - a. The storage system is changed.
 - b. Product specifications are changed.
 - c. Machinery or equipment is replaced.
3. Items to be marked include:
 - a. Items to replace.
 - b. Items to rework.
 - c. Items to resort.
4. Items may be marked:
 - a. By tying them together with ropes.
 - b. By attaching labels or plates to them.
 - c. By storing them in a certain place.
5. One person should be given responsibility for deciding:
 - a. Which items are not needed.
 - b. How to classify items that are not needed.
 - c. Whether unneeded items should be put in storage or disposed of.
6. There are two main storage categories:
 - a. Items maintained by each department.
 - b. Items maintained on a company-wide basis.
 - c. Items located outside the building.
7. Procedures for disposing of items that have been judged unnecessary include:
 - a. Classify items according to type and characteristic.
 - b. Classify items according to type and cost.
 - c. Make semi-processed goods unusable before disposing of them.
8. To record the disposal of unnecessary items:
 - a. Decide what to keep records of.
 - b. Use the same request form for everything.
 - c. Carry out disposal in accordance with the request form.

5.2 Remove defective goods from the workplace

9. If defective products are put together with non-defective products it can be difficult to maintain:
 - a. Correct cost levels.
 - b. Correct stock levels.
 - c. Supplies.
10. Examples of quality features are:
 - a. The appearance of the item.
 - b. The size of the item.
 - c. The value of the item.
11. Signs used to indicate defects include:
 - a. Standing signboard.
 - b. Rust.
 - c. Coloured tape.
12. A system for removing defective items from the workplace should include:
 - a. Separating or disposing of defective goods as soon as they are identified.
 - b. Marking defective goods in red.
 - c. Providing box or location for goods to be disposed of by product or by component.
13. Abnormalities are:
 - a. Always defects.
 - b. Often defects.
 - c. Seldom defects.
14. The procedure for reporting abnormalities should include the steps to be taken by:
 - a. The employee.
 - b. The superior who receives the abnormality report.
 - c. The person in charge of storage.
15. A procedure for dealing with abnormalities should include checking:
 - a. Production immediately before the occurrence of the abnormality.
 - b. Production immediately after the occurrence of the abnormality.
 - c. Production before the machine is started again.
16. The procedure for restarting operations should include:
 - a. The instruction to be given to return to normal production.
 - b. The method of informing the preceding and following production processes that operations are restarting.
 - c. The method of verifying that all operators are at their places.

5.3 Set up a storage system

17. The criteria for storing items should cover:
 - a. The items to be stored and the storage location.
 - b. The time when items are brought into storage.
 - c. A method for maintaining quality during storage.
18. The storage area for components, jigs, tools, WIP, etc. should be:
 - a. Outside the workplace.
 - b. Inside the workplace.
 - c. In the inventory.

19. Designate a storage area for finished products according to:
 - a. Item type or size.
 - b. Shipment lot or destination.
 - c. Quantity of items.
20. The method of marking storage areas, locations and shelves may include:
 - a. Marking with letters.
 - b. Separating with ropes.
 - c. Using bulletin boards.
21. The storage system should:
 - a. Provide space for defective items.
 - b. Specify container types and lot makeup.
 - c. Allow verification of the first-in, first-out method.
22. To set up a "first-in, first-out" system clearly mark items with their:
 - a. Production date.
 - b. Serial number.
 - c. Shipment date.

5.4 Set up a good inventory system

23. Maintaining the right level of inventory means that:
 - a. Whatever is needed for production is always in stock.
 - b. There are always plenty of extra parts in stock.
 - c. Parts can be ordered when the production process needs them.
24. To decide on standard inventory levels:
 - a. Keep informed of changes in the use of items.
 - b. Keep a note of when incoming items are expected.
 - c. Check the possibility of cancelling the order.
25. Carry out a review of inventory levels:
 - a. When an incoming order arrives.
 - b. When a shipping plan is decided on.
 - c. When a lot production is completed.
26. Periodic inventories for finished products, WIP, and product accessories should be taken:
 - a. Every six months.
 - b. Once or twice every fiscal year.
 - c. Once a year.
27. The procedure for carrying out an inventory should include the following:
 - a. Conducting the inventory according to the "3W1H".
 - b. A specialist with technical knowledge to take the inventory at the job site using the asset ledger.
 - c. Contacting related departments on a weekly basis to inform them about discrepancies.
28. To set up a good inventory storage system decide on:
 - a. Different storage areas for items of different value.
 - b. Different storage areas for different types of items.
 - c. The maximum quantities of each item to be stored.

29. To display inventory levels so that people can see them at a glance, show:
- a. The amount of inventory used and the balance remaining.
 - b. The maximum and minimum amounts that should be in the inventory.
 - c. The dates of the incoming deliveries.
30. To establish procedures to make sure that the right amount of items go to the right place at the right time decide on:
- a. The method for bringing items into the inventory.
 - b. The method for storing things in the inventory.
 - c. The method by which the next production process comes to collect things.

5.5 Mark passageways

31. Passageways need to be marked out in the workplace in order to:
- a. Ensure the safety of employees moving about.
 - b. Ensure the speedy shipment of goods.
 - c. Allow a smooth flow of goods and equipment in the workplace.
32. The main types of passage are:
- a. Passages for transport and motorized vehicles.
 - b. Passages for inspectors.
 - c. Passages for employees between machines.
33. In marking passages:
- a. Mark with white or yellow lines.
 - b. Round-off corners by at least 90 cm.
 - c. Install mirrors to ensure safety.
34. The appropriate measurements are:
- a. The main passages should be at least 1800 mm wide.
 - b. The lines that mark passages should be 80-100 mm wide.
 - c. The passages between machines should be at least 800 mm wide.
35. The method of moving finished products and WIP may include:
- a. Automatic conveyor between machines.
 - b. Conveyor belt.
 - c. Motorized vehicle.

5.6 Pack and move goods carefully

36. The method of packing goods may include:
- a. Wooden crates.
 - b. Trolleys.
 - c. Bags.
37. The method of handling goods may include:
- a. Maximizing the number of items stacked.
 - b. Keeping to weight limits.
 - c. Safeguarding product quality.

5.7 Encourage everyone to follow the rules

38. To keep the workplace neat and well organized, everyone must follow the rules for:
- a. Organising and arranging items throughout the work process.
 - b. Removing environmental factors that adversely effect product quality.
 - c. Storing materials and finished products.

39. People cannot be expected to follow the rules if:
- a. The criteria and rules are impossible to follow.
 - b. They do not feel motivated.
 - c. The manuals are difficult to read.

Relationship with ISO

5.1 Remove all unnecessary items from the workplace

Relationship with ISO 9001:2000

- 4.2.3 Control of documents
- 8.3 Control of nonconforming product

5.2 Remove defective goods from the workplace

Relationship with ISO 9001:2000

- 8.3 Control of nonconforming product
- 8.5.1 Continual improvement
- 8.5.2 Corrective action
- 8.5.3 Preventive action

5.3 Set up a storage system

Relationship with ISO 9001:2000

- 7.5.3 Identification and traceability
- 7.5.5 Preservation of product

5.4 Set up a good inventory system

Relationship with ISO 9001:2000

- 7.1 Planning of product realization
- 7.5.5 Preservation of product
- 4.2.4 Control of records
- 7.4 Purchasing
- 7.5.3 Identification and traceability
- 7.5.4 Customer property
- 7.5.1 Control of production and service provision

5.5 Mark passageways

Relationship with ISO 9001:2000

- 6.3 Infrastructure
- 6.4 Work environment

5.6 Pack and move goods carefully

Relationship with ISO 9001:2000

- 7.5.1 Control of production and service provision
- 7.5.5 Preservation of product

5.7 Encourage everyone to follow the rules

Relationship with ISO 9001:2000

- 7.5.1 Control of production and service provision
- 7.5.5 Preservation of product

Unit 6

Hygiene and Health



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Unit summary

Everyone should work in a comfortable, healthy environment. This is also the most productive environment. There are five sets of actions that you can take to keep your workplaces healthy and comfortable – and to avoid polluting the area around your factory or plant.

6.1 Keep your workplaces clean

To keep your workplaces clean:

- a. Set up a system for collecting and storing waste.
- b. Have the workplaces cleaned every day.
- c. Collect shavings.
- d. Establish standards for the cleaning activities.

6.2 Use the 5S activities

The 5S Activities are ways of maintaining cleanliness and tidiness in the workplace. These activities are central to the Japanese practice of TQM. The name 5S is taken from five Japanese words beginning with “s”:

- a. Seiri (organizing).
- b. Seiton (keeping things neat).
- c. Seiso (cleaning).
- d. Seiketsu (cleanliness).
- e. Shukanka (make cleanliness a habit).

6.3. Maintain appropriate levels of lighting, temperature and humidity

If you want to have your workplaces comfortable and healthy you need to define the factors that create such an environment, and then establish standards to maintain these factors. These include not only cleanliness, but also the right levels of lighting, temperature, and humidity.

6.4 Keep down noise, odour, vibration, and dust

A healthy, comfortable workplace must have low levels of noise, odour, vibration, and dust. Establish standards for procedures to keep these down. Keep in mind too that products and tools should be stored in suitable environmental conditions.

6.5 Prevent environmental pollution: treat industrial waste

Industrial waste is causing more and more environmental pollution. Dirty water and poisonous gases are released from factories and workplaces in ever increasing quantities. This has led to a new appraisal of a company’s obligation to society. A company is now seen as having as much responsibility for avoiding environmental pollution outside the factory as for maintaining cleanliness inside. Companies must establish standards for disposing of their waste in a way that will not cause environmental pollution.

Learning tools

The RADAR questions

As you read each text you will discuss how it could be applied in your company. The RADAR questions will help you to focus this discussion:

- R** - Are these ideas **relevant** to my company?
- A** - How would I **apply** each of them in my company?
- D** - What **difficulties** might I meet and how would I overcome them?
- A** - Are there any **additional** actions that I might take that are not mentioned in the text?
- R** - What **resources** would be needed, what would these cost, and how could they be acquired?

There will of course be some discussion points where not all of these questions will be applicable.

The 6-Point Structure

After you have discussed the ideas in the text, you write an action plan in which you present practical proposals for implementing the conclusions you have reached in your discussion. The 6-Point Structure will help you to write your action plan:

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts, tables etc. that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these could be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

6.1 Keep your workplaces clean

Introduction

1. To keep your workplaces clean:
 - a. Set up a system for collecting and storing waste.
 - b. Have the workplaces cleaned every day.
 - c. Collect shavings.
 - d. Establish standards for the cleaning activities.

Set up a system for collecting and storing waste

2. To set up a system for collecting and storing waste:
 - a. Keep garbage cans in a fixed location and mark them so that everyone can recognize them.
 - b. Separate usable items from those that can be thrown away.
 - c. Collect and store waste by type. Prepare separate boxes for burnable waste, dirty rags, metal shavings, and glass waste. Then get everyone to make a habit of separating these when they are disposing of them.
 - d. Introduce a regular day and time for collecting waste by type.
 - e. Apply these rules outside the factory as well as inside.

Make a special effort not to create waste in the first place. Right from the product design phase think about ways of minimizing the creation of waste in production methods, in raw materials, and in the packaging of products.

Figure 6.1a Diagram of cleaning areas and responsibility (page 9)

Figure 6.1b Diagram of the cleaning results (page 9)

Figure 6.1c Assembly line cleaning responsibility chart (page 10)

Figure 6.1d Dividing collection of garbage (page 10)

Have the workplaces cleaned everyday

3. To have the workplace cleaned everyday:
 - a. Specify what is to be cleaned: machinery, equipment, jigs and tools, measuring devices; floors, ceilings, walls, windows, shelves, cabinets; storage areas, warehouses, restrooms.
 - b. Specify who is responsible for cleaning which items and areas.
 - c. Draw up a cleaning schedule.
 - d. Inspect the condition of measuring devices on machinery and equipment during cleaning.
 - e. Be especially careful to remove oil leaks.
 - f. Establish standards that make it clear how well things have to be cleaned.

4. Use the following checkpoints:
 - a. No oil residue.
 - b. No oil leaks.
 - c. No dust.
 - d. No rust.
 - e. No gummy residue from tape, etc.
 - f. Everything is in its designated location.
 - g. Markings are clear and things are easy to locate.
 - h. Specific people are in charge of maintenance and storage.

Look on cleaning as part of the normal preparation before using machinery, equipment and measuring devices.

Figure 6.1e Cleaning check point table

Work Location		Number 1 Assembly Team	Period				Inspector	Supervisor Mr. XX
No.	Checkpoints	MON 25	TUE 26	WED 27	THU 28	FRI 29	Comment	
1.	Dirt on floor (oil)	○	○	X	△	X	Beneath the	
	workbench							
2.	Dirt on floor (garbage)	○	○	○	○	○	Good	
3.	Dirt on workbench	X	X	X	○	○	Scattered tools	
4.	Component storage	○	○	X	X	X	Numerous empty boxes	
5.	Tool shelf	○	⊗	○	○	X	Dusty, disorganized	
6.	Dirty uniforms	X		X	X	X	Mr. A. Mr. B.	
7.	Organization of cleaning							

Collect shavings

5. Give special attention to collecting shavings. Shavings include scrap produced during pressing, and shavings produced during cutting. They are constantly being produced and there are always a lot of them. Take the following steps to deal with them:
 - a. Don't allow shavings to be scattered: place a plate under machinery to catch them, or cover the machinery.
 - b. Collect shavings: place boxes for collecting them near machinery, collect them after each working cycle, and wipe away any oil or dirt where they have been lying. When work finishes, clean the area carefully.
 - c. Remove them from the workplace at least once a day, depending on the amount produced. Replace the collecting boxes at regular intervals.
 - d. Establish standards for procedures to keep the workplace clear of them.

Figure 6.1f Standards for collecting shavings

Category	Person in-charge	Frequency	Method
Gathering cleaning	Actual worker	After every work cycle	Gather the shavings and put them into a box for collection. Clean machines and floor. Use rags to clean off oil and dirt.
Collecting the box	Person on duty	Once a day	Replace the box for collection with an empty one, carry it to the designated place and give shavings to the processing agency.
Checking and evaluation	Leader at the job site	Upon finishing work	See Table 3.6 5S evaluation list and standards.

Establish standards

6. Establish standards to make sure that all these cleaning activities are carried out in an organized way:
 - a. Specify what is to be cleaned.
 - b. Specify responsibility – who cleans where.
 - c. Include a schedule of when the cleaning is to be done.
 - d. Include criteria for evaluating the cleaning.

Figure 6.1c Assembly line cleaning responsibility chart (page 10)

Figure 6.1g 5S Evaluation list and criteria

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text **if** you feel these are relevant to your company.

Introduction

- a. Parag. 1. How clean is your workplace? How often are your work areas and machinery cleaned? Do you feel that this is enough?

Set up a system for collecting and storing waste

- b. Parag. 2 gives guidelines for collecting and storing waste. How many of these do you already follow in your factory? Apply the RADAR questions to the guidelines.
- c. Figures 6.1a, 6.1b, and 6.1c give some examples of cleaning plans and methods. Look at them and comment on which you could imagine using in your company. If you feel it would be useful, devise charts that would suit your workplace.
- d. Figure 6.1d suggests a colour code for dividing garbage by type. Would it be meaningful to divide it by type in your factory? If so, what system might you use?

Have the workplaces cleaned everyday

- e. Parag. 3 specifies several items to be cleaned. How many of these do you already include in your cleaning programme? Which would you now include? Are there any others that you would add to the list?
- f. Parag. 3: How many of these rules do you already follow? Which do you feel you should apply? Would you include any others?
- g. Parag. 4: What checkpoints do you already use for cleaning? Which of the checkpoints in the text would also be useful for you to use? Are there any others that you would add to the list?
- h. Look at Figure 6.1e. Would a chart like this be useful in your workplace? How would you adapt it to suit your workplace?

Collect shavings

- i. Parag. 5: Do you have problems in your factory with shavings? What do you do about them?
- j. Parag. 5 presents some practical steps for keeping the workplace clear of shavings. What similar steps would you take in your workplace?
- k. Look at Figure 6.1f. If you feel it would be appropriate prepare a similar table for your workplace.

Establish standards

- l. Parag. 6: Do you already have standards for cleaning the workplaces? If so, how do they compare with those suggested in the text?
- m. If you do not yet have standards, do you feel it would be useful to establish them? If so, discuss what you might include in them, with reference to the guidelines in the text. Make concrete and specific suggestions for:
 - i. Cleaning objectives.
 - ii. Who would be responsible.
 - iii. A cleaning schedule.
- n. Look at Figure 6.1g. What criteria might you use for evaluating the cleaning in your workplaces?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing improvements in your company. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

Figure 6.1a Diagram of cleaning areas and responsibility

A "Diagram of cleaning areas and responsibility" posted at each factory

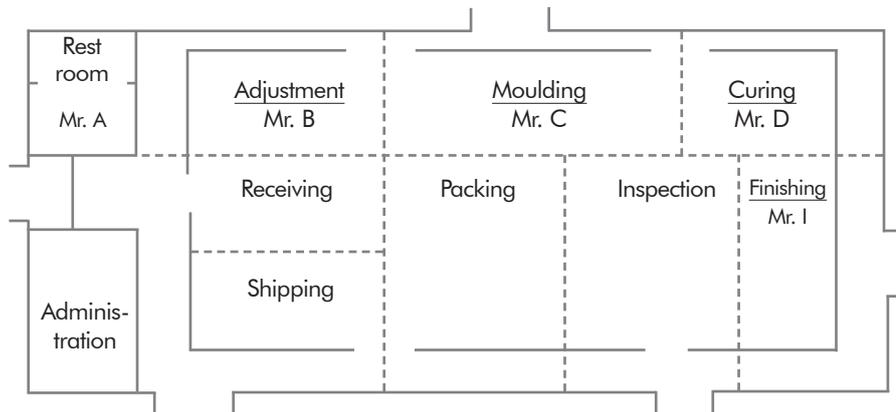
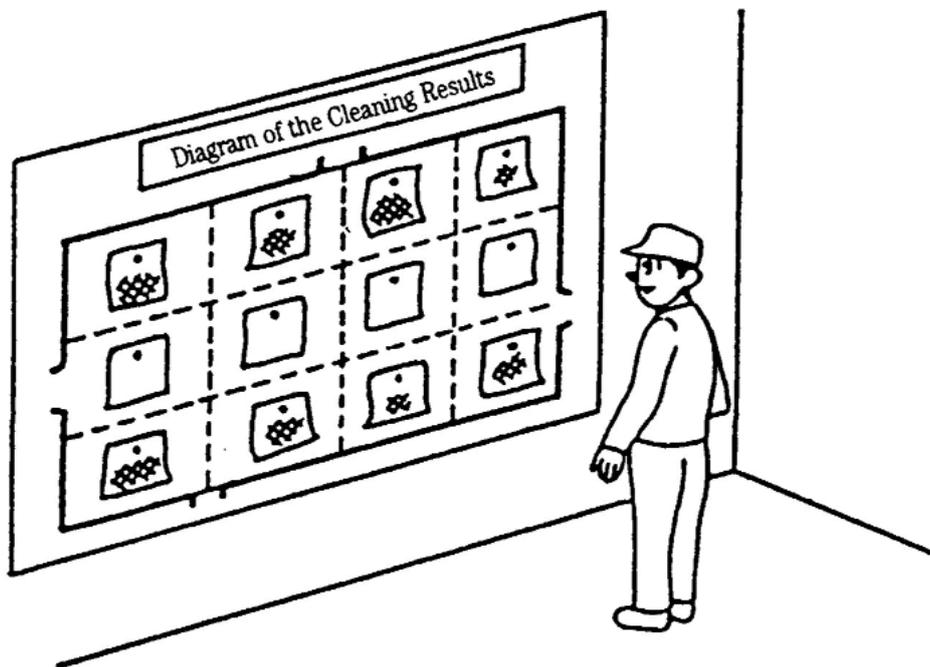


Figure 6.1b Diagram of the cleaning results



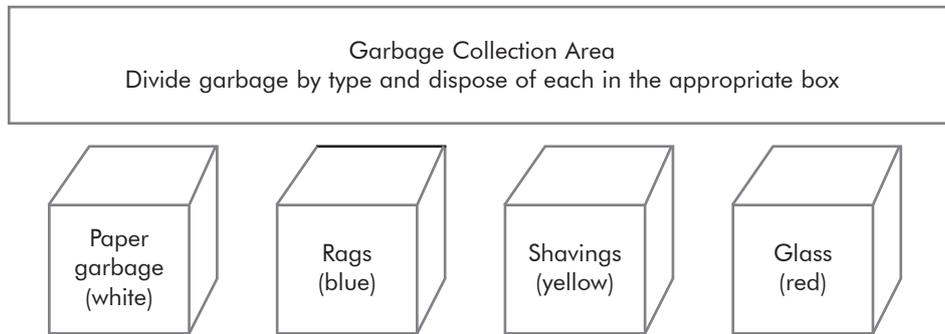
White handkerchiefs, which have been used to wipe off dirt, are hung here in plain view.

Figure 6.1c Assembly line cleaning responsibility chart

Area	MON	TUE	WED	THU	FRI
Floor (including oily surfaces)	Mr. A	B	C	A	B
Locker Room	B	C	A	B	C
Restroom	C	A	B	C	A
Walls	D	E	D	E	D
Windows	E	D	E	D	E
Shelves	F	G	F	G	F
Shelves	G	F	G	F	G
Equipment	H	H	H	H	H

Figure 6.1d Dividing collection of garbage

An example of dividing collection



6.2 Use the 5S activities

Introduction

1. The 5S Activities are ways of maintaining cleanliness and tidiness in the workplace. These activities are central to the Japanese practice of TQM. The name 5S is taken from five Japanese words beginning with “s”:
 - a. Seiri (organizing): separate necessary and unnecessary items and eliminate the latter.
 - b. Seiton (keeping things neat): store necessary items in their designated place so that they can be easily found.
 - c. Seiso (cleaning): remove dirt and rubbish from the workplace.
 - d. Seiketsu (cleanliness): clean the workplace systematically and prevent dirt recurring.
 - e. Shukanka (make cleanliness a habit): train employees in these practices and attitudes so that they become a habit.

2. The word “clean” may be used for three different purposes:
 - a. Cleaning means to get rid of garbage, dirt, and impurities in:
 - i. Floors, ceilings, walls, shelves, cabinets, locker room, restrooms, etc.
 - ii. Machines, jigs and tools, measuring equipment, etc.
 - b. Cleanliness means to keep things clean after they have been cleaned (including work uniforms). All employees should take to heart the idea that good work begins with being clean, and with a workplace that reflects this.
 - c. Making cleanliness a habit means to keep things organized, neat, and clean, and to maintain a clean environment.

3. Making the 5S activities a regular practice in your workplaces will bring three important benefits: consistent quality, improved efficiency and safety, and a comfortable workplace.

Implement the 5S throughout the company

4. The systematic implementation of the 5S throughout the company requires:
 - a. A company-wide implementation plan.
 - b. Setting up a hierarchy of those responsible for implementation.
 - c. Establishing priority items.
 - d. A plan to educate employees in carrying out the 5S activities, and to disseminate information to them.
 - e. A method to check results.
 - f. A system for generating and processing an activity report for each workplace.
 - g. A plan for top management to make the rounds, praising what is good and giving advice, and to carry out an audit. (It is also a good idea that people from different workplaces visit and look around other sites.)
 - h. Standards for evaluating the 5S.

Figure 6.2a 5S activity report

Period	1997 1.13-17	Work Location	Number1 Assembly Team	Worker Name	Mr. A
Activities			Superior's Remarks		
<ol style="list-style-type: none"> 1. Cleaned tool shelf, and classified and organized items on January 14. The area became easier to use. 2. Gathered improvement data from each team. 			<p>Good job cleaning the tool shelf. If possible, please label the shelf to make it easier to find.</p>		

Figure 6.1g 5S Evaluation list and criteria

Figure 6.2b The organisational structure of 5S implementation

Get employees actively engaged in the 5S activities

5. To get employees actively engaged in the 5S activities:
 - a. Determine targets and evaluate the achievement of these targets.
 - b. Make out a plan of monthly and daily activities.
 - c. Point out priority items for cleaning at the beginning and end of work and help employees to recognise problem areas.
 - d. Demonstrate how the activities should be carried out.
 - e. Make daily rounds of the workplace, and comment on what is good and bad, including clothes and uniforms.
 - f. Determine areas of responsibility for cleaning and hold a contest to encourage competition among employees.
 - g. Use the company bulletin boards to make the results of all these activities known to the entire company.
 - h. In addition, the factory manager should make regular rounds to help raise employee awareness of the 5S.

Plan monthly and daily activities

6. The plan of monthly and daily activities should include:
 - a. A list of "to do" items, and the period in which to complete these items.
 - b. The name of the person in charge.
 - c. The exact date and time of activities.
 - d. A programme for educating employees and disseminating the 5S concept, with the names of those to be educated.

Process activity reports

7. Activity reports should be processed as follows:
 - a. Weekly report: incorporate each individual's activity record into a weekly report and present this to superiors.
 - b. Monthly report: each person-in-charge at each workplace reports their monthly progress to the person in overall charge.
 - c. The person in overall charge summarizes the implementation data and distributes this information to employees in the form of a 5S newspaper. This should include

news of future plans, and other public relations material (slogans, examples of improvement, etc.).

Figure 6.2c Rules for 5S activities

Figure 6.2a 5S activity report

Figure 6.2d Annual plan for 5S activities

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text **if** you feel these are relevant to your company.

- a. Parag. 2. Do things stay clean for long in your workplaces? Which items get dirty again most quickly? Which stay clean the longest? How would it be possible to keep any of these items clean for a longer period before they have to be cleaned again?
- b. Parag. 3. Would you expect the 5S to bring these benefits to your workplaces?
- c. Parag. 4. Apply the RADAR questions to these rules for implementing the 5S Activities company-wide.
- d. Parag. 5. Apply the RADAR questions to these guidelines for getting employees actively engaged in the 5S activities in the workplace.
- e. Parag. 6: Apply the RADAR questions to these suggestions for creating a plan for monthly and daily activities. Be as concrete as possible.
- f. Parag. 7. Discuss how you would set up a system for keeping activity records, and how you would deal with any problems you could expect.
- g. Look again at all these 5S concepts and guidelines. Do you now think that the 5S activities would bring the three primary benefits to your company that are mentioned at the beginning of the text?

Action plan

Draw up an action plan for implementing the 5S Activities in your workplaces. Alternatively you may choose to prepare one action plan when you have discussed several texts. You might like to follow the 6-Point Structure.

6.3 Maintain appropriate levels of lighting, temperature and humidity

Introduction

1. If we want to have a working environment that is always comfortable, healthy and clean we need to define the factors that create such an environment, and then establish standards to maintain these factors. They include not only cleanliness, but also the right levels of lighting, temperature, and humidity. Factors, on the other hand, that create an unpleasant environment – noise, odours, vibration, and dust - are examined in Text 6.4.

Be flexible in establishing standard levels

2. The standards should be based on the type of work being performed, and may vary from one job site to another. Desirable levels of lighting, temperature and humidity will be different in offices used for reading and writing, in places where inspections are carried out, in general work areas, and in outdoor locations. The methods used to control these levels will also vary. In some work locations it will be impossible to provide a comfortable environment, so you should regulate the amount of time that any employees have to spend in such locations.

Measure the levels

3. Some environmental factors, such as temperature and relative humidity, can be measured numerically, while others, such as odour and vibration, either cannot be measured or are often ambiguous. Because of this, it is important not to get too caught up in numbers. Rather, set standards that relate to the way one actually feels in a particular environment. There is no need, except in special circumstances, to enforce strict specific standards for minimum and maximum brightness, temperature and relative humidity. However if employees are exposed to harsh environmental conditions, working time should be reduced so as not to pose a health hazard. In short, environmental standards should suit the situation, and should be kept under constant review.

Establish standards for lighting, temperature and humidity

4. *Lighting.* While lighting requirements for places such as inspection locations may be as much as 640 lux or more, it is more common to simply specify “appropriate lighting” and set suitable lighting levels for each area. Within a given room set the lighting levels with reference to the main working area, since brightness may vary greatly. (Lux is a unit of illumination equal to 1 lumen per square metre.)
5. *Temperature.* Temperature control is a very important factor in keeping workplaces comfortable. Temperature levels should be set to provide a comfortable working environment. Limit working time in extreme environments, such as steel mills or freezers. Apart from special cases however, it is not critical to specify the temperature range.

6. *Humidity*. While humidity is recognised as an important element in health, appropriate humidity levels are usually not specified in numeric terms, except for special types of work. Normally it is left to nature to determine humidity levels. Variations due to seasonal differences, such as the wet and dry seasons, and to the location, are not unusual. However it is important to prevent excessive humidity or dryness, since these can damage health.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text **if** you feel these are relevant to your company.

- a. Parag. 1: How comfortable and healthy is your workplace? Where do any problems lie in terms of the factors mentioned here? How would you define a healthy workplace?
- b. Parag. 2: Are there any special factors that make your workplaces unhealthy or uncomfortable? What solutions could be found for these?
- c. Parag. 3: Do you agree with the ideas in this paragraph. Does your company reduce hours that employees have to spend in an unhealthy environment? If not, should it do so?
- d. Parags 4, 5 and 6: What acceptable levels for the factors of brightness, temperature and humidity would you specify in standards? In other factors? (Noise odour and vibration will come in Text 9.4.)
- e. Discuss specific steps that should be taken to ensure that lighting, temperature and humidity are at appropriate levels throughout your company. How cost-effective would this be in terms of improvements in productivity, employee morale etc.?

Action plan

Prepare an action plan for Texts 6.3 and 6.4 together after you have discussed Text 6.4. Alternatively you may choose to prepare one action plan when you have discussed other texts as well. You might like to use the 6-Point Structure.

6.4 Keep down noise, odour, vibration, and dust

Introduction

1. A healthy, comfortable environment must have low levels of noise, odour, vibration, and airborne particles (dust). Establish standards for procedures to keep these down. Keep in mind too that products and tools should be stored in suitable environmental conditions.

Noise

2. Design and insulate noisy workplaces, so that employees in adjacent work areas will not hear the noise. For example, when adjusting an engine, work should be performed in an insulated, soundproof room, with the door tightly closed and employees wearing ear protection. Do not keep the same employees in a noisy workplace for lengthy periods of time.

Odour

3. Take the following measures to reduce odours:
 - a. Fix odour-eliminating filters to all equipment that produces odour.
 - b. Pass any gas produced in a chemical reaction room through set filtering systems before releasing it.
 - c. Filter all gas prior to releasing it outside the facility and check the filters regularly.

Vibration

4. Take the following measures to limit vibration to the human body:
 - a. Include vibration damping in planning the layout of the workplace.
 - b. Put in vibration-damping equipment when installing large presses, and isolate them from the rest of the workplace. Verify that the vibration caused by the press does not escape the room.
 - c. Install equipment to limit vibration in areas where work causes vibration.
 - d. Install vibration meters around the facility and record the vibration level.
 - e. Regularly check the results of vibration damping since employees at other jobs may find vibration much more intolerable than those who are actually doing the vibration-producing work.
5. Remember that workplaces that produce noise, odour, or vibration must counter their impact in the local community just as much as in the workplace.

Dust

6. Dust, referred to scientifically as “airborne particles”, is a danger to health and a source of discomfort. Standardise methods to reduce the levels of dust generated in the workplace and apply them rigorously:
 - a. Whenever possible, install a dust catcher at or near the areas where the dust is created, and collect the dust continuously.

- b. Use fans to keep the workplace constantly ventilated.
 - c. Install measuring equipment and take regular measurements.
 - d. When dust levels are found to exceed the standards, investigate the cause immediately and prevent this happening again.
 - e. Employees in shearing and polishing factories should wear dust-proof masks.
- One could limit the amount of SPM (suspended particle matter with a diameter of 10 microns or less and which is circulating in the air) to 0.20 mg/litre or less per hour. This is a common environmental standard, but it is quite lenient when one considers the consequences of prolonged exposure. Depending on the workplace, particles may be dispersed. In this case, particles could be greater than 10 microns in diameter and not be considered SPM.

Figure 6.4a Specifications for the office environment (page 18)

Figure 6.4b Specifications for the work site environment

Figure 6.4c Specifications for the restroom (page 18)

Figure 6.4d Control standard for light, temperature and humidity (page 19)

Store products, equipment and tools in suitable environmental conditions

7. Keep environmental factors in mind when storing finished products, machinery, equipment, jigs, tools, etc. Store them in a way, however, that does not reduce their functionality nor make it more difficult for employees to handle them.
 - a. Pay close attention to the temperature, humidity, and dust level in areas where items are stored. Be especially careful to establish and maintain environmental standards for items that are prone to rusting or are sensitive to dust.
 - b. Be careful to prevent leaks where rain might get in, or gaps through which wind might pass.
 - c. Cover items that are stored outdoors with a tarpaulin or sheet.
 - d. Choose the proper storage location for each type of item, and make sure that different types do not get mixed up. Use storage addresses so that everyone will know where items are located.
 - e. Mark part names, lot numbers etc. clearly on locations and on items to indicate the item's history. When controlling items individually, be sure to attach an item card to each. When controlling items by lot, attach a lot card to the lot.
 - f. Clean items on a regular basis, as well as at the beginning and end of work.

Figure 6.4a Specifications for the office environment

Example 1	Brightness	No impediment to the work performed
	Temperature	Standard 200C-250 C
	Relative humidity	Standard 40%-80%
	Noise	60 phone or less (except under special circumstances)
	Odor	No impediment to the work performed
Example 2	Area	10m ² /person or more
	Openings, for example Windows	Max. opening should be 1/20th of the floor area or more
	Degree of purity of air supply	Airborne particles (about 10 microns or less) should be limited to 0.15 mg/m ³ or less
	Air current	0.5m/s or less
	Temperature	170C-280C
	Relative humidity	40%-70%
	Light	150 lux or more
	Noise	60 phone or less. In the case where five or more typewriters, etc., are used, provide an exclusive room and establish noise insulation equipment.
	Odor	No notable odor

Figure 6.4c Specifications for the restroom

Example	Separation	Separate for male and female
	Male toilet	At least 1 per 60 people
	Male urinal	At least 1 per 30 people
	Female toilet	At least 1 per 20 people

Figure 6.4d Control standard for light, temperature and humidity

Light	Standard	Control method	Remarks
	For detailed work 300 lux or more. For normal work 150 lux or more. For rough work 70 lux or more.	Inspect lighting equipment every six months	Preferable ratio of overall light to directed light is 1/10 or less.
Temperature	Greater than 17°C not more than 28°C	When temperature is 10°C or less, provide a heater. When temperature is 28°C or more, provide an air conditioner.	When using an air conditioner, the temperature difference between the interior and exterior should be 7°C or less.
Relative Humidity	Greater than 40% but not more than 70%	Take measurements using a wet-and-dry bulb hygrometer with 0.5 scale or an Assmann draft hygrometer, and make necessary adjustment using a dehumidifier or humidifier.	

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text **if** you feel these are relevant to your company.

- Parag. 1. What problems do you have in your workplaces with noise, odour, vibration and dust? What effects do they have on the health and comfort of employees? What effect do they have on productivity, directly or indirectly?
- Parag. 2: What steps has your company taken to protect employees who have to work in a noisy workplace? What further steps could be taken?
- Parag. 2: Is it possible to reduce noise levels? To reduce the noise that escapes from a noisy workplace? What steps have you already taken? What further steps could you take?
- Parag. 3: Do you have problems with bad odours escaping from the factory? If so what steps have you taken to reduce them? How effective are these measures? Apply the RADAR questions to these suggestions for installing filters.
- Parag. 4: Is vibration a problem in your workplaces? If so, what effect does it have on employee health and comfort? In the workplace and in adjoining areas? What steps have you taken to deal with it? How successful have they been?
- Parag. 4: Apply the RADAR questions to these measures for dealing with vibration.

- g. Parag. 5: Do you agree that you should be concerned about the impact of these factors on the environment? What steps have you taken, or could you take, to reduce this?
- h. Parag. 6: Is dust a problem in your workplaces? What negative effects does it have? What steps have you taken to deal with it? How successful have they been?
- i. Parag. 6: Apply the RADAR questions to the methods suggested for reducing the levels of dust.
- j. Figures 6.4a, 6.4b, 6.4c and 6.4d give a variety of specifications for maintaining a healthy and comfortable environment. Which of these could be applicable to your workplaces? Are there alternatives that would be more appropriate.
- k. Parag. 7: What measures do you take to store finished products, machinery, equipment, jigs, tools etc. in suitable environmental conditions? How successful are they? What problems do you still have in this area? Do you have any difficulty combined combining such storage with maintaining the functionality of equipment etc. and easy access to it?
- l. Parag. 7: Apply the RADAR questions to these six storage guidelines.

Action plan

Draw up a detailed and concrete action plan for maintaining a comfortable, healthy and clean working environment in your workplace, or company based on your discussions of Texts 6.3 and 6.4. You might like to follow the 6-Point Structure. In your introduction make it clear why it is important to have a good working environment. Alternatively you may choose to prepare one action plan based on your discussions of several texts.

6.5 Prevent environmental pollution: treat industrial waste

Introduction

1. Industrial waste is causing more and more environmental pollution. Dirty water and poisonous gases are released from factories and workplaces in ever increasing quantities. This has led to a new appraisal of a company's obligation to society. A company is now seen as having as much responsibility for avoiding environmental pollution outside the factory as for maintaining cleanliness inside. Companies must establish standards for disposing of their waste in a way that will not pollute the environment.

Standards for treating industrial waste

2. Industrial waste includes trash, waste oil, paint, solvent, waste water, and exhaust gas. Standards should specify
 - a) the procedures to be followed before disposing of waste and
 - b) the conditions for disposing of it. Follow these guidelines:
 - a. Separate the waste by type, and standardize the disposal methods used for each type.
 - b. Use designated equipment to process waste that requires treatment, and then give it for treatment to the proper agency. This applies especially to chemical substances which can lead to water and ground pollution: organic solvents, strong acids, and strong alkalis.
 - c. Write a manual for processing this waste before it is passed to the agency. Follow this manual carefully.
 - d. Establish standards for disposal: for example, an impurity concentration rate percentage, or pH for treated water, and SO_2 ppm, or the quantity of particles contained in a gas. These standard values should not contradict those in government laws and regulations.
 - e. Ensure that equipment for the treatment of poisonous waste, water purification equipment, and equipment for measuring the amount of waste particles in the air, etc. adheres to official standards for the prevention of environmental pollution.
 - f. Measure the waste upon disposal at designated intervals, and keep records. Assign a person to be in charge of treating industrial waste and a person to control the overall waste disposal process. The controller should take appropriate action when the measured value does not meet the standards.
 - g. Educate employees in the importance of these standards and encourage them to cooperate in implementing them. Set up checkpoints to ensure that proper procedures are followed, and that data is collected and analysed regularly.
 - h. Wherever possible minimize waste and recycle waste materials.

Examples of treatment procedures

3. The following are some examples of procedures that can be used to prevent pollution:
 - a. Process strong acids and alkaline in a neutralizing tank, and neutralize the chemicals prior to disposal. Measure the pH potential of hydrogen ions prior to disposal.
 - b. Use the activated sludge process in an established purification system to purify wastewater leaving the factory. Use carp (fish) as a biological index to check the purity level prior to discharge. If the carp dies, the level is too high!
 - c. Give the disposal of used organic solvents to a licensed disposal agency.
 - d. Gather paper waste and pass it to a qualified agency for recycling.

Figure 6.5a Treating waste (page 23)

Standards for preventing environmental pollution

4. Standards to prevent environmental pollution must, at the very least, follow official environmental standards, laws, and regulations. If possible they should set even higher levels.
5. The main pollution categories, with their elements, are:
 - a. Air pollution: The major elements of air pollution are carbon monoxide, sulphur oxide, nitrogen oxide, and suspended particulate matter (SPM).
 - b. Water pollution: The main control elements are BOD (biochemical oxygen demand), COD (chemical oxygen demand), DO (dissolved oxygen; standard at 8.8 mg/litre), SS (suspended solids).
 - c. Chemical substances: cadmium, cyanogen, organic phosphorus, lead, chromium (6 valence), arsenic, the mercury family, PCB.
6. Standards for prevention vary dramatically from one industry to another. However it is important to specify the substances that need to be controlled, if there is any danger that they will be released.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text **if** you feel these are relevant to your company.

- a. Parag. 1. Do you agree that a company has as much responsibility for avoiding environmental pollution outside the factory as inside? Does your company cause pollution in the outside environment? What kind? What steps are you taking to reduce it? How effective are these steps?
- b. Parag. 2: Apply the RADAR questions to these eight guidelines.
- c. Parag. 3: Are any of the examples of treatment procedures in the text and in Figure 6.5a relevant to your company? Are there any alternative procedures that you could use?

- d. Parag. 4: How do your standards relate to official environmental standards, laws, and regulations?
- e. Parag. 5: What substances are used or produced in your company that could be dangerous to the outside environment?

Action plan

Draw up a detailed and concrete proposal for dealing with your company’s industrial waste. You might like to follow the 6-Point Structure. In your introduction make it clear why this is important. Alternatively you may choose to prepare one action plan when you have discussed several texts.

Figure 6.5a Treating waste

Waste	Treatment		Measurement			
	Method	Person in-charge	Items	Frequency	Standard value	Person in control
Scap	Put into the designated container and turn them over to an agency that specializes in processing scraps	Manufacturing supervisor				
Trash	Put into divided containers, and turn them over to disposal agencies	Each supervisor				
Waste oil	Put into designated containers and turn over to oil processing agencies		Manu- facturing supervisor			
Effluent from acid bath	After neutralizing, drain wastewater to the treatment pit	Acid bath supervisor	PH	Every time	0.0-0.0	Factory manager
Plating effluent	After chemical treatment drain the wastewater treatment pit. Turn over precipitated substances to processing agencies	Plating supervisor	PH Impurity	Every time	0.0-0.0 0.0% or less	Factory manager
Waste-water	Drain all wastewater to the wastewater treatment pit, and drain after treatment	Safety supervisor	PH Impurity	Every one hout	0.0-0.0 0.0% or less	Factory manager
Exhaust gas from super heated furnace	Release from the chimney after processing it through equipment for eliminating sulfur	Super heated furnace supervisor	SO ₂	Every one hour	0 ppm or less	Factory manager
Paint effluent						

Test

Answer these questions using **only** the information given in the text. For each question one, two or all three answers may be correct. Tick the answer or answers you think are correct for each question. Each question carries 3 points – you get one point for each correct answer that you tick, and one point for each wrong answer that you do not tick.

6.1 Keep your workplaces clean

1. Different boxes should be used for separating waste by:
 - a. Quantity.
 - b. Age.
 - c. Type.
2. Ways of minimizing waste should be considered from:
 - a. The start of production.
 - b. When the product is being designed.
 - c. When the first products appear.
3. During cleaning it is important to inspect the condition of:
 - a. Cleaning materials.
 - b. Measuring devices.
 - c. Oil leaks.
4. Checkpoints for cleaning machines include:
 - a. No measuring tools
 - b. No gummy residue from tape.
 - c. No oil residue.
5. To prevent shavings being scattered, which two of the following options could you choose?
 - a. Cover the machinery.
 - b. Place a plate under the machinery.
 - c. Wash the machinery.
6. Collect boxes of shavings:
 - a. Before each working cycle.
 - b. After each working cycle.
 - c. During each working cycle.
7. Which of the following should you include in creating standards for cleaning?
 - a. Specify what is to be cleaned.
 - b. Specify responsibility – who cleans where.
 - c. Specify the cleaning materials.

6.2 Use the 5S activities

8. The three important benefits of the 5S Activities include:
 - a. A comfortable workplace.
 - b. Consistent quality.
 - c. Improvements in efficiency and safety.

9. Cleanliness means specifically to:
- a. Clean things whenever they get dirty.
 - b. Keep things clean after they have been cleaned.
 - c. Keep work uniforms clean.
10. The systematic implementation of 5S throughout the company will include which two of the following?
- a. A plan for top management to make the rounds and carry out an audit.
 - b. A system for generating an activity report for each workplace.
 - c. A bulletin board to put results on.
11. To get employees actively engaged in the 5S Activities in the workplace do which of the following?
- a. Determine targets and evaluate their achievement.
 - b. Help employees to recognize problem areas.
 - c. Make daily rounds and comment on how clean things are.
12. The factory manager should make regular rounds to:
- a. Help raise employee awareness of the 5S.
 - b. Check that employees are cleaning correctly.
 - c. Check that employees are comfortable enough.
13. A plan for monthly and daily activities should include:
- a. A programme for educating employees.
 - b. A programme for disseminating employees.
 - c. A list of items to be carried out within a certain period.
14. To create an activity record:
- a. Incorporate each employee's activity record into a weekly report to be presented to superiors.
 - b. Report monthly progress to the person in overall charge.
 - c. Present monthly progress to top management.
15. Top management should:
- a. Make the rounds at least once a week.
 - b. Praise good points.
 - c. Give instructions for improvement.

6.3 Maintain appropriate levels of lighting, temperature and humidity

16. Establishing standards for maintaining a healthy workplace environment will involve:
- a. Having medical personnel in the workplace.
 - b. Defining what constitutes a healthy workplace.
 - c. Establishing specific standards for the features that make a healthy workplace.
17. Standards should be based on:
- a. The type of work being done.
 - b. The size of the job site.
 - c. The number of employees on the job site.
18. Desirable levels of lighting, temperature and humidity will vary depending on:
- a. The size of the workplace.
 - b. The purpose of the workplace.
 - c. The location of the workplace.

19. Which environmental standards can specify numerical measurements. Those for:
- a. Temperature.
 - b. Odour.
 - c. Relative humidity.
20. Where exact measurements are not possible it is better to use standards that relate to:
- a. How people feel in a particular environment.
 - b. How many hours people are working.
 - c. How hard people are working.
21. For most areas, standards:
- a. Should specify lighting of 640 lux.
 - b. Give no specification.
 - c. Specify "appropriate lighting".
22. It is critical that standards specify the temperature level:
- a. Always.
 - b. Never.
 - c. In special cases.
23. Humidity levels should normally be:
- a. Left to nature.
 - b. Specified exactly.
 - c. Specified as "appropriate".

6.4 Keep down noise, odour, vibration and dust

24. Noisy workplaces should be designed and insulated so that:
- a. No noise escapes.
 - b. The level of noise that escapes is not noticeable in neighbouring areas.
 - c. All noise in the workplace is eliminated.
25. Which of the following should be done to deal with odour in the workplace:
- a. Fix odour-eliminating filters to all equipment that produces odour.
 - b. Fix odour-eliminating filters at all doors and windows.
 - c. Filter all gas before it is released outside the facility.
26. Which of the following measures should be taken to limit vibration to the human body:
- a. Install vibration meters around the facility and record the results.
 - b. Install equipment to limit vibration in areas where work causes vibration.
 - c. Require employees in areas where vibration levels are high to wear protective clothing.
27. Which of the following are methods to reduce the levels of dust generated in the workplace?
- a. Install a dust catcher near the areas where dust is created.
 - b. Install measuring equipment and regularly take measurements.
 - c. Use fans to keep the dust from circulating.
28. A common environmental standard for an acceptable level of airborne particle matter is:
- a. 0.10 mg/litre or less per hour.
 - b. 0.20 mg/litre or less per hour.
 - c. 0.30 mg/litre or less per hour.

29. When storing finished products, equipment etc, ensure:
 - a. Their functionality is not reduced.
 - b. It is not more difficult for employees to handle them.
 - c. They are securely locked up.
30. Which of the following guidelines should be followed in order to store products etc. in suitable environmental conditions:
 - a. Prevent leaks where rain might get in.
 - b. Do not store any items outdoors.
 - c. Choose the proper storage location for each item type.
31. Which further guidelines should be followed:
 - a. Mark gaps through which the wind might pass.
 - b. Mark part name, lot numbers etc. clearly on locations and on items.
 - c. Clean items on a regular basis, and at the beginning and end of work.

6.5 Prevent environmental pollution: treat industrial waste

32. A company is now seen as having ... responsibility for avoiding pollution outside the factory as/than inside.
 - a. as much ... as
 - b. less ... than
 - c. more ... than
33. Standards for treating industrial waste should specify:
 - a. Procedures to be followed before disposing of waste.
 - b. Conditions for actually disposing of it.
 - c. Procedures for informing employees that waste has been disposed of.
34. Guidelines for disposing of waste should include:
 - a. Write up a manual for this agency to use.
 - b. Separate waste by type and standardize disposal methods for each type.
 - c. Give waste that requires treatment to a proper agency.
35. Standards should be established for waste disposal that:
 - a. Are always the same as government laws and regulations.
 - b. Are almost as high as those in government laws and regulations.
 - c. Do not go against government laws and regulations.
36. Waste should be measured on disposal:
 - a. At planned intervals.
 - b. Weekly.
 - c. At the start and finish of work.
37. Employees should be:
 - a. Required to implement the environment standards.
 - b. Encouraged to cooperate in implementing the environment standards.
 - c. Educated in the importance of the environment standards.
38. Examples of procedures that can be followed to prevent pollution include:
 - a. Process strong acids and alkaline in a neutralizing tank, and neutralize the chemicals prior to disposal.
 - b. Put carp in the waste water before discharging it.
 - c. Put carp in the wastewater after it leaves the factory.

39. Standards for preventing environmental pollution vary ... from one industry to another
- a. a great deal.
 - b. a little.
 - c. not at all.

Relationship with ISO

6.1 Keep your workplaces clean

Relationship with ISO 9001:2000:

- 6.4 Work environment
- 7.5.1 Control of production and service provision

6.2 Use the 5S Activities

Relationship with ISO 9001:2000:

- 6.4 Work environment
- 7.5.1 Control of production and service provision

6.3 Maintain appropriate levels of lighting, temperature and humidity

Relationship with ISO 9001:2000:

- 6.3 Infrastructure
 - 6.4 Work environment
 - 7.5.1 Control of production and service provision
 - 7.5.2 Validation of processes for production and service provision
- Relationship with ISO 14001:1996:

- 4.4.6 Operational control
- 4.5.1 Monitoring and measurement

6.4 Keep down noise, odour, vibration, and dust

Relationship with ISO 9001:2000:

- 6.3 Infrastructure
- 6.4 Work environment
- 7.5.1 Control of production and service provision
- 7.5.2 Validation of processes for production and service provision

Relationship with ISO 14001:1996:

- 4.4.6 Operational control
- 4.5.1 Monitoring and measurement

6.5 Prevent environmental pollution: treat industrial waste

Relationship with ISO 14001:1996:

- 4.3.1 Environmental aspects
- 4.4.6 Operational control

Unit 7

Safety



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Unit summary

Each year thousands of employees are killed or seriously injured at work. The vast majority of these deaths could be prevented, and the severity of the injuries could be greatly reduced. There are nine key sets of actions that you can take to improve safety in your company.

7.1 Mark emergency exits and put up warning signs

The two safety priorities in the workplace are that:

- a. People can leave the building quickly when there is an emergency: mark emergency exits clearly.
- b. People do not enter dangerous areas: put up warning signs showing areas that are dangerous to enter.

7.2 Provide protective clothing and tools

Accidents will of course always happen, but there is a great range of protective clothing and tools to lessen the risk, and to protect employees from injury and death when accidents do happen. Every company should:

- a. Provide protective clothing and tools wherever there is any risk to employees.
- b. Check that these are worn and used properly.
- c. Install devices that automatically halt operations or sound alarms when something goes wrong.

7.3 Raise safety awareness

Employees must be safety conscious. They must be aware, directly and personally, of the importance of accident prevention in all the company's activities. To achieve this, the company should take the following actions:

- a. Assess the level of safety awareness throughout the company.
- b. Promote company-wide safety awareness.
- c. Provide formal safety education.
- d. Train employees to recognise hidden danger.

7.4 Establish safety standards and regulations

Every company should have safety standards and regulations to prevent accidents at work, to clarify job responsibilities in relation to safety, and to encourage employee initiative in undertaking safety activities. The company should:

- a. Establish safety standards and regulations based on the law of the country.
- b. Train employees in the safety standards.
- c. Put instructions for operating machinery in writing to ensure that employees follow the standard procedures.

7.5 Set up safety committees and patrols

There are two valuable organisational measures that a company can take to maintain a high level of safety:

- a. Set up a safety committee.
- b. Run safety patrols.

7.6 Ensure facilities and equipment are safe

Facilities and equipment can be sources of danger. To ensure that your facilities and equipment are as safe as possible take the following actions:

- a. Carry out a thorough safety inspection when you purchase new facilities or equipment, or remodel or renovate existing ones.
- b. Establish standards for the management and maintenance of facilities and equipment.
- c. Watch out for abnormalities – for anything unusual.

7.7 Keep accident records

Records are a valuable way of learning from past accidents and preventing them recurring. Use an accident report form to give the causes of the accident, and the measures to prevent similar accidents recurring. There are three main actions to take:

- a. Fill in a full accident report form with all the details of the accident.
- b. Classify and maintain these accident records.
- c. Use the accident records to assess the accident rate.

7.8 Set safety targets

Accidents can always happen. The critical question for each company is how often they happen, and especially if they happen more often in your company than in other companies. Set safety targets to lower your accident rate. There are three actions to take:

- a. Assess the accident rate in your company.
- b. Set safety targets to improve your accident rate.
- c. Check that these targets have been achieved.

7.9 Be prepared to deal with disasters

Fortunately disasters do not happen very often. However when they do happen, whether they be major accidents at work, fires in the company or the local community, or natural disasters like earthquakes, the results can be terrible – so be prepared. Set up an in-house organisation to prepare systems and train employees to deal with disasters.

Learning tools

The RADAR questions

As you read each text you will discuss how it could be applied in your company. The RADAR questions will help you to focus this discussion:

- R** - Are these ideas **relevant** to my company?
- A** - How would I **apply** each of them in my company?
- D** - What **difficulties** might I meet and how would I overcome them?
- A** - Are there any **additional** actions that I might take that are not mentioned in the text?
- R** - What **resources** would be needed, what would these cost, and how could they be acquired?

There will of course be some discussion points where not all of these questions will be applicable.

The 6-Point Structure

After you have discussed the ideas in the text, you write an action plan in which you present practical proposals for implementing the conclusions you have reached in your discussion. The 6-Point Structure will help you to write your action plan:

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts, tables etc. that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these could be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

7.1 Mark emergency exit signs, put up warning signs

Introduction

1. The two safety priorities in the workplace are that:
 - a. People can leave the building quickly when there is an emergency: mark emergency exits, evacuation routes and evacuation sites clearly.
 - b. People do not enter dangerous areas: put up warning signs showing areas that are dangerous to enter.

Put up signs to show emergency exits, evacuation routes and evacuation sites

2. Indicate emergency exits and evacuation routes clearly. The evacuation routes should lead to evacuation sites where people can gather safely. When people are gathered in one place it is easier to see if anyone may still be in the building. Take the following actions:
 - a. Put emergency exit signs on the doorways of all rooms, and illuminate these at night.
 - b. Put up signs to indicate how to follow evacuation routes, and illuminate these at night.
 - c. Make sure that all emergency exits and evacuation routes are kept clear of obstructions.
 - d. Install rope ladders and evacuation chutes, if the design of the building requires them.
 - e. Mark tools to be used for evacuation and keep them always ready for use.
 - f. Make sure that absolutely every employee knows where the evacuation sites are.
 - g. Use emergency power sources to illuminate the emergency signs at night, if possible.Emergency exits may include doorways that people are normally not allowed to use.

Put up signs to show dangerous areas

3. Clearly indicate areas that are dangerous for employees to enter or go near. These may include:
 - a. The area within a certain range of operating machinery and equipment.
 - b. Sites with movable facilities and equipment.
 - c. Sites where harmful gases are produced.
 - d. Sites for storing radioactive substances.
 - e. Areas where there are electricity hazards e.g. high-voltage power cables.
 - f. Passageways near moving traffic.
 - g. Construction sites.
4. Fix danger signs where they can be easily seen – on walls, fences or wire nets. On construction sites put the signs near the dangerous area. Use the same sizes, colours and words that the public authorities use.

5. The decision to designate certain areas as dangerous may be taken by public authorities, or agencies connected to them, or it may be based on a code of practice in the area of business that the company belongs to.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Do you already have emergency exits, evacuation routes and evacuation sites? And signs for them? If yes, could they be improved? If you do not have them, why not?
- b. How valuable do you think each of these three emergency features is?
- c. Parag. 2. Apply the RADAR questions to these suggestions for emergency signs.
- d. Parag. 3 suggests seven areas that could be dangerous for employees to enter or go near. What areas in your company are dangerous? How do you keep unauthorized employees away from them?
- e. Parag. 4. Apply the RADAR questions to these suggestions for ways of warning employees about dangerous areas.

Action plan

Draw up an action plan for introducing or improving emergency exits, evacuation routes and evacuation sites, and the signs to indicate them, in your company. You might like to follow the 6-Point Structure.

7.2 Provide protective clothing and tools

Introduction

1. There will always be a risk of accidents occurring, but there is a great range of protective clothing and tools to lessen the risk, and to protect employees from injury and death when accidents do happen. Every company should:
 - a. Provide protective clothing and tools wherever there is any risk to employees.
 - b. Check that these are worn and used properly.
 - c. Install devices that automatically halt operations or sound alarms when something goes wrong.

Provide protective clothing and tools

2. Employees who work in dangerous environments must use protective clothing and tools. These must conform to standards set by the government. They will include:
 - a. Eyeglasses for operations that involve cutting, grinding and chipping.
 - b. Masks for operations in which organic solvents are used, and for operations that produce dust.
 - c. Gloves for handling hot, sharp or pointed items.
 - d. Helmets for operations at high altitudes, and for working with forklifts.
 - e. Earplugs for operations classified in noise management categories II and III.
 - f. Protective uniforms for handling specific chemical substances etc.
 - g. Heat-resistant uniforms for working in high temperatures.
 - h. Uniforms that prevent sleeves and cuffs from being caught in machines.

Check that protective clothing and tools are being used properly

3. Check periodically that protective gear, both clothing and tools, are being used properly, and keep a record of the results. Follow these procedures:
 - a. Designate the operations and the employees that require protective gear at each work site.
 - b. Keep a record of where this protective gear is distributed for joint use, and where for individual use.
 - c. Check that the protective gear conforms to the standards set by the government or industrial organizations.
 - d. Keep records of periodic checks on the number of items of protective gear that are in use.
 - e. Record the periodic cleaning and maintenance of protective gear.
4. Patrol teams appointed by the safety committee should conduct periodic safety patrols and report when protective gear is not being worn. The safety committee should act on these patrol reports, so that everyone will realise the importance of wearing protective gear.

(See Text 7.5 for detailed guidelines on safety patrols.)

Install devices that automatically halt operations or activate alarms

5. A very good way to prevent accidents is to use protective devices that either halt mechanical operations or send out electrical, visual or mechanical alarms when an employee enters dangerous areas around specific machines or around cables that connect with other machines and facilities. Examples of these are:
 - a. Frontal sections of the blades of shearing machines.
 - b. Safety fences around robots.
 - c. The operational spheres of pieces of equipment that are connected to each other.
 - d. Systems that prevent excessive winding by machines such as cranes.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Which employees in your company use protective clothing or tools? How necessary are these? Should more of them do so? Do the clothes and tools conform to government standards?
- b. Parag. 2: The text gives eight examples of protective clothing and tools. Which of these does your company already use? Which do you think they should use? Which others might they use?
- c. Parag. 3: Apply the RADAR questions to these suggested actions to check that protective clothing and tools are being used properly.
- d. Parag. 5: The text gives examples of this type of protective device. Do you already use any of these? If so, how useful are they? If not, how useful do you think they would be? Are there any others that you use, or that you think would be useful?
- e. Consider how you would improve any of your existing protective devices, or install any new ones. What difficulties might you meet and how would you overcome them?

Action plan

Draw up an action plan for using protective clothing, tools and devices in your company, using the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

7.3 Raise safety awareness

Introduction

1. Employees must be safety conscious. They must be aware, directly and personally, of the importance of accident prevention in all the company's activities. To achieve this, the company should:
 - a. Assess the level of safety awareness throughout the company.
 - b. Promote company-wide safety awareness.
 - c. Provide formal safety education.
 - d. Train employees to recognise hidden danger.

Assess your company's level of safety awareness

2. Consider these questions:
 - a. Is safety given top priority at all times?
 - b. Do superiors try to establish the kind of relationship in which subordinates will tell them about potentially dangerous situations?
 - c. Do employees dress properly, use polite language and treat each other with respect?
 - d. Do employees try to follow the safety rules and encourage others to do so too?
 - e. Do employees respect the principles of the – seiri, seiton, seiso and seiketsu (see Text 6.2) – and keep their workplaces neat, clean and orderly?
 - f. When something goes wrong with the safety systems is it always corrected?
 - g. Are there plenty of signs to remind employees to be safety conscious?

Promote company-wide safety awareness

3. To promote company-wide safety awareness:
 - a. Clarify which company organizations are responsible for safety control. Committee members of these organizations should wear special armbands or badges.
 - b. Examine safety issues periodically, make improvements and record the results.
 - c. Train employees to recognise potential dangers. Provide safety instructions and reminders to employees at morning gatherings at least once a week.
 - d. Encourage employees to go to lectures and seminars where they can get safety qualifications.
 - e. Hold meetings where safety achievements can be reported.
 - f. Organize activities at which safety posters and slogans can be displayed.
 - g. Encourage employees to participate in national safety events, and run in-house safety campaigns – national safety week, hygiene week, year-end campaigns etc.
 - h. Arrange study visits to model companies.
 - i. Introduce the practice of pointing at an object and commenting on how safe it is.

Provide formal safety education

4. Give employees formal education and training courses in the knowledge, skills, and attitudes they will need if they are to contribute to a safe and healthy working environment. Prepare written plans for these courses.

5. It is especially important to give such formal courses:
 - a. When employees begin to work for the company.
 - b. When they change jobs within the company.
 - c. When they are preparing for new qualifications (chief operators etc.).
 - d. As part of a special safety education program, e.g. for forklift drivers or overhead crane operators.

6. General safety courses should cover the following:
 - a. An outline of the work site.
 - b. Discipline at the work site.
 - c. Methods for operating machines and equipment.
 - d. Methods and procedures for safety activities.
 - e. Methods for handling materials.
 - f. Methods for handling tools.
 - g. How to report abnormalities.
 - h. Promotion of the 4 S.
 - i. Examples of accidents at work, including extremely light accidents that may nevertheless disturb employees.

7. Keep 3-year records of the safety education given to new employees, to employees changing jobs, and to employees receiving special purpose education. These records should include the time and dates of the courses, the length, the names of the employees and the instructors, and the subjects taken. (This does not apply to special education outside the company.)

Train employees to recognise hidden danger

8. There can often be hidden dangers in the movement of people and machines. It is important to train employees to recognise such potential danger before anyone is injured. An effective way of doing this is the Four Round Method. This method consists of four stages or rounds:
 - a. Round 1: Get a good grasp of the facts.
 - b. Round 2: Search for the underlying problem.
 - c. Round 3: Work out countermeasures.
 - d. Round 4: Finalise action plans.

9. To organise training in this method:
 - a. Prepare leaders.
 - b. Arrange training dates.
 - c. Decide on roles for team members (leaders, secretaries, presenters and others).
 - d. Switch the roles among team members each time the training theme changes.

10. The actual training should consist of the following stages:
 - a. Practise the basic method in small groups (five to eight people).
 - b. Practice it using training materials and scenarios.
 - c. Train in the actual work situation.
 - d. Post notices about the method on workplaces and refer to them each day.
 - e. Attach tags or labels to machinery and equipment in the workplace with action and target words.

Figure 7.3a How to resolve problems using the Four Round Method

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. How safety conscious are the employees in your company? How do you know?
- b. Parag. 2 suggests seven questions to check your company's level of safety awareness. Is each question relevant to you? Are there any others that you would add to the list? Apply your final list of questions to your company. Consider each question in detail. What results do you get?
- c. What concrete steps could be taken to improve these results?
- d. Parag. 3: Apply the RADAR questions to these suggestions for promoting safety awareness.
- e. Parag. 5 suggests four times when safety education may be provided. Are these applicable in your company? What other times would you include?
- f. Parag. 6 suggests nine points that should be included in safety training for new employees. Would you include all of these? Would you add others to the list? How would you implement each of the items in your final list?
- g. Parag. 7: What is the value of keeping records of safety education? What records do you feel you should keep in your company, and for how long?
- h. Parag. 8: What kind of hidden dangers could be found in your company? Have you any system for trying to spot them? How effective is it?
- i. Parag. 8: Do you feel that the Four Round Method would be useful in your company. If so, how would you apply it to a typical example of hidden danger in your company?
- j. Parags. 9 and 10. If you feel this method is relevant to your company, apply the RADAR questions to using it.

Action plan

Draw up an action plan for introducing or improving safety education in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

7.4 Establish safety standards and regulations

Introduction

1. Every company should have safety standards and regulations to prevent accidents at work, to clarify job responsibilities in relation to safety, and to encourage employee initiative in undertaking safety activities. The company should:
 - a. Establish safety standards and regulations based on the law of the country.
 - b. Train employees in the safety standards.
 - c. Put instructions for operating machinery in writing to ensure that employees follow the standard procedures.

Establish safety standards and regulations

2. Establish safety standards and regulations based on the law of the country and taking into account the local culture and the special character of the workplace. These standards and regulations must be followed by every employee, and should cover the following:
 - a. Clothes.
 - b. Protective tools.
 - c. Operational procedures and methods.
 - d. Environmental maintenance.
 - e. Promotion of the 4-S.
 - f. Employee safety-related behaviour and activities.
 - g. Health maintenance and management.
 - h. Travelling to and from work.
 - i. Any other standards and regulations which may have been adopted at a particular business facility.
3. Decide which department will be responsible for establishing these standards and regulations, review them either continually or periodically, and keep records of the reviews. Decide also which forms will be used at different business facilities.

Figure 7.4a Classification of standards and regulations

Train employees in the safety standards

4. Train employees in the safety standards, especially in the following six areas:
 - a. Mechanical danger:
 - i. Primary movers and rotary shafts (use covers).
 - ii. Belt cutting.
 - iii. Loose processed goods and metal particles.
 - iv. Operational signals.
 - v. Presses and other machines.

- b. Transport vehicles: forklifts, in-plant vehicles, freight cars.
 - c. Fire, explosions etc.; prevention of natural fire, standards for working with fire.
 - d. Electricity: short circuits, hot-line work.
 - e. Handling freight etc: inspection of ropes, prohibition of uneven load distribution
 - f. Crashes and falls: protective floor covers and hand rails.
5. To make training in the safety standards as effective as possible:
- a. Use standards and regulations for individual machines and operations as teaching materials.
 - b. Restrict education to standards related to the operations concerned, and base training on written plans.
 - c. Include past experiences and examples in the lectures, group discussions and on-site studies.
 - d. Keep records of education and training as prescribed in Text 7.3.7.

Put procedures for operating machinery in writing

6. You should also put procedures for operating machinery in writing to make sure that employees operate, inspect and maintain machines and equipment according to the standards and not on the basis of their own personal judgment. Write down the procedures and instructions for each set of operations. These should cover:
- a. The materials, facilities, equipment and tools to be used.
 - b. The actions to be carried out in the operation.
 - c. The specific points to be noted during work.
7. In one company, for example, pre-operation inspections for forklifts are conducted before the start of operations each day. However, employees are permitted to conduct the inspections for the next day at the end of their work if their work allows. When inspections show that machines and equipment are unfit for use until they have been repaired, employees must put up a "Use forbidden" notice and ask management to bring in someone to repair them.

Figure 7.4b Pre-operation inspection records

8. In this example the following points are observed:
- a. Sheets for pre-operation inspections are used to record the results of daily inspections on a given machine for a period of three months.
 - b. Numbers appearing at the extreme left of the sheets represent dates. Numbers provided across the sheets correspond to inspection items described at the top.
 - c. The check marks \checkmark , \otimes , or "X" as prescribed in the margin of the sheets should be entered in the boxes.
 - d. Boxes marked with the X or a triangle must be reported to those in charge of forklift management (team leaders and others) for immediate repair request.
 - e. Those in charge of the management of the machines conduct the inspections and record the results.
 - f. The inspection sheets will normally be bound as a book and looked after by those in charge.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1 gives three types of safety control systems. Give two or three examples of how each of these might be applied in your company.
- b. Parag. 2. How many of these items do you already have regulations for. Which items on the list do you feel you should have new or revised regulations for?
- c. Parag. 2: How would you carry out a thorough review of the safety regulations for each of these items? What help would you need in doing so?
- d. Parag.4 gives six categories where safety standards should be established. Which of these are relevant to you? What others would you add to the list? How would you go about establishing such standards? What resources would you need?
- e. Parag. 5. Apply the RADAR questions to these proposals for providing education and training in the standards.
- f. Parag. 6: Does it often happen in your company that employees ignore the standards for performing operations and do them the way they think best? Is this a problem? If so, how do you deal with it?
- g. Parag. 6: Discuss the points that you would include in written procedures and operator instructions for a typical group of operations.
- h. Parags. 7 and 8 give an example of regulations for inspecting forklifts before operating them. Could these be applied to any of the machines in your company? Would you make any changes to them? What difficulties might you meet, and how would you deal with them?

Action plan

Draw up an action plan for improving safety regulations and standards in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

7.5 Set up safety committees and patrols

Introduction

1. There are two valuable organisational measures that a company can take to maintain a high level of safety:
 - a. Set up a safety committee.
 - b. Run safety patrols.

Set up a safety committee

2. A primary function of a safety committee is to discuss countermeasures and recurrence prevention measures whenever an accident occurs or some danger emerges. The key procedures are:
 - a. Members of the committee hold a meeting within 24 hours of an accident. The secretariat of the business facility should take part, and report the discussions to the committee in charge at that facility. (A business facility is any building or site in which a company carries out its operations.)
 - b. Ask the question “Why did those involved act in that way?” rather than “Why did it happen?”
 - c. Gather only information relevant to the identification of the cause of the accident - avoid theoretical judgments based on previous experience.
 - d. Do not interrupt explanations given by the individuals in charge of the sections where accidents occurred. Listen carefully to what they have to say.
 - e. In implementing countermeasures ask the 5 Ws and 1 H questions – who did what, where, when, why and how; check and record the progress of implementation.
 - f. The meetings may be held:
 - i. At business facilities (central safety and health committee meetings).
 - ii. At places of work (workplace safety and health committee meetings).Minutes of the meetings should be kept for at least three years.

Figure 7.5a Minutes of meeting to discuss countermeasures and recurrence prevention

Figure 7.5b The law relating to safety and health committees (page 18)

Run safety patrols

3. A safety patrol is a group of employees that goes round the building periodically to check that safety procedures are being followed:
 - a. Are safety signs, notices, and displays easy to see?
 - b. Are employees following the 5-S activities?
 - c. Are they doing anything that could cause danger?

The patrol should have the authority to point out improvements that need to be made. Employees should be able to inform the patrol of any machines, facilities, equipment or employee behaviour at other work places that could be a danger to them, and ask them to do a survey and make a diagnosis.

4. Guidelines for effective use of safety patrols:
 - a. Types of patrol:
 - i. Top executive/CEO patrol.
 - ii. Safety committee patrol.
 - iii. Department head or supervisor patrol within a workplace.
 - b. Procedures:
 - i. Patrol teams should be staffed by 5 to 10 employees, depending on the size of the business facility.
 - ii. Patrols should last for one or two hours.
 - iii. Check sheets should be used for points to be patrolled and diagnosed.
 - iv. Problematic areas and items for improvement should be clearly specified.
 - c. Patrol feedback:
 - i. The patrol submits patrol sheets and diagnostic sheets.
 - ii. It classifies cases into common problems and improvement points, and individual problems and improvement points.
 - iii. It asks those who have detected problems to submit written plans for improvement to the safety secretariat. These plans should specify countermeasures, the people to be in charge, and action deadlines.
 - d. Follow-up on results of safety patrols:
 - i. Check that the implementation of the countermeasures is on schedule.
 - ii. Provide counselling and assistance when problems arise.

Figure 7.5c Check sheet for safety patrols and diagnosis

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 2: Do you think that safety committees would be a good idea in your company? If so, what matters might they deal with and where might they be based? Include Figure 7.5b, The Law Relating to Safety and Health Committees, in your discussions.
- b. Parag. 2 presents guidelines for a meeting held after an accident occurs. Apply the RADAR questions to these guidelines in relation to a typical accident in your company.
- c. Parags. 3: What benefits can you see from having a safety patrol? How effective do you think it might be in your company?
- d. Parag. 4. Apply the RADAR questions to these guidelines for using safety patrols.

Action plan

Draw up an action plan for organizing safety committees, meetings and patrols in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

Figure 7.5b The law relating to safety and health committees

This is an example of safety regulations in company N.

Safety and health committee:

Article 9

1. All business facilities to which 50 or more workers belong on a full-time basis must establish either a health committee or a safety committee and organize a meeting of this committee at least once each month. *(Related laws: Labour Safety and Health Law Article 17, Article 18)*
2. Regulations set by business facilities prescribe organizational and administrative details of the safety and health committee.
3. Business facilities to which more than 10 and less than 50 workers belong are expected to establish a committee in a way that corresponds to item 1. above in order to achieve the objectives and perform the responsibilities described in Article 7.
4. Minutes of committee meetings must be kept on file for a period of three years.

Safety and health gatherings and others:

Article 10

1. Business facilities that cannot set up a committee described in the above article must set up monthly forums for listening to the opinions of workers about points related to their safety and health.
2. Minutes of safety and health gatherings must be kept on file for a period of three years.

Special committee:

Article 11

A health committee or a safety and health committee can set up a special committee to study, teach and discuss special items related to safety and health.
(Article 23-2)

7.6 Ensure facilities and equipment are safe

Introduction

1. Facilities and equipment can be sources of danger. To ensure that your facilities and equipment are as safe as possible take the following actions:
 - a. Carry out a thorough safety inspection when you purchase new facilities or equipment, or remodel or renovate existing ones.
 - b. Establish standards for the management and maintenance of facilities and equipment.
 - c. Watch out for abnormalities – for anything unusual.

Check the safety of new, remodelled or renovated facilities

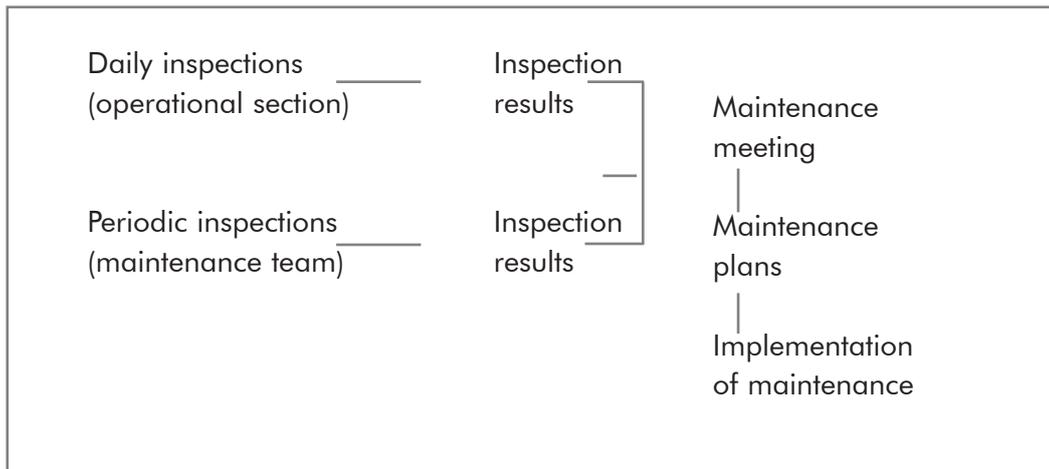
2. The departments responsible for designing facilities and equipment, receiving orders for them, or authorising them should give particular attention to safety features. They should carry out thorough safety studies before any new facilities and equipment are constructed or existing ones are remodelled or renovated. These departments will include:
 - a. Departments or committees at the business facility.
 - b. Departments and sections introducing new facilities and equipment.
 - c. Departments and sections who request remodelling or renovation.
3. Carry out safety checks at the following stages, using safety check sheets:
 - a. The design of the facilities and equipment.
 - b. The acceptance inspections (inspections carried out where the facility and equipment are manufactured).
 - c. When the facilities and equipment are set up or installed.
 - d. When final authorisation is given to use them.
 - e. When operation begins.
4. When a safety improvement is requested at one stage, do not move to the next stage until that improvement has been implemented. Use different safety check sheets for different facilities and equipment.

Figure 7.6a Sample safety check sheet

Establish standards for facility and equipment management and maintenance

5. Direct production facilities and equipment like lathes and grinders must be kept in optimal condition at all times, for both safety and efficiency. Establish standards that will protect them from damage, malfunction and deterioration. As well as reducing the risk of accidents, this will improve their operating ratio and the quality of products.

6. Establish maintenance standards for:
 - a. Planned maintenance as in this flow chart:



- b. Unscheduled maintenance to deal with malfunctions.
 - c. Periodic inspections, which may be daily, monthly or annual.
7. Keep maintenance records for each machine:
 - a. Store maintenance records by the machines.
 - b. Make effective use of this data for preventive maintenance.
 - c. Provide reference data to the maintenance committee.
 - d. Identify causes of malfunctions and standardize maintenance measures.

These records will provide a maintenance history of a machine, speed up the maintenance process, stabilize quality and prevent accidents.

Watch out for abnormalities – for anything unusual

8. When something unusual happens it can always mean danger. Always investigate why it has happened, and take whatever countermeasures are necessary. There are many abnormalities that can indicate danger:
 - a. Unusual movement of machines and equipment.
 - b. Strange noises.
 - c. Heat or vibration.
 - d. Changes in pressure.
 - e. A stop in the production cycle.
9. The most critical abnormalities are:
 - a. Sound or light alarms do not go off when they should, or when a production cycle stops.
 - b. Sound or light alarms go off when the machines and equipment are working normally.
 - c. Machines and equipment stop automatically or alarms activate even though values are within the designated levels.
 - d. Abnormalities in production cycles: values cannot be set back to the original figures, alarms do not activate etc.

Possible causes: When alarms go off at the wrong times or do not go off at the right times, they were probably not set according to the technical manuals or it was impossible to do so (e.g. oil pressure).

10. To correct abnormalities:

- a. Use inspection standards or written operational procedures to confirm that they are genuine abnormalities.
- b. Place a card that says “power supply must be turned off” beside switches when you are stopping machines to correct abnormalities. Put up a warning sign that clearly indicates that the machines or equipment are out of order.
- c. Always ask certified people to do any corrective work that requires certificates.
- d. People working together to correct abnormalities should always confirm any signals they receive from each other.
- e. Report abnormalities to superiors whenever necessary.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 2: Does your company have any plans to construct new facilities, or to remodel or renovate existing ones? Or has it recently done so? Which departments or individuals are responsible for this? What safety problems can such work bring?
- b. Parag. 3: How would you carry out safety checks at these five stages? What problems might you meet and how would you deal with them?
- c. Parag. 4: Read the sample safety check sheet in Figure 7.6a. Prepare a similar one for one of your machines.
- d. Parag 5: What are some of your typical problems in keeping your production facilities and equipment in good and safe condition? How do you try to solve these problems?
- e. Parag. 6 suggests three areas that maintenance standards could cover. What areas would you want to establish standards for in your company? What points might you include in these standards? How would you go about establishing these standards? (See Unit 8 Standardization for detailed guidelines on establishing standards.)
- f. Parag. 7 makes suggestions about keeping maintenance records for each machine. Apply the RADAR questions to these suggestions.
- g. Parag. 8 gives five examples of abnormalities that can indicate danger. Do any of these apply in your company? Are there others that you would add to the list? What are typical causes of your abnormalities?
- h. Parag 9: Have you experienced these types of abnormalities? Or similar ones? How have you dealt with them?
- i. Parag. 10: Apply the RADAR questions to these actions to correct such abnormalities.

Action plan

Draw up an action plan to introduce the ideas you have just discussed in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

7.7 Keep accident records

Introduction

1. Records are a valuable way of learning from past accidents and preventing them recurring. Use an accident report form to give the causes of the accident, and the measures taken to prevent similar accidents recurring. There are three main actions to take:
 - a. Fill in a full accident report form with all the details of the accident.
 - b. Classify and store the accident records.
 - c. Use the accident records to assess the accident rate. (See Text 7.8.2.)

Fill in a full accident report form

2. First, write a quick report of the accident as soon as it happens. Then hold a meeting to identify the causes and decide on countermeasures to prevent similar accidents in the future. After this meeting write up a full accident report, using an in-house form. This full accident report form should have sections for the following information:
 - a. The circumstances at the time of the accident: include columns for what happened, and where, when, who, why and how it happened, and with a space for a rough sketch of the accident.
 - b. The causes of the accident: include columns for material causes (unsafe conditions), human causes (unsafe actions) and managerial causes (unsafe systems or procedures).
 - c. Any other factors that contributed to the accident.
 - d. Countermeasures aimed at improvement: include columns for what measures should be taken, who should take them, how they should do so, and when they should have them finished.
 - e. Confirmation by safety managers that countermeasures have been carried out, with their comments.
 - f. Confirmation and approval of the countermeasures by superiors at work.The reports should be given to those concerned within 48 hours of the accident.

Figure 7.7a Accident report

Classify and maintain accident records

3. Keep permanent records of all accidents. These are valuable reference materials that lessons can be learned from. The sections in charge of maintaining the records are:
 - a. Company-wide storage: the secretariat of the company-wide safety and health committee maintains reports submitted by all departments within the company on work accidents. These reports can be used to compile company statistics.
 - b. Business facility storage: the secretariat of the safety and health subcommittee at the worksite maintains records of work accidents that occurred in that facility.

4. Classify these records as follows:
 - a. Incidents where there was not an actual accident but people were frightened.
 - b. Extremely light accidents: injuries can be treated by nurses and do not impede work.
 - c. Light accidents that allow work to continue: injuries must be treated by doctors, or doctors diagnose the injuries as presenting no problem if work restrictions are observed.
 - d. Accidents that require work suspension: injuries are judged by a doctor to require additional rest. The doctor must issue a certificate for paid leave.
 - e. Accidents that require work suspension and cause after-effects: injuries are judged by the doctor in charge as causing permanent disability. This is confirmed by another doctor from the appropriate public authority.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Does your company keep records of accidents at work? If yes, what form do they take, and are they useful? If not, what benefits do you think they might bring?
- b. Parag. 2 suggests six sets of information to include in an accident report form. Look at each of these, and decide how you could apply it in a similar form for your company. Are there any items you would leave out, or additional items you would include. For each item give examples of concrete information you might enter. What difficulties might you meet in designing such a form? And what problems might you or your colleagues have in using it?
- c. Parag. 3: If your company already keeps accident records how are they stored? Who keeps copies? Could your system be improved? What are the advantages of keeping records?
- d. Parag. 3 suggests how and where accident records should be permanently maintained. What would be the best places to keep them in your company?
- e. Parag. 4 suggests a classification for accidents. Would this system be relevant to your company? How would you adapt it? Give examples of accidents for each of your classifications.

Action plan

Draw up an action plan keeping and storing accident records in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

7.8 Set safety targets

Introduction

1. Accidents can always happen. The critical question for each company is how often they happen, and especially if they happen more often in your company than in other companies. Set safety targets to lower your accident rate. There are three actions to take:
 - a. Assess the accident rate in your company.
 - b. Set safety targets to improve your accident rate.
 - c. Check if these targets have been achieved.

Assess the accident rate

2. To assess the accident rate in your company, work out the accident ratio numerically and compare it with competitors and with the national average. Ratios may be calculated as follows:
 - a. Per 1,000: Ratio of injuries and deaths per 1,000 employees per year:
$$\frac{\text{Number of injuries and deaths per year} \times 1,000}{\text{Average number of employees}}$$
 - b. Frequency: ratio of injuries and deaths per 1,000,000 working hours:
$$\frac{\text{Number of injuries and deaths} \times 1,000,000}{\text{Total working hours}}$$
3. The following table shows statistics in Japan for fiscal year 1996 (these are accidents that caused deaths, or causes injuries where employees were off work for four days or longer).

Accidents in 1996	All industries	Mining	Manufacturing	Construction	Transport and communications
Per 1,000	4.560	6.168	2.832	3.000	10.200
Frequency	1.890	2.570	1.180	1.250	4.250

Set safety targets

4. Set numerical safety targets for the entire company and try to get everyone to work together to achieve them. Set the targets as high as possible – do not limit yourself to the levels of past or present achievements, but do not aim, either, for impossible levels.
5. You can set targets for:
 - a. Accidents at work (including traffic accidents on work assignments):
 - i. Accidents that stop work.
 - ii. Accidents that stop work and cause after-effects.
 - iii. Accidents that do not stop work.
 - iv. Extremely light accidents.

- b. Traffic accidents while travelling to work.
 - c. A safer working environment, e.g. less noise in the workplace.
6. Set your targets with reference to these criteria:
- a. The number of accidents each year.
 - b. The types of accident, the types of operations they occurred in, causes etc.
 - c. The frequency of accidents.
 - d. The seriousness of accidents.
 - e. The number of traffic accidents:
 - i. During work – by modes of transportation (walking, public transportation), by types of accident, by causes etc.
 - ii. While travelling to work – by modes of transport (walking, public transportation, or own cars), types of accident, causes, by places of work etc.

Check that the safety targets have been achieved

7. It is important to assess the progress that is being made towards achieving the safety targets. This will also allow every employee see what is being done to make the workplace safer, and where problems may still exist. Analyse the results by departments and sections etc. using Pareto diagrams to rank them, and the FTA (Failure Tree Analysis) method, and circular and bar graphs. (FTA is a technique that uses a tree-like diagram to analyze the routes, causes, and ratios of faults by tracing events back to their sources.)

Figure 7.8a and Figure 7.8b FTA analysis

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Do you know the accident rate in your company? If you do, how does it compare with other companies? If not, how do you think it compares? Do you think it could be improved?
- b. What do you think of the idea of calculating accident ratios in order to make an assessment of the company's accident rate?
- c. Parag. 2 suggests two ratios. Would these be useful in your company? Are there any others that would be preferable?
- d. Calculate your own accident ratios using whatever statistics you have at hand, or making a good guess as to what the statistics might be.
- e. Parag. 4: What would you think are the benefits of setting numerical safety targets?
- f. Parag. 5 suggests three categories that targets could be set for. Are these categories relevant to your company? Would you change any of them? Or add others?

- g. Parag. 6 presents sets of criteria for setting safety targets. Look at each of these and consider how you could apply them to setting your own safety targets. Apply them to typical examples of accidents in your own company using whatever information you have at hand.
- h. Parag. 7: What progress do you feel your company is making towards achieving greater safety? How could it do better? Do you think that your employees feel that enough is being done?
- i. Parag. 7: How would you go about analysing the results of your attempts to achieve safety targets using these methods?

Action plan

Draw up an action plan for introducing safety targets in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

7.9 Be prepared to deal with disasters

1. Disasters, fortunately, do not happen very often. However when they do happen, whether they be major accidents at work, fires in the company or the local community, or natural disasters like earthquakes, the results can be terrible – so be prepared. Set up an in-house organisation to prepare systems and train employees to deal with disasters.
2. This organization will be responsible for taking concrete action in any disasters that may occur, and for providing daily emergency training. Appoint regional leaders in all major departments and distribute responsibilities for communications and liaison, fire fighting, assistance in evacuation assistance, rescue, and transport.
3. Appoint people to the following jobs, depending on the size of your company:
 - a. The chief of headquarters is responsible for the training, instruction and supervision of fire-fighting leaders and their deputies.
 - b. Fire-fighting leaders direct and control regional teams, confirm the stage that evacuation has reached, and report injuries and other information to headquarters.
 - c. Communication and liaison officers report disasters to fire stations, disaster-handling centres, in-house departments and sections in charge of disaster management, and to disaster-handling leaders in their regions.
 - d. Fire-officers at departments and sections in charge rush to the sites of fire and perform early fire-fighting activities. Other fire-officers join them with fire extinguishers, under the direction of the fire-fighting leaders.
 - e. Evacuation assistance officers help all employees and visitors reach evacuation sites using in-house radio broadcasts, confirm the numbers of registered employees evacuated, and report these numbers to regional fire-fighting authorities.
 - f. Rescue officers rescue injured people, provide emergency protection and bring medicines for emergency treatment.
 - g. Transport officers remove important documents and objects (data disks and other items).
 - h. Protection officers move anyone who is obstructing evacuation and fire-fighting.
4. Make an assessment of your company's readiness to deal with disaster in terms of the following five stages:
 - a. First stage: You have company-wide goals, but virtually no self-directed activities.
 - b. Second stage: You recognise the issues that need to be addressed, but no self-directed activities have been undertaken.
 - c. Third stage: You have allocated roles, and employees have taken on self-directed activities in accordance with divisional, departmental, and sectional plans.
 - d. Fourth stage: You have allocated roles, and employees have taken on self-directed activities in cooperation with related departments and sections.
 - e. Fifth stage: You have allocated roles, and company-wide activities haven been undertaken vigorously.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Have you ever had a major disaster in your company? If yes, how well did your company deal with it? If you have not yet had a disaster, how well prepared are you to deal with one? How could your company make itself better prepared?
- b. Parag. 2 and 3: To what extent would such an in-house organization be possible in your company? Apply the RADAR questions to these suggestions and to the list of safety jobs.
- c. Parag. 4 suggest five stages of preparedness for a disaster. What stage do you think your company is at?

Action plan

Draw up an action plan for to prepare your company to deal with any disasters that could occur. You might like to follow the 6-point structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

Test

Answer these questions using **only** the information given in the text. For each question one, two or all three answers may be correct. Tick the answer or answers you think are correct for each question. Each question carries 3 points – you get one point for each correct answer that you tick, and one point for each wrong answer that you do not tick.

7.1 Mark emergency exits; put up warning signs

1. Set out and clearly mark:
 - a. Emergency sites.
 - b. Evacuation routes.
 - c. Emergency exits.
2. To indicate the emergency exits:
 - a. Put up guide signs to indicate evacuation routes.
 - b. Make sure that all emergency exits and evacuation routes are kept clear.
 - c. Install rope ladders and evacuation chutes on all floors.
3. Areas that are dangerous for employees to enter or go near are:
 - a. The area outside a certain range of operating machinery and equipment.
 - b. Construction sites.
 - c. Sites with movable facilities and equipment.
4. Fix danger signboards on:
 - a. Walls.
 - b. Fences.
 - c. Chairs.

7.2 Provide protective clothing and tools

5. Match protective clothing and tools with the operations, or operation contents:

a. Eyeglasses	1. Working at altitudes, or with forklifts
b. Masks	2. Organic solvents
c. Gloves	3. High temperatures
d. Helmets	4. Noise
e. Earplugs	5. Hot, sharp or pointed items
f. Protective uniforms	6. Specific chemical substances
g. Heat-resistant uniforms	7. Cutting, grinding and chipping

 - a. a5, b6, c2, d4, e7, f1, g3
 - b. a7, b2, c5, d1, e4, f6, g3
 - c. a7, b5, c2, d1, e4, f6, g3
6. To periodically check that protective clothing and tools are being used properly:
 - a. Record where protective gear is distributed for joint use, and where for individual use.
 - b. Check that protective gear conforms to the standards set by the business facility.
 - c. Keep records of periodic checks on the numbers of items of protective gear that are in use.

7. Examples of protective devices that halt operations or activate alarms include:
- a. Safety fences around apparatuses that are connected to each other.
 - b. Frontal sections of the blades of shearing machines.
 - c. Systems that prevent excessive winding of cranes.

7.3 Raise safety awareness

8. Checkpoints for promoting safety awareness include:
- a. Do superiors try to establish the kind of relationship that encourages employees to follow orders precisely?
 - b. Do employees try to follow the safety rules and do they encourage others to do so too?
 - c. Are there enough signs prompting employees to be safety conscious?
9. Actions to promote safety awareness include:
- a. Arrange study visits to model companies.
 - b. Provide safety instructions and reminders to employees at regular morning gatherings at least once a week.
 - c. Provide training on ways of recognizing potential dangers.
10. Formal safety education may be provided when:
- a. Employees begin to work in the company.
 - b. Employees are about to move to another company.
 - c. Employees are preparing for new qualifications.
11. General safety courses should cover the following points:
- a. Reporting abnormalities.
 - b. Methods for handling materials.
 - c. Methods for reporting the use of the 4S.
12. The "Four Round Method" is an effective way of training employees to recognize the ... in the movement of machines, equipment and people.
- a. Obvious risks.
 - b. Hidden dangers.
 - c. Most effective methods.
13. The basic Four Round Method includes two of the following:
- a. Get a good grasp of the facts.
 - b. Search for the underlying problem.
 - c. Report results to the safety committee.

7.4 Establish safety standards and regulations

14. Safety standards and regulations should:
- a. Be based on the law of the country.
 - b. Take into account the local culture.
 - c. Take into account the special character of the workplace.
15. Safety standards and regulations should cover:
- a. Operational procedures and methods.
 - b. Travelling to and from work.
 - c. Clothes.

16. Written procedures for operating machinery should cover:
- a. The materials, facilities, equipment and tools to be used.
 - b. The names of the supervisors of the operations.
 - c. The specific items to be noted during the operations.
17. Employees should be trained in safety standards in six areas. Match the areas with the examples.
- | | |
|------------------------|--|
| a. Mechanical danger | 1. Short circuits, hot-line work |
| b. Transport vehicles | 2. Primary movers and rotary shafts |
| c. Fire and explosions | 3. Inspection of ropes; prohibition of uneven load distribution |
| d. Electrical danger | 4. Protective floor covers and hand-rails to prevent crashes and falls |
| e. Handling freight | 5. Prevention of natural fire; standards for working with fire |
| f. Crashes and falls | 6. Forklifts; in-plant transport vehicles; freight cars |
- a. a2, b3, c5, d1, e6, f4
 - b. a2, b6, c3, d1, e5, f4
 - c. a2, b6, c5, d1, e3, f4
18. To make training in the safety standards as effective as possible:
- a. Restrict education to standards related to the operations concerned.
 - b. Do not use standards and regulations for individual machines as teaching materials.
 - c. Keep records of education and training.

7.5 Set up safety committees and patrols

19. A meeting held after an accident occurs should include the following
- a. Ask the question "Why did it happen?"
 - b. Do not interrupt explanations given by the individuals in charge of the sections where safety deficiencies occurred.
 - c. Gather only information relevant to the cause of the accident.
20. Safety committees may hold meetings:
- a. At business facilities.
 - b. In government organizations.
 - c. At places of work.
21. A safety patrol should be carried out:
- a. Daily.
 - b. Weekly.
 - c. Periodically.
22. When an employees feel that machines, facilities, equipment and behaviour at another workplace are a source of danger to them, they may:
- a. Request the patrol to do a survey and make a diagnosis.
 - b. Diagnose the situation and request the patrol to do a survey.
 - c. Stop all contact with the other workplace until they deal with the situation.
23. Safety patrols should:
- a. Last for one or two hours.
 - b. Be staffed by two or three employees.
 - c. Be staffed by five to ten employees.

7.6 Ensure facilities and equipment are safe

24. Facility safety checks should be carried out at the following stages:
 - a. Design.
 - b. Acceptance.
 - c. When operation begins.
25. Establish standards that will protect equipment such as lathes and grinders from:
 - a. Damage.
 - b. Functional deterioration.
 - c. New employees.
26. To keep maintenance records for each machine:
 - a. Store maintenance records in the facility office.
 - b. Make effective use of the data for preventive maintenance.
 - c. Identify causes of malfunctions and standardize maintenance measures.
27. Abnormalities that may have safety implications include:
 - a. Unusual movements of operators.
 - b. Strange noises.
 - c. Changes in pressure.
28. To correct abnormalities:
 - a. Try to ask certified individuals to perform recovery and restoration tasks that require certificates.
 - b. Place a card that says "power supply must be turned off" around switches, when suspending the operation of machines and equipment.
 - c. Report abnormalities to superiors at work whenever necessary.

7.7 Keep accident records

29. An in-house report form should include two of the following:
 - a. The circumstances at the time of the accident.
 - b. The costs of the accident.
 - c. Confirmation that countermeasures have been implemented.
30. Causes of an accident can include:
 - a. Unsafe actions.
 - b. Unsafe human factors.
 - c. Unsafe records.
31. Accident records should be kept by:
 - a. The secretariat of the company-wide safety and health committee.
 - b. The section in charge of facility and equipment maintenance.
 - c. The secretariat of the safety and health subcommittee at the worksite.
32. Classification of accidents includes:
 - a. Accidents that require work to stop.
 - b. Accidents that allow work to continue.
 - c. Accidents that require work to stop and cause after-effects.

7.8 Set safety targets

33. To assess the accident rate in a company, work out the accident ratio numerically and compare it with:
- a. Competitors.
 - b. Other departments.
 - c. The national average.
34. When setting safety targets:
- a. Set the target levels as high as possible.
 - b. Do not aim for levels that are impossible.
 - c. Set targets levels at past or present achievement levels.
35. Set safety targets with reference to these criteria:
- a. The number of accidents each month.
 - b. How often accidents occur.
 - c. How serious the accidents are.

7.9 Be prepared to deal with disasters

36. Match jobs with duties:
- | | |
|---|---|
| a. Fire-fighting leaders | 1. Remove important documents and objects (data disks and other items). |
| b. Fire-fighting officers at departments and sections in charge | 2. Direct and control regional teams, confirm the stage that evacuation has reached, and report injuries and other information to headquarters. |
| c. Transport officers | 3. Rush to the sites of fire and perform early fire-fighting activities. |
- a. a2, b3, c1 b. a1, b3, c2 c. a2, b1, c3
37. Match stages of readiness to deal with disaster with content:
- | | |
|-----------------|--|
| a. First stage | 1. Roles are distributed and self-directed activities are undertaken in accordance with divisional, departmental, and sectional plans. |
| b. Second stage | 2. Roles are distributed and company-wide activities are undertaken vigorously. |
| c. Third stage | 3. Issues to be addressed are put in order, but there are no self-directed activities. |
| d. Fourth stage | 4. There are company-wide goals, but virtually no self-directed activities. |
| e. Fifth stage | 5. Roles are distributed and company-wide activities are undertaken in cooperation with related departments and sections. |
- a. a4, b3, c1, d5, e2 b. a4, b1, c3, d2, e5 c. a4, b3, c2, d5, e1

Unit 8

Standardization



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Unit summary

Standardization is an essential tool for maintaining and improving quality in a company. A standard is a written description of the best way to do a job, carry out an operation, or complete a process. Its purpose is to ensure that jobs, operations and processes are always carried out in the same way. It can also refer to the specifications of a product. The concept of standardization appears in many different units. In this unit we will be dealing with operation standards.

8.1 Introduce operation standards and work instructions

Draft and implement standards for all your company's operations and procedures. Then prepare work instructions, based on these standards, for employees to use in their jobs. To introduce standards effectively in your company you will need to:

- a. Be clear about the purpose of standards.
- b. Recognise the range of items that may be included in a standard.
- c. Decide on the procedures you will follow to introduce standards in your company.
- d. Prepare work instructions from the standards.

8.2. Maintain the standards

When standards have been drafted and implemented, there are three important ongoing actions to take:

- a. Make sure that employees are following the standards.
- b. Keep the standards up-to-date.
- c. Use the standards to check that operations have been carried out correctly.

8.3. Educate and train your employees to follow the standards

Standardization will greatly improve quality in your company – but only if employees always follow the standards. There are three reasons why they may not follow them:

- a. They do not know them: this is a problem of knowledge.
- b. They cannot do the operations correctly: this is a problem of skill.
- c. They will not follow them: this is a problem of motivation.

8.4. Organize standards on a company-wide basis

When standards have been established for all the operations in a company, there will probably be a lot of them. Some may easily be lost or duplicated or may contradict other standards. To avoid this, organise standards carefully on a company-wide basis; classify them; decide who has the authority to establish, revise, or withdraw them; and draw up rules to govern all this.

8.5. Assess and promote standardization

If standards are to make a lasting and effective contribution to quality, three important actions need to be taken:

- a. Set up a system to regularly assess standardization throughout your company.
- b. Set up a unit to promote standardization.
- c. Involve employees in continuously improving standardized operations.

Learning tools

The RADAR questions

As you read each text you will discuss how it could be applied in your company. The RADAR questions will help you to focus this discussion:

- R** - Are these ideas **relevant** to my company?
- A** - How would I **apply** each of them in my company?
- D** - What **difficulties** might I meet and how would I overcome them?
- A** - Are there any **additional** actions that I might take that are not mentioned in the text?
- R** - What **resources** would be needed, what would these cost, and how could they be acquired?

There will of course be some discussion points where not all of these questions will be applicable.

The 6-Point Structure

After you have discussed the ideas in the text, you write an action plan in which you present practical proposals for implementing the conclusions you have reached in your discussion. The 6-Point Structure will help you to write your action plan:

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts, tables etc. that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these could be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

8.1 Introduce operation standards and work instructions

Introduction

1. An operation standard is a written description of the best way to carry out an operation or a process so that it will always be done in the same way. Draft and implement standards for all your company's operations and procedures. Then prepare work instructions, based on these standards, for employees to use in their jobs. To introduce standards effectively in your company you will need to:
 - a. Be clear about the purpose of standards.
 - b. Recognise the range of items that may be included in a standard - its contents.
 - c. Decide what procedures you will follow in introducing standards in your company.
 - d. Prepare work instructions from the standards.

The purpose of standards

2. A standard has five main purposes:
 - a. To ensure that an operation is done in the same way by every employee, and to the highest level of quality.
 - b. To identify the key points to monitor in an operation in order to prevent production problems and non-conforming products (products that are not of the right quality).
 - c. To facilitate improvements in operations by stating what exactly the operations are.
 - d. To improve operator efficiency.
 - e. To keep every level of the organization up to date with the operations in use.

The contents of a standard

3. An operation standard may contain any of the following categories of information, depending on the type of operation:
 - a. Scope – the part of the operation covered by this standard.
 - b. Operation procedures and cautionary remarks: pre-operational checks, preparatory operations, main operations, and final operations.
 - c. The sequence of the manufacturing process.
 - d. Operating conditions (location, safety aspects, temperature etc).
 - e. Materials and parts used in the operation.
 - f. Equipment, jigs, tools and measuring devices used.
 - g. A sketch of the control panel.
 - h. Inspection procedures.
 - i. Actions when out-of-control events occur (events well outside the control limits of what is acceptable).
 - j. Operation report.
 - k. Boundary samples (for use in sensory inspection).
 - l. Operators: who does it?
 - m. Operator's qualification.

- n. Standard operation hours – how long does it take?
- o. Related standards.
- p. Other items.

Procedures for introducing standards

4. You will need to decide:
 - a. What procedures you will use to draft, establish, revise, file and abolish standards, and to inform employees of the latest standards.
 - b. Who is to be in charge of these procedures.
 - c. The basic format and style of the standards.
 - d. The specific content of each standard, its title and any symbol you might use with it.
 - e. How to classify the standards in groups, and the classification numbers. Classify standards on a company-wide basis to prevent them being duplicated or contradicting each other. (See Text 8.4.)

Figure 8.1a Control criteria for company standards

Classification	Class symbol	Contents	Person responsible for establishing	Distributed to
Product standard				

Figure 8.1b Operations standard

5. In drafting the standards make sure that:
 - a. The instructions are such that, when followed, non-conforming products will not be produced.
 - b. They are easy to implement.
 - c. They are as simple as possible. Too much documentation lowers productivity.
 - d. They indicate procedures for practical actions.
 - e. They include methods and criteria to evaluate the quality of the products.
 - f. They make clear the scope of responsibility, and the authority for implementation and revision. Authority should be delegated as much as possible.
 - g. They optimise the whole production process, and not just parts of it.

Prepare work instructions

6. A work instruction is a clear, simple written description of the daily production plans and related information, based on the standards, that is given to the employees before they begin operations. It is always a good idea to meet employees before they begin an operation and go over the work instructions with them. In any case, employees should always read them before they begin operations.
7. A work instruction specifies who should do what, when, where, why and how (5W1H). It should include:

- a. The names of the employees who will do the work.
- b. The machinery and material they will use.
- c. The method they will use.
- d. The environment in which they will do it.

In TQM this is referred to as 4M1E (men, machinery, material, method, environment).

Include columns for the results of operations: the hours worked, the values or quantity of items completed, the quality characteristic values, and any abnormalities or defects.

These columns may then be included in operation reports.

8. A work instruction may be written on:
 - a. A work instruction sheet.
 - b. A bulletin board.
 - c. An illuminating board (showing the operation number, and key points of operation in automated manufacturing lines).
 - d. An operation slip (to accompany individual products, or each lot of products).
9. Always include the numbers of the operation standards in the work instruction, since the detailed work methods are given in the operation standards, and it may be necessary to refer to these.

Figure 8.1c Work instruction sheet A

Figure 8.1d Work instruction sheet B

10. The box on page 8 presents a variety of typical manufacturing standards.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 2: How does an operation standard ensure that an operation is always done to the highest level of quality?
- b. Parag. 3: Look at the list of possible categories of information that could be on an operation standard. Think of some operations in your department and discuss these questions:
 - i. If you already have standards, which of these categories are already included?
 - ii. Which would you add to your standards?
 - iii. If you do not yet have written standards, which categories would you put in new written standards?
 - iv. Are there any additional categories that you might add for any of these operations?
- c. Parag. 4: Apply the RADAR questions to these guidelines for introducing standards.
- d. Parag. 5: How important do you think each of these guidelines would be for your company?

- e. Parags. 6, 7, 8 and 9: Do you already give written work instructions to your employees? If yes, how effective is your system? How could it be improved? If not, what benefits do you think such a system would bring to your workplace?
- f. Apply the RADAR questions to these proposals for using work instructions.
- g. Look at Figure 8.1c, the work instruction sheet. Prepare a similar sheet for one or two of the operations in your own company.
- h. Parag 10. Which of the standards in Box 1 do you already have? Which would it be useful to have?

Box 1 Typical manufacturing standards

- a. **Product standards** define the quality requirements that a product must satisfy. They specify a realistic quality level, given the current level of technical skill in the workplace. They are established by senior management.
- b. **Raw material standards** specify the raw materials that are used to produce goods that will meet the product standards. They should:
 - i. Make clear the quality characteristics of raw materials (the ingredients, structure, shape, size, weight, conductivity, melting point, boiling point, container, etc.).
 - ii. Define the purchasing specifications for raw materials.
 - iii. Specify the procedures for inspecting incoming raw materials.
 Note: Raw materials include parts and supplementary materials.
- c. **Inspection standards** describe the test categories, inspection methods, evaluation standards, etc., for raw materials, work-in-process (WIP), and finished products.
- d. **Job standards** describe the work procedures for production, (including the operation of equipment), inspection, shipping and transportation, working conditions, safety issues, etc.
- e. **Standards for maintaining equipment** describe the methods for inspecting, maintaining, and preserving equipment.
- f. **Standards for maintaining measuring devices** describe the identification, calibration, maintenance of accuracy, and control methods for measuring devices.
- g. **Packaging standards** describe the methods for packaging products and WIP, and give the specifications, and identification methods for packaging materials, etc.
- h. **Work standards** define the broader business rules, procedures, methods and report formats.
- i. **Supplementary standards** are additional standards which include work procedures, operation procedures for equipment, operation procedures for measuring devices, work instructions, safety instructions, and one-point lectures used for basic training.
Examples: Figure 8.1e Work card, Figure 8.1f Quality card, Figure 8.1g One-point lecture, Figure 8.1h One-point lecture.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured plan for introducing standardization in your company. You might like to follow the 6-Point Structure.

8.2 Maintain the standards

Introduction

1. When standards have been drafted and implemented, there are three important ongoing actions to take:
 - a. Make sure that employees are following the standards.
 - b. Keep the standards up-to-date.
 - c. Use the standards to check that operations have been carried out correctly.

Make sure that employees are following the standards

2. First of all educate employees to use the newest standards correctly (see Text 8.3). Then set up a method of checking that they are using them. Do this systematically. Find out in each workplace what percentage of operations are using newly established standards (including old standards that have been revised) and then find out what percentage of these are being followed. If they are not being followed, find out why, and then take whatever steps are necessary to make sure that they are followed in every operation.

Keep the standards up-to-date

3. Draw up rules to make sure that the standards are maintained and revised properly. There are a number of actions you can take.
 - a. Carry out periodic reviews to see how the standards have been implemented, and how effective they are.
 - b. Revise standards whenever:
 - i. There are changes in the production process.
 - ii. Out-of-control events occur even though operations are carried out according to the standards. (These are events well outside the control limits of what is acceptable.)
 - iii. There are changes in outside conditions, such as raw materials, equipment, or target quality.
 - c. Put a person with practical experience in charge of establishing and revising each standard. Include his name in the standards and delegate the necessary authority to him.
 - d. Include in each standard the dates when it was established and revised.
 - e. Be sure to remove from the workplace any operation standards that are no longer in use.
4. Include notes with each standard giving the history of its establishment and revision. These notes may include:
 - a. Controversial items found during the review.
 - b. Explanation of items specified in the standards.
 - c. The rationale for the standard values, and for the classification of the standard.
 - d. Relationship with external standards if any.
 - e. Any design changes that have been made.
 - f. Issues that have to be decided, including future policies.
 - g. Any experimental data.

Use the standards to check that operations have been carried out properly

5. To do this you will need to have:
 - a. Methods for checking operations and confirming that they have been carried out correctly.
 - b. Rules for handling things that do not go according to plan – when the quality characteristics of products are not what the standards say they should be. These are known as abnormalities or out-of-control events.

6. There are two ways of checking:
 - a. Cause-factor check: Check if operations have been carried out according to the standards. If not, find out why and take whatever action is necessary. This could mean reviewing the standards. To review the standards, compare the quality characteristics specified in the standards with the quality characteristics of the products that have been produced according to the standards.
 - b. Effect-factor check: Check if the effects (or results) of the operations – the quality characteristics of the products - satisfy the standards. When abnormal quality characteristic values appear, find out the cause. If necessary, investigate the operation conditions (e.g. raw materials, equipment or target quality) and revise the standards.

7. The methods for carrying out these checks should be stated clearly in the operation standard sheet or QC process chart. The main points to decide are:
 - a. Who is to check what, how frequently, where, and how.
 - b. The sampling and measuring devices to be used.
 - c. The handling methods to use when abnormalities occur.
 - d. The boundary samples to be used, if these are needed.When the checks have been completed write up reports of what has been done, and have these confirmed by supervisors or managers.

8. Use control charts to provide ongoing monitoring of the process check points. This will help to stabilise the manufacturing process, and show where further improvements may be needed.

Figure 8.2a QC Process chart

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

Make sure that employees are following the standards

- a. Parag. 2 emphasises the need to take a systematic approach to checking if employees are following the standards. Use the best information you have at the moment to suggest answers to the following questions:
 - i. What are the total number of operations in your department or company?
 - ii. How many of these operations have standards been established for?
 - iii. What percentage is this?
 - iv. In what percentage of these operations would you say that standards are being followed?
 - v. What would you say are the main reasons they are not being followed?
 - vi. What would be appropriate actions to take in some of these cases?
 - vii. Are you satisfied with this percentage? Can it be improved?
 - viii. Are there any problems that make it difficult to improve this percentage? How could you solve them?
- b. Apply the RADAR questions to these suggestions for making sure that employees follow the standards.

Keep the standards up-to-date

- c. Parags. 3 and 4 describe what to do to keep standards up to date. Discuss the following questions:
 - i. How often do out-of-control events occur in your department or company?
 - ii. How many of these occur even when you are sure the standards are being followed?
 - iii. What are typical changes that you may have in conditions related to an operation, e.g. in raw materials, equipment or target quality? What effects can these have on operations?
 - iv. How do you go about changing the operations because of these changes in conditions? How do you make sure that employees carry out the new operations correctly?
 - v. How often do you review your standards? Who is in charge of revising them, or who would you put in charge?
- d. Parag. 4 contains a list of notes that might be put in a revised standard. Which of these might you include in some of your revised standards?
- e. Parags. 3 and 4: Apply the RADAR questions to these guidelines.

Use the standards to check operations

- f. Parag. 5:
 - i. How often do you check that operations have been carried out correctly? What methods do you use to do the checks?
 - ii. How often do you find that operations have not been carried out correctly? What are typical things that have not been done correctly? What are typical causes?
 - iii. What do you do when you find that operations have not been carried out correctly? Do you often have to change the operations? How do you get the employees to change the way they carry out the operations?

- iv. If you have written standards, how often are the results of an operation different from what the standards say they should be? What are some typical examples of such differing quality characteristics? And what are typical causes?
- v. Have you got criteria for actions to take when such abnormalities appear? If not, what criteria might you use?
- g. Parags. 6, 7 and 8. Apply the RADAR questions to these guidelines for using the standards to check that operations have been carried out properly. Include Table 8.1 QC Process Chart in your discussion.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare a larger action plan after you have discussed several more texts.

8.3 Educate and train your employees to follow the standards

Introduction

1. Standardization will greatly improve quality in your company - but only if employees always follow the standards. There are three reasons why they may not follow them:
 - a. They do not know them: this is a problem of knowledge.
 - b. They cannot do the operations correctly: this is a problem of skill. This can be a reason why defective products occur even when the operator follows the standard.
 - c. They will not follow them: this is a problem of motivation.
2. To ensure that your employees have the necessary knowledge, skills and motivation, you should:
 - a. Educate them in the value and use of standards.
 - b. Provide the technical training needed to carry out the operations.
 - c. Provide training in quality consciousness.
 - d. Audit operations periodically.

Educate employees in the value and use of standards

3. Educate employees in the value and use of standards so that they will:
 - a. Be able to read and understand the standards and work instructions.
 - b. Recognise the importance of standardisation in maintaining quality, and realise that operations must always be carried out according to the standards.
 - c. Understand the quality level that is to be reached in the manufacturing process.
 - d. Understand the methods to be used to confirm that these quality levels are reached, and the measures to be taken when they are not.

Provide technical training

4. If a system of standardization is to be fully effective, employees must of course be able to carry out the standardized operations. These operations, however, may require technical skills that they do not have – nor can they be left to pick up these skills on their own. Managers should look carefully at the standards and systematically identify which skills are needed, and to what level:
 - a. Define three to five levels of skills.
 - b. Assess the current skills that operators have.
 - c. Set the target level of skills that they should reach.
 - d. Make clear to employees the methods that will be used to evaluate the new skills
 - e. Begin training.
 - f. Retrain operators whenever operation methods are changed.
5. Training methodology. There are two ways to provide technical training: on-the-job training (OJT) during operations, and off-the-job training (OFT) before and after operations. OFT can be used to provide training in practical skills, technical education, and awareness training. OFT can include workshops and group discussions, as well as

the more traditional lectures. Standardize the methods of training, and always use common, everyday terminology. When training is completed, check the level that the employees have achieved. If necessary carry out re-training, and record the results.

Figure 8.3a Formatting the results of education and training

Title of Standard	Standard No.	Date of establishment and revision	Part revised	Date education provided	Name of operator	Key points of education and training	Evaluation

6. Benefits. By providing operators with systematic and continuous training in operations, you will ensure that equipment is used better, that quality is maintained and improved, that productivity is raised, and that safety is improved. (See Unit 12 for more detailed guidelines on education and training.)

Provide training in quality consciousness

7. If employees are to make a maximum contribution to quality, they need to be trained in quality consciousness. They should become familiar with several key quality concepts:
 - a. Recognising quality characteristics. Train employees to recognize the important quality characteristics of their products and job procedures, and to be committed to producing only quality products. They should be aware that defective products decrease work efficiency, increase costs, and break delivery promises - and ultimately destroy customer confidence.
 - b. The person in the next process is your customer. They should think about the employee in the next production process as their customer - think of how the quality of their work may effect the quality of that person's work.
 - c. Tidiness and cleanliness. Consciousness of quality is also important at the level of tidiness and cleanliness. Employees should always follow the 5S (from their Japanese names – see Text 6.2):
 - i. Seiri (organizing): separate necessary and unnecessary items and eliminate the latter.
 - ii. Seiton (keeping things neat): store necessary items in their designated place so that they can be easily found.
 - iii. Seiso (cleaning): remove dirt and rubbish from the workplace.
 - iv. Seiketsu (cleanliness): clean the workplace systematically and prevent dirt recurring.
 - v. Shukanka (make cleanliness a habit): train employees in these practices and attitudes so that they become a habit.

8. There are various ways that managers can encourage employees to develop an overall quality consciousness:
 - a. Be well informed themselves of the present quality level of production: the ratio of defects, process capability etc.
 - b. Ensure that all the employees are aware of this quality level: hold periodic meetings and pre-work meetings. Get everyone to see quality as a common issue.
 - c. Make good use of QC circle activities.
 - d. Use every opportunity to promote quality consciousness. State “quality first” on corporate policy documents, and encourage employees to develop posters and slogans that can be put on display.
 - e. Remind employees of these 5S rules in a concrete way whenever a good opportunity arises.

They should also try to establish a system where it is impossible for practical products to be sent on to the next process.

Figure 8.3b Promotion to raise quality consciousness

Audit operations

9. Supervisors and those responsible for quality control should carry out periodic audits of operations, to confirm that operations are being carried out according to operation standards. If they are not, decide whether to revise the standards, re-educate, re-train or re-motivate the operators, and perhaps to review the training program.

Figure 8.3c Formatting the results of education and training

Figure 8.3d Skills evaluation sheet

Name of operator:		Date checked:		Person responsible:		Checked by:
Skill item		Level attained				Score
		0 Cannot use	1 Can use equipment when it is adjusted	2 Can set and adjust equipment according to parameter table	3 Can trouble-shoot equipment	

(Note that each skill item should be evaluated by the supervisor on the basis of both observation and the results of the operation i.e. the workmanship of the product.)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

Introduction

- a. Do employees in your company always follow the standards? If not, what do you think the main reasons are that they do not? How could you deal with these reasons?
- b. Parag. 2. Do you already provide any of these forms of training? If so, how effective are they? Where do they need to be improved? If not, how useful would it be to have them in your company?

Educate employees in the value and use of standards

- c. Parag. 3: How relevant are these educational objectives to your company? How would you go about achieving them?

Provide technical training

- d. Parags. 4 and 5: How capable are your employees of carrying out the operations that are, or will be, described in the operation standards? Apply the RADAR questions to these guidelines for organising technical training.
- e. Parag. 6. Think of concrete examples of benefits that you would like training to bring to your company in:
 - i. Ways that equipment could be used better.
 - ii. Areas where you would especially like to see quality improved.
 - iii. New productivity levels that you would like to reach.
 - iv. Improvements in safety that would avoid most injuries.

Provide training in quality consciousness

- f. Parag. 7a: Discuss ways in which defective products in your company can
 - i. Decrease work efficiency
 - ii. Increase costs.
 - iii. Break delivery promises.
 - iv. Destroy customer confidence.
- g. Parag. 7b. Consider the concept of “the person in the next process is my customer”. Think of instances when work was slowed up in one or two processes because of what had gone wrong in the previous process.
- h. Parag. 7c: Look at the definitions of the 5S. Apply the RADAR questions to introducing these in your company.
- i. Parag. 8: Look at the five ways that managers can encourage employees to develop an overall quality consciousness. Discuss the following:

- i. What is the present production status in your area? Would it be difficult for you to keep up-to-date with it?
- ii. How could you get everyone to think about the production status? How would periodic and pre-work meetings help? Would they be difficult to organise? If so, in what other ways could you get people to think about the present work situation?
- iii. Do you already have QC circles. If not see Unit 7 for more information about them.
- iv. How do you think your employees would respond to a request for ideas for posters and slogans to promote quality consciousness? Would it be good if they did so? How could you encourage them to come up with ideas? In what other ways could you get them to think more actively about quality?
- v. What kind of system could be introduced on your workplace that would make it impossible for defective products to be sent on to the next process?
- vi. How useful would Figure 8.3b Promotion to raise quality consciousness, be in your company. Would you make any changes to it?

Audit operations

- j. Parag. 9. How useful do you think this Skills Evaluation Sheet in Figure 8.3d would be in you company? Would you make any changes to it?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan to cover the ideas discussed in several texts.

8.4 Organize standards on a company-wide basis

1. When standards have been established for all the operations in a company, there will probably be a lot of them. Some may easily be lost or duplicated or may contradict other standards. To avoid this, organise standards carefully on a company-wide basis; classify them; decide who has the authority to establish, revise, or withdraw them; and draw up rules to govern all this.
2. Rules governing the use of standards will vary depending on the type of industry and the size of the company, but normally they will contain:
 - a. Basic rules for the general use of standards.
 - b. Rules for product and manufacturing standards.
 - c. Common rules for formatting and classifying standards.
3. The basic rules will include:
 - a. Rules for basic policies.
 - b. The roles of top and middle managers.
 - c. How to set up committees.
 - d. The role of promotional departments.
 - e. The roles of all departments.
 - f. How to promote policy management, education, the use of statistical methods, standardization, diagnosis and the utilization of QC circles.
4. The rules for product and manufacturing standards include rules, standards and specifications.
 - a. Rules specify quality level and inspection items (the points that are examined in an inspection) for products and raw materials.
 - b. Standards specify criteria, sequences, procedures and methods in design, manufacturing and inspections.
 - c. Specifications document the manufacturing and testing methods. They are used mainly in transactions with other businesses.
5. Common rules specify the formatting of standards, and their classification, and the numbering system, units, symbols, graphic symbols, and terminology used.

Look at Figures 8.4a, 8.4b and 8.4c. These tables are an important part of this text, otherwise you will find it rather abstract. Note also that the distinction in meaning between “rules” and “standards” and “specifications” is rather fine. You may find it more practical in your discussion to use the word “rules” for all of these. (Remember too that one can speak of “standards for organising standards”.)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Focus especially on Figures 8.4a, 8.4b and 8.4c. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: Do you already use standards throughout your company? If so, do you experience any problems with standards being lost, duplicated or contradicting each other? List some examples.
- b. Parag. 4: The rules for product and manufacturing standards are in a separate category. Why do you think this is?
- c. Look carefully at Figures 8.4a, 8.4b and 8.4c. Would it be useful to prepare similar tables for your company? If so, how would you do so?

Action plan

Draw up an action plan for introducing a system for organising and classifying standards in your company, using the 6-Point Structure. Alternatively you may choose to prepare one action plan to cover the ideas discussed in several texts.

8.5 Assess and promote standardization

Introduction

1. If standards are to make a lasting and effective contribution to quality in your company, there are three important actions to take:
 - a. Set up a system to regularly assess standardization throughout your company.
 - b. Set up a unit to promote standardisation.
 - c. Involve employees in continuously improving standardised operations.

Set up a system to regularly assess standardisation throughout your company

2. This system should be set up by a top manager and senior managers from each department and should be run by a company-wide quality control committee and departmental quality control committees. Use the system to periodically check if standardization has been implemented as planned and is functioning properly.
3. Carry out company-wide assessment at least once a year, and departmental assessment at least once every six months. Inform each department in advance of the important items on which its assessment will be based. These assessment items may include:
 - a. Standards related to claims, quality and similar matters.
 - b. Standards related to new or modified products and operations.
 - c. The percentage of standards that have been established and implemented.
 Keep minutes of discussions for future reference and action.

Figure 8.5a Sample of minutes

Workplace					
Date	Assessors	Participants	Agenda	Result of discussion	Instruction items
03.9.01	President, general manager X, general manager Y	Section manager, deputy section manager, workplace leader, workplace sub-leader	Painting is not uniform. 20,000 units to be recalled for repair.	Standards relating to painting to be reviewed.	Compressor gun pressure to be changed (pressure change of +/- 10% to be studied). Specifications of paint gun to be changed (by Sept. 20).

Set up a unit to promote standardization

4. Form a company-wide quality control committee, headed by a top manager, to promote standardization throughout your company. This committee should plan, assess, promote and provide education in standardization. It should appoint a secretariat, and should aim to involve all employees in promoting company-wide quality control. Department committees should also be formed, each headed by a senior departmental manager and with a departmental secretariat.
5. The company-wide secretariat and the departmental secretariat should carry out the following actions as instructed by their committees:
 - a. Plan standardization.
 - b. Maintain the standards system.
 - c. Monitor how standardization is progressing.
 - d. Plan and implement assessment.
 - e. Plan and implement education and popularisation.

Figure 8.5b Organisation for promoting standardization

Involve employees in improving standardised operations

6. The ultimate purpose of standardization is improvement. Standardizing the daily work of the entire workplace will not only reduce abnormalities and deficiencies. It will create a system that brings continuous improvement in quality. But it is essential that employees are involved.
7. Managers must create an environment where employees are motivated to look out for problems in their workplaces, and report them. Managers can then examine these problems, select those whose solution will bring the greatest improvement, and find solutions to them, often with the participation of employees. Standards are improved when problems are recognised and solved.
8. When simple improvement activities are introduced, revise the operation standards immediately. Complex improvement activities should be implemented as a project activity or as a QC Circle activity.
9. Evaluate the effects of improvements in terms of quality, productivity, quantity, safety, efficiency, the productivity index, and cost-effectiveness. Summarise and record the results, and use these records to motivate employees to seek further improvement. Give awards for excellent improvements.

Figure 8.5c Record of improvement activity (page 22)

Figure 8.5c Record of improvement activity

Workplace: XX factory, XXX workplace						
Date of activity	Improvement theme	Persons in charge	Standard No.	Date of implementation	Effect	Monetary value of effects
	Improvement of yield of product A	XX XX	XX-XX		Improvement of yield by x%	xxxxxx dollars
	Improvement of assembly procedure of product B	YYY YYY	YY-YY		Increased production volume X/D	xxxxxx dollars

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on those that are relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

Set up a system to assess standardization

- Parags. 2 and 3: What stage of implementation have you reached with standardization company-wide? How often do you check that it is functioning as it should? Who carries out the assessment? List some typical findings from these checks – and some unexpected findings.
- If you were using the assessment system described in this text which important assessment items would you look at in some of your departments?
- Parag. 3 specifies three categories of assessment items. Which of these are relevant to your company? If they are relevant, list a few examples for the first two categories.
- Do you have other standards that do not fit into these categories?

Set up a unit to promote standardization

- Parag. 4: Apply the RADAR questions to these proposals for forming company-wide and departmental committees to promote TQM and implement standardization.
- Parag. 5: Apply the RADAR questions to these proposals for the secretariats.

Involve employees in improving standardized operations

- Parag. 6: Which of these improvements would you expect to gain from standardisation? How far do you think it is realistically possible to reduce abnormalities or deficiencies in your company? – to 20%, 10%, zero?

- h. Parag. 7. Do your employees often report problems in their workplaces to you? Are they good at recognizing problems? Do you think they find it easy to report them? Share some examples from your experience. How could you create an environment where they would feel more able to report problems?
- i. Parag. 8: Give one or two examples of both simple and complex improvement activities from your own experience.
- j. Parag. 9: How effective would this proposal for summarising and recording improvement activities be in motivating the employees in your company? Give one or two examples from your own workplace of improvements, or possible improvements, in each of the areas referred to here.
- k. Parag. 9: Do you already have a system for giving awards to employees who suggest excellent improvements? If not, what kind of award might you introduce?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan to cover the ideas discussed in several texts.

Test

Answer these questions using **only** the information given in the text. For each question one, two or all three answers may be correct. Tick the answer or answers you think are correct for each question. Each question carries 3 points – you get one point for each correct answer that you tick, and one point for each wrong answer that you do not tick.

8.1 Introduce operation standards and work instructions

1. An operation standard describes the ... way to carry out an operation.
 - a. Quickest.
 - b. Best.
 - c. Easiest.
2. To systematically draft standards you need to decide on:
 - a. Basic format and style.
 - b. Categories for each standard.
 - c. A work instruction.
3. An operation standard may contain:
 - a. Materials and parts.
 - b. A bulletin board.
 - c. Operating conditions.
4. An operation standard may also contain:
 - a. An operation slip.
 - b. An operation report.
 - c. Operation procedures.
5. A work instruction should include:
 - a. Names of the employees.
 - b. Results of operations.
 - c. Procedures for drafting instructions.
6. Results of operations that should go in the work instruction sheet include:
 - a. Any abnormalities.
 - b. Materials and parts.
 - c. Quality characteristic values.
7. Product standards:
 - a. Define the price that should be charged for a product.
 - b. Define the quality requirements that a product must satisfy.
 - c. Define the level of technical skills needed to create products.
8. Raw material standards:
 - a. Make clear the quality characteristics of raw materials.
 - b. Define the purchasing specifications for raw materials.
 - c. Specify the basis for inspecting incoming raw materials.
9. Inspection standards describe:
 - a. Test categories.
 - b. Evaluation standards.
 - c. Inspection staff.

10. Standards for maintaining equipment describe the methods for:
 - a. Purchasing equipment.
 - b. Inspecting equipment.
 - c. Preserving equipment.
11. Standards for maintaining measuring devices describe the ... methods for measuring devices.
 - a. Identification.
 - b. Maintenance of accuracy.
 - c. Calibration.
12. Packaging standards describe:
 - a. The specifications for packaging materials.
 - b. The identification methods for packaging materials.
 - c. The purchasing methods for packaging materials.

8.2. Maintain the standards

13. To check the extent to which standards are being put into practice you should focus on the questions:
 - a. Have standards been classified?
 - b. Have newly established standards been fully implemented?
 - c. Have standards been established for all operations?
14. To keep standards up-to-date you have to:
 - a. Implement and maintain them.
 - b. Establish and implement them.
 - c. Maintain and revise them.
15. Revise standards whenever:
 - a. Out-of-control events occur because standards are not followed.
 - b. Out-of-control events occur even though standards are followed.
 - c. Out-of-control events occur unexpectedly.
16. Revise standards when:
 - a. Raw materials are changed.
 - b. Equipment is cleaned.
 - c. The quality targets are changed.
17. Carry out periodic reviews:
 - a. Even when there are no out-of-control events.
 - b. Only when there are no out-of-control events.
 - c. Whenever there are out-of-control events.
18. Put a person in charge of revising each standard who:
 - a. Is a department manager.
 - b. Is a quality manager.
 - c. Has practical experience.
19. Each standard should include notes giving:
 - a. The history of establishing and revising the standard.
 - b. The history of drafting and signing the standard.
 - c. The history of drafting and operating the standard.
20. Which of the following items could be included in these history notes?
 - a. Explanation of items specified in the standards.
 - b. Relationship with external standards.
 - c. Issues that have to be decided.

21. To use the standards to check that operations have been carried out properly you will need:
 - a. Rules for handling things that do not go according to plan.
 - b. Methods for checking and confirming that operations have been carried out correctly.
 - c. Rules for revising quality characteristics.
22. A cause-factor check is used to check if:
 - a. Operations have been carried out according to the standards.
 - b. The results of an operation satisfy the standards.
 - c. Operations have been carried out as directed by the supervisor.
23. An effect-factor check is used to check if:
 - a. The results of an operation satisfy the standards.
 - b. The results of an operation satisfy the supervisor.
 - c. Operations have been carried out according to the standards.
24. When abnormal quality characteristics arise you should first:
 - a. Revise the standard.
 - b. Investigate the cause.
 - c. Check the quality.
25. In carrying out these checks:
 - a. Decide who is to carry out the check.
 - b. Choose the sampling and measurement equipment to be used.
 - c. Always prepare boundary samples.
26. The items that have been checked in these checks should be summarized in operations reports and:
 - a. Confirmed by managers.
 - b. Confirmed by supervisors or managers.
 - c. Sent to the manufacturers.

8.3. Educate and train your employees to follow the standards

27. If standardization is to be successful employees should be educated and trained in:
 - a. The history of standards.
 - b. Quality consciousness.
 - c. How to carry out the operations described in the standards.
28. If employees are to appreciate and use standards they need:
 - a. To understand the important role that standardization plays in maintaining quality.
 - b. To realize that operations must always be carried out according to the standards.
 - c. To understand the standards and work instructions.
29. A systematic approach to skills training requires managers to:
 - a. Assess the current skills that operators have.
 - b. Set the target level to be reached.
 - c. Aim for the highest level of skills.
30. Always retrain operators whenever:
 - a. Operation methods are reviewed.
 - b. Operation methods are changed.
 - c. Out-of-control events occur.

31. Use OJT:
 - a. Before operations.
 - b. During operations.
 - c. After operations.
32. Giving operators systematic and continuous guidance in operations will ensure that:
 - a. Productivity is raised.
 - b. Quality is maintained and improved.
 - c. Equipment is updated.
33. To give employees training in quality consciousness, train them to:
 - a. Produce only quality products.
 - b. Recognize the important quality characteristics of their products.
 - c. Recognize that defective products destroy customer confidence.
34. Employees should become aware that the person in the next process is:
 - a. "my supervisor".
 - b. "my customer".
 - c. "my colleague".
35. The 5S include:
 - a. Never come late to work.
 - b. Never leave litter lying around.
 - c. Store unnecessary items in the right place.
36. Managers can encourage employees to develop an overall quality consciousness by:
 - a. Preparing posters for employees to look at.
 - b. Keeping themselves well-informed of the present production status.
 - c. Ensuring that employees think about the present production status.
37. If operations have not been carried out according to the standards which of the following steps may have to be taken?
 - a. Remove the standards.
 - b. Retrain the employees.
 - c. Review the training programme.

8.4. Organize standards on a company-wide basis

38. Organizing and classifying standards systematically throughout the company will:
 - a. Prevent standards needing to be revised.
 - b. Prevent standards being duplicated.
 - c. Prevent standards contradicting each other.
39. In classifying standards, basic rules for general use will include:
 - a. How to set up committees.
 - b. The roles of top and middle managers.
 - c. Specifications of testing methods.
40. Rules for product and manufacturing standards should specify:
 - a. Quality level and inspection items for products and raw materials.
 - b. How to promote the use of statistical methods.
 - c. Criteria, sequences, procedures and methods in design, manufacturing and inspections.

8.5. Assess and promote standardization

41. Company-wide assessment should be carried out:
 - a. At least once every 3 months.
 - b. At least once every 6 months.
 - c. At least once a year.
42. Each department to be assessed should:
 - a. Be informed in advance of important assessment items.
 - b. Not be informed in advance of any assessment items.
 - c. Be informed in advance of all assessment items.
43. The quality control committee secretariats should:
 - a. Monitor how standardization is progressing.
 - b. Plan and implement education and popularisation.
 - c. Relate standards to claims, quality and similar matters.
44. The ultimate purpose of standardization is:
 - a. Removing abnormalities.
 - b. Creating a quality system.
 - c. Achieving improvement.
45. Managers should create an environment where employees:
 - a. Will feel able to report problems.
 - b. Will recognize problems.
 - c. Will solve problems.
46. The effect of improvement activities in each workplace should be summarized and recorded in order to:
 - a. Provide a basis for giving employees awards.
 - b. Revise standard operations.
 - c. Motivate employees to seek further improvement.

Relationship with ISO

8.1 Introduce operation standards and work instructions

Relationship with ISO 9001:2000

- 4.2.3 Control of documents
- 6.2.2 Competence, awareness and training
- 7.5.1 Control of production and service provision

8.2 Maintain the standards

Relationship with ISO 9001:2000

- 4.2.3 Control of documents
- 8.2.3 Monitoring and measurement of processes

8.3 Educate and train your employees to follow the standards

Relationship with ISO 9001:2000

- 6.2.2 Competence, awareness and training
- 8.2.2 Internal audit

8.4 Organize standards on a company-wide basis

Relationship with ISO 9001:2000

- 4.2.3 Control of documents

8.5 Assess and promote standardization.

Relationship with ISO 9001:2000

- 4.2.3 Control of documents
- 6.4 Work environment
- 8.2.2 Internal audit

Unit 9

Problem Solving



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Test 41

Unit summary

There will always be problems in work processes. What is important is that we spot them at once, report them to whoever will act on them, take emergency action to stop them doing any damage, find out what is causing them, and prevent them from happening again. There are systems we can use that will help us to recognise and deal with problems. (Unit 11 provides detailed guidelines on using statistical methods to solve problems by analysing and interpreting data.)

9.1 Recognising abnormalities

If managers and employees are to spot problems as soon as they occur, they need to be alert – and alert not just for problems, but for anything unusual, anything that is different from the normal – for abnormalities. An abnormality is not always a defect or a problem, but it often indicates that there is a hidden problem or a potential problem. Always treat an abnormality as a danger signal, find out what is causing it, and take measures to prevent it recurring.

9.2 Reporting abnormalities

If abnormalities are to be dealt with properly they have to be reported. Good abnormality reports will accurately describe what happened, when it happened and to whom it happened. This information must then be passed on quickly to whoever is in a position to act on it. To ensure that employees report abnormalities, you need to:

- a. Create a company culture where they are willing to report abnormalities.
- b. Draw up rules for making abnormality reports.

9.3 Emergency actions with non-conforming products

Abnormalities may be products that are not of the right quality – known as non-conforming products. First, take emergency actions to stop any more non-conforming products being made and to deal with those that have been made. Only then should you begin to investigate the causes.

9.4 Preventing the recurrence of abnormalities

Pay special attention to any causes of abnormalities that are related to work processes and job procedures, and try to get to the root causes. Once the root causes are known, take recurrence prevention measures to prevent these causes bringing any more problems. The combination of emergency action, when it is necessary, and systematic recurrence prevention measures, will provide stable production.

9.5 Rules for processing abnormalities

It is important to have a set of rules for dealing with abnormalities. These rules set out the methods and responsibilities for all the actions that have to be taken to process abnormalities:

- a. Take emergency actions.
- b. Investigate the causes of the abnormality.

- c. Implement countermeasures.
- d. Confirm the effects of the countermeasures.
- e. Standardise the successful countermeasures.

9.6 Base problem solving on facts

Problem solution should be based on facts, rather than on subjective judgements. Problem solution does of course require experience and intuition. Without experience it is impossible to know what kind of facts to look for, and how to interpret these facts once they have been identified. However it is dangerous to rely only on experience. Subjective impressions must be objectified. This means gathering and quantifying the facts.

9.7 Managing dispersion

Once data has been collected, it has to be interpreted. Averages are the most common way of interpreting data, but they often fail to give a true picture of what the data means. Measuring how the data is dispersed gives a more complete picture. Dispersion refers to how the different items of data are spread out or scattered in relation to how they are supposed to be, i.e. in relation to the standard or target values.

9.8 Control charts

Control charts are a key tool in interpreting data. They can distinguish between dispersions caused by accidental factors and dispersions caused by abnormal factors, and can show whether the process is in a stable condition or not.

9.9 The QC Story I

Sometimes we over-react to problems. We try to solve them immediately in whatever way we can. But over-hasty reactions often get us nowhere. We will handle problems much more effectively if we approach them systematically. For this we need to have a basic problem-solving procedure, and to follow it step by step. A QC Story is a good procedure for solving problems scientifically and rationally. Text 9.9 presents the first two steps of the QC Story:

- a. Select a theme to work on.
- b. Clarify the problem and set targets.

9.10 The QC Story II

This text presents the next two stages of the QC Story:

- a. Get a clear understanding of the effects of the problem.
- b. Investigate the causes: analysis.

9.11 The QC Story III

This text presents the final four stages of the QC Story:

- a. Devise and implement recurrence prevention measures.
- b. Confirm the effects of these measures.
- c. Standardise the new methods.
- d. Reflect on the problems left unsolved.

9.12 Preventing problems arising

The best way to avoid problems is to anticipate them, and stop them before they happen. This is known as preventive action. It is especially important at any planning stage.

Learning tools

The RADAR questions

As you read each text you will discuss how it could be applied in your company. The RADAR questions will help you to focus this discussion:

- R** - Are these ideas **relevant** to my company?
- A** - How would I **apply** each of them in my company?
- D** - What **difficulties** might I meet and how would I overcome them?
- A** - Are there any **additional** actions that I might take that are not mentioned in the text?
- R** - What **resources** would be needed, what would these cost, and how could they be acquired?

There will of course be some discussion points where not all of these questions will be applicable.

The 6-Point Structure

After you have discussed the ideas in the text, you write an action plan in which you present practical proposals for implementing the conclusions you have reached in your discussion. The 6-Point Structure will help you to write your action plan:

1. **Problems:** Problems you have in your company in the area you have just discussed.
2. **Proposals:** Your proposals for improvement.
 - a. Be specific and concrete.
 - b. Include an implementation plan, with a time schedule and minimum and optimal implementation targets.
 - c. Refer to any forms, charts, tables etc. that you would use, and include samples in an appendix.
3. **Obstacles:** Obstacles to implementation in employee attitudes, company organization and culture etc., and how these could be overcome.
4. **Resources:**
 - a. The resources required: funds, equipment, materials, man-hours, expertise etc.
 - b. The resources available within the company.
 - c. Any resources that would have to be found outside the company.
 - d. Alternatives that could be used to cover any shortfall in resources.
5. **Assessment:** Ways of assessing the results of implementing these proposals.
6. **Benefits:** The benefits your proposals would bring.

9.1 Recognising abnormalities

Introduction

1. If managers and employees are to spot problems as soon as they occur, they need to be alert. And they need to be alert not just for problems, but for anything unusual, anything that is different from the normal – for abnormalities. An abnormality is not always a defect or a problem, but it often indicates a hidden problem or a potential problem. Always treat an abnormality as a danger signal, find out what is causing it, and take measures to prevent it recurring. There are two types of abnormalities: those that can be identified through inspections, and those that cannot be identified through inspections.

Abnormalities that can be identified through inspections

2. Typical abnormalities that are found in inspections are:
 - a. A greater number of defects than usual.
 - b. A new type of defect.These may be found by inspectors during periodic inspections, by employees conducting their own inspection, or they may be seen in control charts (see Text 9.8).
3. In periodic inspections the current values of the product or process are compared with the standard or target values (the values you want to have). The term 'dispersion' (see Text 9.7) is used to describe how the current values differ from the standard or target values. Some dispersion is expected and accepted, but if dispersion goes beyond that, then you have an abnormality. Wherever possible, convert the values observed in inspection into numerical figures, and present them visually in graphs or charts so that abnormalities can be easily spotted. A control chart is a typical graph for identifying abnormalities. It shows how the values are dispersed and will immediately show the presence or absence of abnormalities.
4. However, dispersion during the production processes is not always caused by abnormalities. It may also be caused by chance, even when standard processes are strictly observed. We need to know which type of dispersion is occurring. This is where the control chart will help. With its control lines and control limits, it will show the dispersion type. When it shows that dispersion results from abnormalities, investigate the causes and take appropriate action.

Abnormalities that cannot be identified through inspections

5. There are some abnormalities that are not spotted in inspections. When machines, for example, produce a greater amount of noise than usual, or material surfaces have a different feel, the situation can be described as abnormal. Such slightly unusual events should be reported as abnormalities by anyone who happens to notice them. This is a responsibility that everyone shares.

6. Example: This example involves plastic auto parts that were injection moulded. Injection moulding is followed by the process of gate(runner)-cutting. One day, a woman in charge of gate cutting thought that the moulded parts felt somewhat “fragile”. She did not know what exactly was wrong, but she felt there was something unusual about the moulded parts, and immediately called her team leader.
7. The team leader, wondering if “the material had changed or if the temperature of the metal melts was lower than usual”, suspended production and investigated the reported abnormality. After establishing that all the other factors in the process except the material were normal, production was resumed using a substitute material. The original material was put on hold. No abnormality appeared after production was resumed.
8. Meanwhile, the suspended material was examined carefully by the manufacturer. The examination confirmed that the material was different from usual. It was found to possess different particle diameters because of a minor abnormality in its manufacturing process. Early detection of the abnormality prevented major losses. Damages were minimized by the woman who “felt something was wrong” and reported it immediately. This employee had never been instructed to take any actions when moulded parts seemed “fragile”. All she had been asked to do was perform gate cutting. However, she sensed the difference and reported the abnormality on her own initiative. Her good sense and appropriate response prevented an increase in the number of defective products.

Figure 9.8d Control chart for the consumption of steam in drying synthetic rubber

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on what is relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: Do you think that abnormalities may often not be noticed in your company? Why do you think this? Do you think they are often ignored? Why do you think so? Give examples of some kinds of abnormalities that may not be noticed or may simply be ignored. What could be done about this?
- b. Parag. 1: Which of these two types of abnormality do you think are most common in your company? Give one or two examples.
- c. Parag. 2: What typical abnormalities are recognized during inspections in your company?
- d. Parag. 3: To what extent can abnormalities found in your work processes be converted into numerical figures? How could they be presented visually?
- e. Parag. 4: Have you often found that dispersion has been caused by chance? How would you use control charts to determine the dispersion type in your company?

- f. Parags. 5, 6, 7 and 8: Give some examples from your company of abnormalities of the kind described in parag. 5 and the example that follows. Are they always reported? Are the reports always taken seriously? How would you like to improve the way people respond to them?

Action plan

Draw up an action plan for improving the way your company attempts to recognize abnormalities, based on the discussions that you have just had. Either write a plan based on these first discussions, or wait until you have discussed one or two more texts, and then write a more comprehensive action plan. You might like to follow the 6-Point Structure.

9.2 Reporting abnormalities

Introduction

1. If abnormalities are to be dealt with properly they have to be reported. Good abnormality reports will accurately describe what happened, when it happened and to whom it happened. This information must then be passed on quickly to whoever is in a position to act on it. To ensure that employees report abnormalities, you need to:
 - a. Create a company culture where they are willing to report abnormalities.
 - b. Draw up rules for making abnormality reports.

Create a company culture where employees will report abnormalities

2. It is important that employees develop the habit of reporting to their superiors when they feel that something is wrong. However they will often find it a burden to have to write even a short, simple report. You should therefore:
 - a. Take every opportunity to explain to employees that there will be no improvement unless managers know the unpleasant facts; that if the managers are not told these facts, the results will be bad for everyone, including the employees themselves.
 - b. Encourage employees to report abnormalities that others may consider not worth reporting, as, for example, deficiencies in the work place that lead to very brief but frequent suspension of processes.
 - c. Establish a relationship of trust with employees. Two good ways of doing this are:
 - i. Show employees that action will always be taken on a report. In particular deal with chronic problems by investing in plant and equipment.
 - ii. Develop the practice of managers and employees solving problems together.A relationship of trust is essential if reliable reports are to be produced.
3. Ensure that all abnormalities are reported, including:
 - a. Abnormalities that may seem too minor to be reported.
 - b. Abnormalities that have been recurring for a long time, and are no longer considered merely abnormalities (including operational deficiencies).

Draw up rules for making abnormality reports

4. The primary rules for abnormality reports are:
 - a. All abnormalities must be reported to superiors: those identified in every production process, from the acceptance of raw materials to product shipment, as well as the conditions in which they have emerged. Reports of abnormalities are important in themselves, whether they are delivered orally or in writing.
 - b. Written abnormality reports should have a fixed format. This is to ensure that abnormalities are properly processed and that recurrence prevention measures are taken to prevent the abnormality appearing again. This format should be easy to use and should relate to the actual realities of the work place.

Figure 9.2a Prompt report of abnormality situations

- c. Before reporting abnormalities observe the following three-step procedure: confirm the actual problem on the spot, and in a realistic way. This corresponds to the Japanese problem-solving principle of sangen shugi: confirm the actual problem (genbutsu) on the spot (genba), with a realistic approach (genjitsu).
- d. Report abnormalities at once. Emergency reports must quickly reach those in charge of emergency action. Some reports may require production suspension, freezing of shipments, and the sorting and isolation of abnormal products – otherwise abnormalities may get worse or damage subsequent processes or even reach customers. These reports must therefore be passed quickly to those with the authority to decide what to do.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on what is relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: Does your company already write up reports on abnormalities? If so, how useful are they, and how could they be improved? If not, what benefits do you think they would bring?
- b. Parag. 2 gives three suggestions for encouraging employees to submit a report every time they have a feeling that something might be wrong. Apply the RADAR questions to these suggestions.
- c. Parag. 3: Give one or two examples from your own workplace of the abnormalities in parts a. and b. Do you agree that even the most minor abnormalities should be reported?
- d. Parag. 4a: Name all the processes in your company where abnormality reports should be written.
- e. Parag. 4b: Look at Figure 9.2a Prompt Report of Abnormality Situations. How suitable would this form be for your company? Are there any changes that you would make to it?
- f. Parag. 4c: Describe how this procedure could be applied to a recent abnormality in your company. How useful do you think this procedure is?
- g. Parag. 4d: How quick is your system of delivering emergency reports? How important is it that it should be quick? How could you speed it up?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

9.3 Emergency actions with non-conforming products

1. Abnormalities may be products that are not of the right quality – known as non-conforming products. First, take emergency actions to stop any more non-conforming products being made and to deal with those that have been made. Only then should you begin to investigate the causes. (But even if emergency actions remove or weaken the abnormalities, always investigate and remove the causes.)
2. Take emergency actions to:
 - a. Prevent abnormalities getting worse.
 - b. Prevent abnormalities causing damage in subsequent processes.
 - c. Identify non-conforming products and confirm how exactly they are non-conforming. Emergency actions should be accompanied by preliminary inspection reports. These will also help to prevent the number of abnormalities increasing, or adversely affecting subsequent processes.
3. To ensure that emergency actions will be as effective as possible, decide in advance:
 - a. Who will be in charge.
 - b. Who will be responsible for taking emergency actions.
 - c. What procedures should be followed.

This will make it much easier, if an emergency action is required, to change the process conditions, suspend processes and segregate products quickly and correctly. (Process conditions are the location, equipment, employees, temperature etc. where the process is carried out.)
4. A number of organisational procedures need to be clearly defined:
 - a. The methods to be used to confirm that abnormalities are starting to emerge and to begin countermeasures.
 - b. The management level at which a final decision will be taken about non-conforming products.
 - c. The method to be used to confirm that decisions have been implemented.

These procedures can be presented in a process flow chart known as a QC Process Chart. A QC process chart is the basic standard for managing the work site.

(See Text 14.1 for more information about QC process charts. You will find examples in Figures 14.1a, 14.1b and 8.2a.)

ISO 9001

5. ISO 9001 calls for construction of the following system for managing non-conforming products:
- a. *Control of non-conforming products.*

To prevent non-conforming products being used or shipped carelessly, make clear:

 - i. The methods for identifying and separating non-conforming products.
 - ii. The procedures for implementing these methods.
 - iii. Who is responsible.

In this context, non-conforming products include, as well as finished products:

 - iv. Purchased materials and procured parts whose abnormalities were identified in acceptance inspections.
 - v. Products left unfinished because of abnormalities that emerged during production processes.
 - b. *Review and dispose of non-conforming products.*

Clearly define:

 - i. Responsibility for confirming the contents of non-conforming products.
 - ii. Authority for taking action for dealing with non-conformities.

Do not allow employees to process non-conforming products in a random, arbitrary manner. Watch out for those who may do so, or who may take actions that do not conform to the regulations.

The ISO 9000 series introduces the following four methods for processing non-conforming products:

- i. Reworking.
- ii. Accepting with or without repair by mutual agreement.
- iii. Using them for alternative applications.
- iv. Rejecting or scrapping them.

It is important to fix these procedures clearly in advance and decide who is to be in charge of them.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on what is relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1: Do you agree that these are the first actions that should be taken? Give an example from your own experience to justify your opinion.
- b. Parag. 2: Give examples from your own experience where emergency action was taken for each of these reasons. What might have happened in these examples if emergency action had not been taken quickly?
- c. Parag. 3 presents guidelines for preventing abnormalities escalating. Apply the RADAR questions to these. What improvements would you expect from the application of such guidelines?

- d. Parag. 4 specifies three procedures that need to be clearly defined. Apply the RADAR questions to these.
- e. Parag. 5 presents the ISO 9001 guidelines for constructing a management system for non-conforming products. Apply the RADAR questions to these guidelines. Be as concrete as you can in your discussion.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

9.4 Preventing the recurrence of abnormalities

Introduction

1. Pay special attention to any causes of abnormalities that are related to work processes and job procedures, and try to get to the root causes. Once the root causes are known, take recurrence prevention measures to prevent these causes bringing any more problems. The combination of emergency action, when it is necessary, and systematic recurrence prevention measures, will provide stable production.

Get to the root causes

2. Causes can vary from one abnormality to the next. However, in many cases, it is only the first, immediate causes that differ. An examination of secondary and third level causes of different abnormalities often leads investigators to the same source cause. If you do not investigate right to the source cause, the problems can recur. It is often useless to deal only with the various first causes each time an abnormality emerges. This is not dealing with the real problem but only with the results of the problem – the phenomena.
3. Look at the example in Figure 9.4a below:

Phenomena and their causes	Countermeasures
Machines came to a halt. Why?	
<i>Because:</i> Fuses blew due to an overload. Why?	Replace fuses.
<i>Because:</i> Bearing lubrication was insufficient. Why?	Increase the rotation frequency of the lubricating pumps.
<i>Because:</i> Lubricating pumps were in poor condition. Why?	Replace pumps.
<i>Because:</i> Pump axis were worn out. Why?	Replace axis.
<i>Because:</i> Sludge had entered.	Attach filters to lubricating pumps.

Take recurrence prevention measures

4. When the fundamental causes have been identified, proper recurrence prevention measures can be taken. One definition of recurrence is the re-emergence of abnormalities due to the same causes within three years (or of the same abnormalities if the causes have not yet been found). Managers should always consider whether an abnormality is a new one or a recurring one. If it is a recurring one, then any causes previously identified were probably not the fundamental causes.

5. Recurrence prevention measures can be taken in three stages:
 - a. Stage 1. Measures aimed at the operations in which the problems are identified.
 - b. Stage 2. Measures aimed at similar operations.
 - c. Stage 3. Measures aimed at the overall system.

6. Example:
 - a. Stage 1: After materials have been put wrongly in storage, improve the storage facility and the written input directions.
 - b. Stage 2: Review the storage locations and write input directions for other materials.
 - c. Stage 3: Improve the criteria for setting up storage locations and the procedure for preparing written input directions.Similar abnormalities can be prevented by taking as many stage 3 measures as possible in addition to Stages 1 and 2 measures.

7. It is essential that managers or supervisors provide leadership in taking action to prevent abnormalities recurring.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on what is relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1: Give some examples from your own experience of recurrence prevention measures.
- b. Parag. 2: Have you also found that often the root causes of abnormalities are the same? Give an example of a time when you thought you had identified the cause of an abnormality, but later found there was a more fundamental cause.
- c. Parag. 3: Look at this example. Can you give a similar example from your own experience of working back to the fundamental cause of an abnormality?
- d. Parag. 4: Do you agree with this definition of a recurring abnormality? Give one or two examples of abnormalities that you would regard as recurring.
- e. Parags. 5 and 6: Give one or two examples of recurrence prevention measures that follow these three stages.
- f. Parag. 7: In what ways do you think managers and supervisors can provide leadership in taking action to prevent abnormalities recurring?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

9.5 Rules for processing abnormalities

1. It is important to have a set of rules for dealing with abnormalities. These rules set out the methods and responsibilities for all the actions that have to be taken to process abnormalities. The rules are:
 - a. Take emergency actions.
 - b. Investigate the causes of the abnormality.
 - c. Implement countermeasures.
 - d. Confirm the effects of countermeasures.
 - e. Standardise the successful countermeasures.
2. The abnormality processing flow chart in Figure 9.5a, after this text, gives a detailed example of such rules. The main rules are:
 - a. When abnormalities appear, classify them into three ranks (A, B or C: serious, medium and minor) based on the impact they would have on quality, cost and the volume of production.
 - b. Report abnormalities as soon as they appear in the 'Prompt report of abnormality situations' form in Figure 9.2a. Enter the nature of the abnormalities, their immediate causes and any actions taken with products.
 - c. Take emergency actions immediately, and then prepare an abnormality report like the one in Figure 9.5b for class A and B abnormalities. Abnormality reports are designed to record the true causes and the recurrence prevention plans and to confirm the effectiveness of these plans.
 - d. Use a table for managing the progress of abnormality processing like the one in Figure 9.5c to check the progress of recurrence prevention with reference to the plans.

Figure 9.5a Abnormality processing flow chart (page 18)

Figure 9.2a Prompt report of abnormality situations

Figure 9.5b Abnormality reports

Figure 9.5c Table for managing the progress of abnormality processing

3. Deal with the three classifications of abnormalities as follows:
 - a. Class A: Report serious abnormalities to CEOs, and confirm the progress of recurrence-prevention plans at monthly meetings of the Council on Quality Assurance chaired by the manufacturing plant director.
 - b. Class B: Report medium-level abnormalities to the manufacturing plant director. Section managers manage the recurrence-prevention plans, and report the progress of recurrence-prevention measures to the Council on Quality Assurance three months after the emergence of abnormalities.
 - c. Class C: Process minor abnormalities in the sections where they emerged. Try to resolve them within a time limit, stratifying them according to recurrence frequency and converting them into themes for discussion in QC circles.

4. There is however one risk in classifying abnormalities based on their impact. If a large impact is produced by chance, it can be treated as a Class A, and recurrence prevention measures taken accordingly. However, an abnormality may have the potential to have a big impact but be identified quickly before anyone recognises this, and be processed as a Class C. It is therefore always important to carry out recurrence-prevention measures as thoroughly as possible. If this is done, it will be quite safe to classify abnormalities according to their results, prioritise them, and carry out recurrence-prevention measures according to this priority.
5. When reports to the management on quality assurance are made obligatory, progressive recurrence-prevention measures can be implemented successfully.
6. When the targets for recurrence prevention measures are not met (i.e. the measures are not confirmed as successful) they are registered as chronic deficiencies. They should be prioritised as themes for improvement, and action taken to resolve them.

Figure 9.5a Abnormality processing flow chart (page 18)

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on what is relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

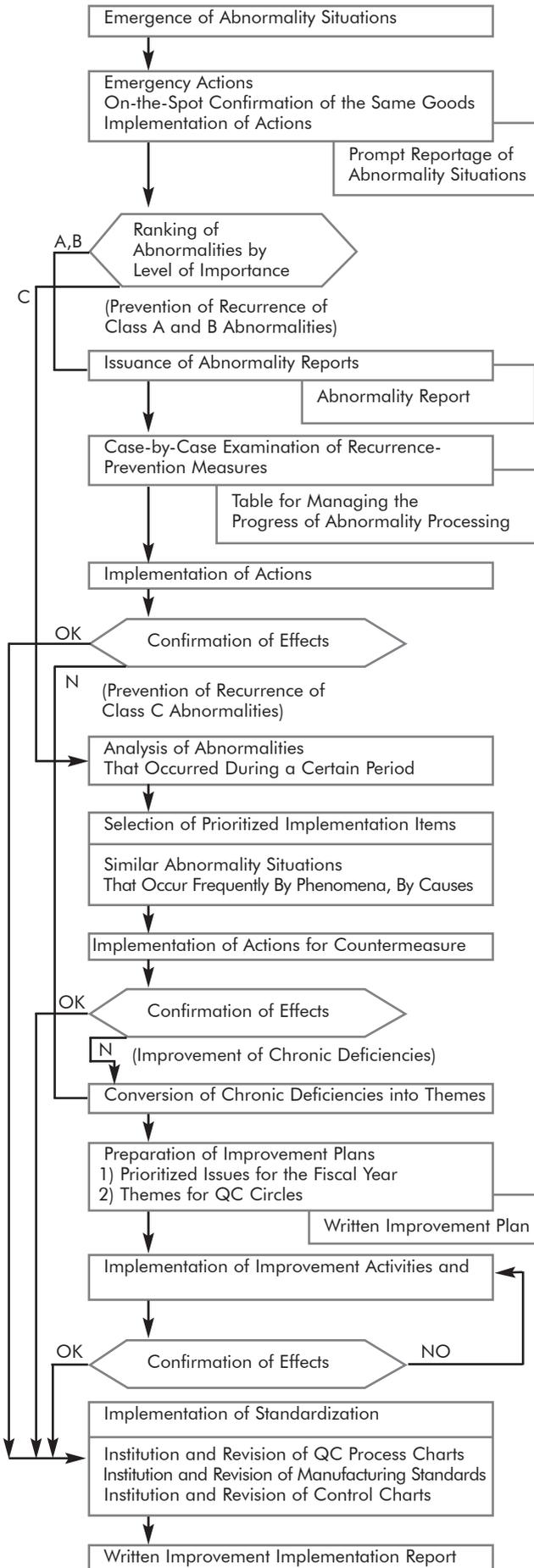
Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 2: Have a look at the detailed flowchart in Figure 9.5a. Then apply the RADAR questions to the four primary rules. Include Figures 9.2a, 9.5b and 9.5c in your discussion.
- b. Parag. 3: Apply the RADAR questions to these guidelines for dealing with the three classes of abnormality.
- c. Parag. 4: Can you think of any examples of abnormalities whose potential impact was not recognised because they were identified quickly?
- d. Parag. 6: Which abnormalities in your company could you imagine coming into the category of chronic deficiencies?

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

Figure 9.5a Abnormality processing flow chart



- Those who discovered abnormalities in production processes fill out the form the “prompt reportage of abnormality situations,” regardless of the type or degree of abnormality, and then submit the report to section managers by way of their work supervisor. Refer to Form 1.
- Section managers confirm the contents of abnormalities and determine their rank according to the separately prescribed ranking criteria.
- Section managers issue “abnormality reports” (Form 2) for abnormalities categorized as Class A or B.
- Section managers report on the progress of recurrence-prevention measures to the Council on Quality Assurance.
- The Quality Assurance Office registers abnormalities using the “Table for managing abnormality processing” and manages its progress accordingly (Form 3).
- Section managers implement recurrence-prevention measures against abnormality situations that occurred in their sections.
- Section managers appraise the results of implemented measures and report their findings to the Council on Quality Assurance.
- Prioritized implementation items against Class C abnormality situations that occur during a given period should be selected based on causal classifications and similar processes in which abnormalities occur frequently.
- Targets that are found to have been left unachieved should be registered as chronic deficiencies. Improvement should be attempted by incorporating the chronic deficiencies into an annual plan.
- Effective recurrence-prevention measures should be standardized.
- Section managers in charge record and store the implementation status of recurrence-prevention measures.

9.6 Base problem solving on facts

1. Problem solution should be based on facts, rather than on subjective judgements. Problem solution does of course require experience and intuition. Without experience it is impossible to know what kind of facts to look for, and how to interpret these facts once they have been identified. However it is dangerous to rely only on experience. Subjective impressions must be objectified. This means gathering and quantifying the facts. Data, when it has been collected and arranged, reveals facts that subjective observation could fail to reveal. Such data provides clear support for hypotheses, and allows us to take positive, effective action.
2. To establish the facts take the following steps:
 - a. Examine the actual spot where the problem occurred.
 - b. Decide on the quality characteristics that the evaluation of quality will be based on. (When these are converted into quantitative data they are called characteristic values.)
 - c. Formulate clearly the objectives for which the data is being collected.
 - d. Gather accurate data.
 - e. Analyse this data using statistical techniques.
 - f. Obtain accurate information from this analysis.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on what is relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, *if* you feel these are relevant to your company.

- a. Parag. 1: To what extent would you say that the approach to problem solving in your company is based on experience, and to what extent on quantified facts? Would you like to see the balance changed?
- b. Parag. 2 suggests six steps for establishing the facts. Apply the RADAR questions to these.

Action plan

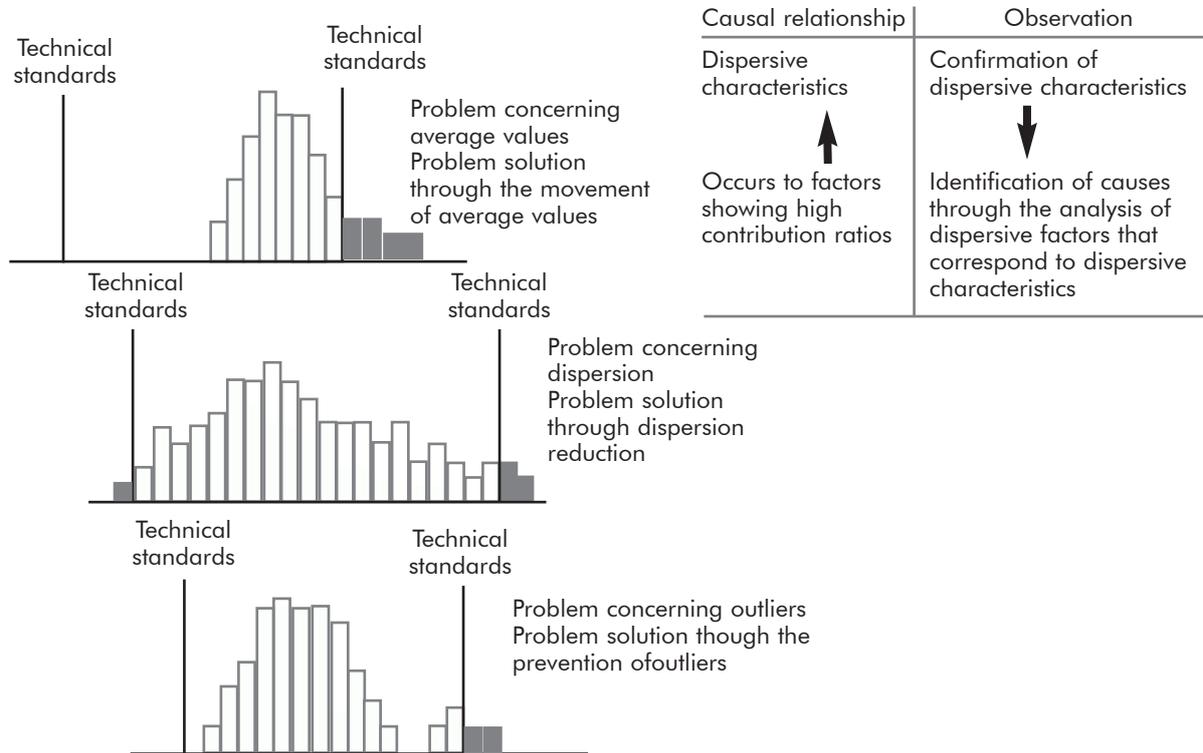
Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure. Alternatively you may choose to prepare one action plan when you have discussed several texts.

9.7 Managing dispersion

1. Once data has been collected, it has to be interpreted. Averages are the most common way of interpreting data, but they often fail to give a true picture of what the data means. Measuring how the data is dispersed gives a more complete picture. Dispersion refers to how the different items of data are spread out or scattered in relation to how they are supposed to be, i.e. in relation to the standard or target values. For example, a residential street with 10 houses with an average price of \$240,000 and where each price differs only a little from the average, would be very different from a street with the same average house price, but with 2 houses valued at \$1 million and the other 8 each costing around \$50,000.
2. The first thing to do when the data seems to indicate a problem is to clarify whether it is the average or the dispersion that indicates that there is a problem. Otherwise it is impossible to solve the problem. Problems that are indicated by averages of the data can be solved relatively easily. Just review the processing conditions and any other factors that affect the results. When problems are indicated by dispersion, base your countermeasures on whether:
 - a. The range of dispersion (the distance of the maximum and minimum data points) from the standard or target values (also referred to as the technical standard) is acceptable, but the average is skewed (distorted or biased).
 - b. The range of dispersion is too wide.
 - c. There are outliers (An outlier is an item of data, or a value, that falls well outside the dispersion range of the rest of the data).
3. Dispersion may be due to chance or to abnormalities. There will always be some dispersion even when the materials and work methods are those prescribed by the standards. It cannot be avoided. This type of chance dispersion stays within a certain range. The values tend to form a bell curve, with the average in the centre. This pattern is known as normal distribution.
4. Dispersion caused by abnormalities may result from the following factors:
 - a. Employees do not follow the operational standards.
 - b. There are changes in materials.
 - c. Inexperienced employees replace experienced employees.These factors skew the average and cause outliers.
5. Dispersion in the quality of a product results from the dispersion of something in the manufacturing process that is strongly related to quality. This dispersion provides a good opportunity to find out the causes of such problems. It indicates that the cause of the problem is strongly related to the results. Such a cause can be identified by searching for any divergent factors (factors that are different from what they should be) and examining their correlation to the dispersed results.

6. The three charts in Figure 9.7a, Quality Dispersion, give examples of problems indicated by the average of the data, by the dispersion of the data, and by outliers.

Figure 9.7a Quality dispersion



Discussion

This text briefly introduces some of the key concepts related to the dispersion of data. You will find much more detail in Unit 11 – Statistical Methods. In the meantime, discuss how these concepts could be used to recognize abnormalities in your work processes. This text does not have an action plan.

9.8 Control charts

Introduction

1. Control charts are a key tool in interpreting data. They can distinguish between dispersions caused by accidental factors and dispersions caused by abnormal factors, and can show whether the process is in a stable condition or not. A control chart consists of a central line (CL) and upper and lower control limits (UCL and LCL). UCLs and LCLs are based on calculated values.
2. When characteristic values that indicate process conditions are plotted as data points on the control chart, and all the points fall within the upper and lower control limits, or there is no bias in the way the points are distributed (i.e. they are not distributed in any particular way), the process is said to be “under control”. When the plotted points fall outside the control limits or there is a bias in the way the points are distributed, the process is “out of control”. In other words, an abnormality has emerged in the process. You should then investigate the causes of the abnormality and take countermeasures. (Texts 11.4.1 to 11.4.5 in Unit 11, Statistical Methods, provide more detailed guidelines on using control charts.)
3. The following criteria indicate when the process is out of control:
 - a. When one or more plotted points fall outside the control lines.
 - b. When the points indicate a bias. This can be:
 - i. When seven or more points form a chain above or below the central line.
 - ii. When a large number of points are on one side of the central line, e.g. 10 out of 11 consecutive points.
 - iii. When five or more consecutive points form an upward or downward line.
 - iv. Other cases which show periodicity.
4. Data may include variables or discrete values or both. Variables include measured values such as length (meter) and weight (kilogram). These are continuous values (i.e. they are uncountables – you cannot count them). Discrete values are non-continuous values such as the number of defective units and flaws within a sheet (i.e. they are countable).

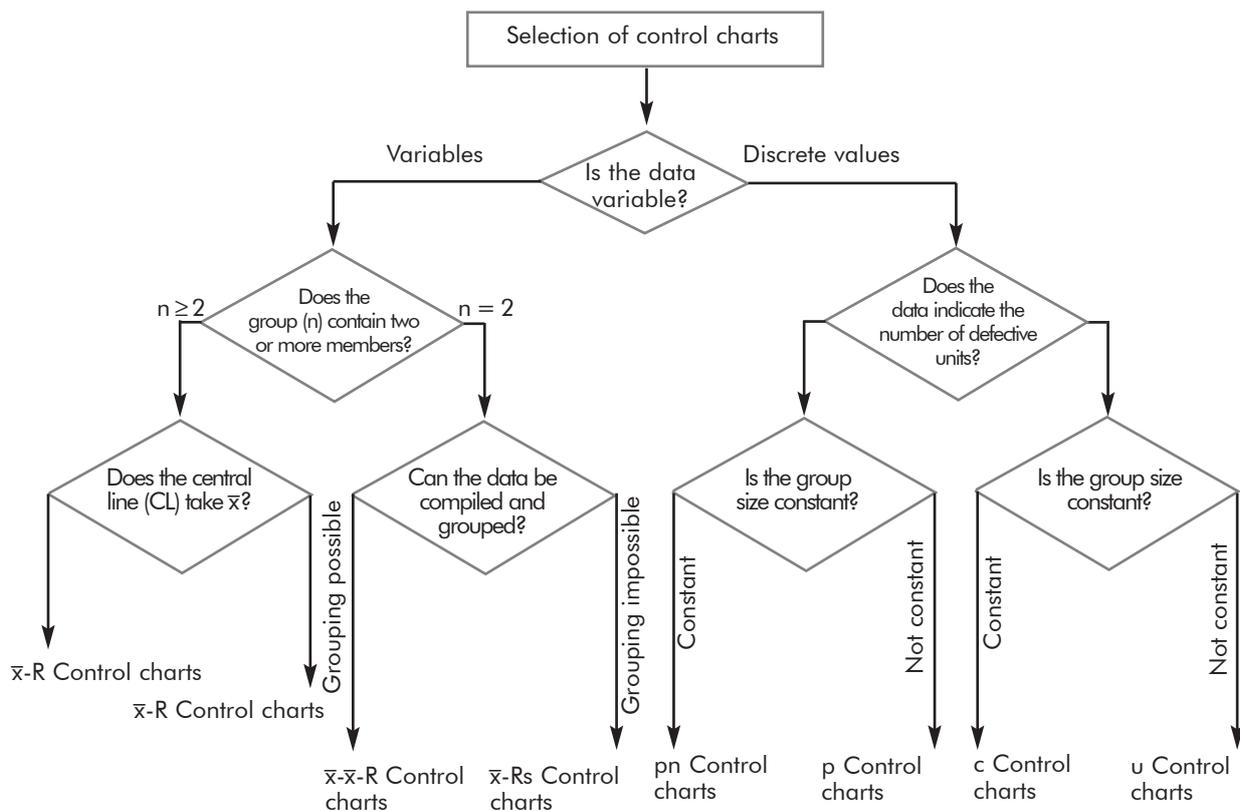
Types of control chart

5. There are several kinds of control chart:
 - a. \bar{x} -R control charts (average and range).

These are used in the management of variable data. \bar{x} and R represent a sub-group average and sub-group range respectively. The \bar{x} control charts are used for monitoring changes in the sub-group average (variation among sub-groups), while the R control charts are used for managing dispersions within a sub-group (variation within a sub group). These two charts are paired for use.

- b. "p" control charts and "pn" control charts:
 These manage processes in which the characteristic values of discrete values are considered. "pn" control charts are used when the number of samples (n) is constant and the number of defective units (pn) is considered. When the number of samples (n) is not constant, in other words when the ratio of defects (p) is considered, "p" control charts are used.
- c. "c" control charts (defects per unit) or "u" control charts (standard defects per unit) may be used depending on the characteristics of measured values.

Figure 9.8a Flow chart for selection of control chart types



How to draw control charts

6. These directions are for \bar{x} -R control charts, the type that is most frequently used.

Step 1. Gather data

In principle, more than 100 pieces of data should be collected. This data must be relatively new, nearly identical to what future processes are expected to produce in terms of technology, and accompanied by a clear history.

Step 2. Classify the data

Classify the data into sub-groups and arrange it by measuring times or lots. The number of data items that one sub-group contains is known as the sub-group size. It is represented by the letter "n". Usually, "n" is set at 2 to 6. The sub-group size should be made uniform. The letter "k" represents the number of sub-groups made by data classification. Normally, 20 to 25 sub-groups are supplied.

In this example, numbers are set as follows:

Sub-group size $n = 3$

Number of data items in a sub-group $k = 30$

Number of all data items $N = n \times k = 90$

Step 3. Calculate the average for sub-groups

Calculate the average (represented by \bar{x}) for respective sub-groups. The value \bar{x} is calculated using the following formula:

$$\bar{x} = (X_1 + X_2 + \dots + X_n)/n$$

The value " \bar{x} " should be calculated to three decimal places after the measured values, then rounded off. For example, the value for sub-group 1 is calculated as follows.

$$\bar{x} = (0.42 + 0.40 + 0.41)/3 = 0.410$$

The average " \bar{x} " for all sub-groups should be calculated in the same manner. Calculated averages should be arranged as shown in Figure 9.8b.

Figure 9.8b Calculation table for \bar{x} -R control charts: Amount of steam consumed in drying synthetic rubber B over a period of one month. An \bar{x} -R control chart is prepared based on this data (page 25).

Step 4. Calculate

Calculate "R", range per sub-group, where $R = [\text{maximal value within the sub-group}] - [\text{minimal value within the sub-group}]$

For example, the value for sub-group 1 is calculated as follows:

$$R = 0.42 - 0.40 = 0.02$$

Range "R" for all sub-groups should be calculated in the same manner. Calculated values should be arranged as shown in Figure 9.8b.

Step 5. Calculate $\bar{\bar{x}}$

- Add up the value " \bar{x} " for all sub-groups and divide this total by "k", the number of data items in a sub-group.

$$\bar{\bar{x}} = (\bar{x}_1 + \bar{x}_2 + \dots + \bar{x}_k)/k$$

- Value " $\bar{\bar{x}}$ " should be calculated to four decimal places after the measured value. For example, the value for data presented in Figure 9.8b is calculated as follows:

$$\bar{\bar{x}} = 13.165/30 = 0.4388$$

Step 6. Calculate \bar{R}

- Add up the value "R" for all sub-groups and divide this total by "k", the number of data items in a sub-group. The resulting figure is value " \bar{R} "

$$\bar{R} = (R_1 + R_2 + \dots + R_k)/k$$

- Value " \bar{R} " should be calculated to four decimal places after the measured values. For example, the value for data presented in Figure 9.8b is calculated as follows:

$$\bar{R} = 4.27/30 = 0.1423$$

Figure 9.8c Coefficient table for calculating the control lines of control charts (page 26)

Figure 9.8b Calculation table for \bar{x} -R control charts

Sub-group number (date)	Morning shift	Mid-day shift	Night shift	Average	Range R
1	0.42	0.40	0.41	0.410	0.02
2	0.48	0.53	0.47	0.493	0.06
3	0.46	0.88	0.66	0.667	0.42
4	0.50	0.44	0.46	0.467	0.06
5	0.33	0.23	0.30	0.287	0.10
6	0.60	0.40	0.36	0.453	0.24
7	0.41	0.35	0.51	0.423	0.16
8	0.41	0.40	0.45	0.420	0.05
9	0.55	0.59	0.42	0.520	0.17
10	0.28	0.50	0.45	0.410	0.22
11	0.56	0.43	0.50	0.497	0.13
12	0.43	0.40	0.45	0.427	0.05
13	0.45	0.36	0.41	0.407	0.09
14	0.44	0.53	0.48	0.483	0.09
15	0.45	0.51	0.29	0.417	0.22
16	0.14	0.30	0.62	0.353	0.48
17	0.47	0.62	0.46	0.517	0.16
18	0.45	0.32	0.57	0.447	0.25
19	0.49	0.43	0.48	0.467	0.06
20	0.49	0.65	0.50	0.547	0.16
21	0.52	0.49	0.48	0.497	0.04
22	0.44	0.68	1.19	0.770	0.75
23	0.48	0.36	0.36	0.400	0.12
24	0.39	0.35	0.34	0.360	0.05
25	0.32	0.30	0.30	0.307	0.02
26	0.35	0.36	0.35	0.353	0.01
27	0.40	0.40	0.38	0.393	0.02
28	0.36	0.35	0.37	0.360	0.02
29	0.31	0.30	0.33	0.313	0.03
30	0.29	0.30	0.31	0.300	0.02
			Total	13.165	4.27

Figure 9.8c Coefficient table for calculating the control lines of control charts

Control chart types	\bar{x}	\tilde{x}	R	
			D_3	D_4
Sub-group size (n)	A_2	m_3A_2	D_3	D_4
2	1.880	1.880	-	3.267
3	1.023	1.187	-	2.575
4	0.729	0.796	-	2.282
5	0.577	0.691	-	2.115
6	0.483	0.549	-	2.004
7	0.419	0.509	0.076	1.924
8	0.373	0.432	0.136	1.864
9	0.337	0.412	0.184	1.816
10	0.308	0.363	0.223	1.777

Note: Columns denoted by “-” are disregarded.

Step 7. Calculate control lines of \bar{x} -R control charts

- \bar{x} Control Charts

CL: Central Line

$$CL = \bar{\bar{x}}$$

UCL: Upper Control Limit

$$UCL = \bar{\bar{x}} + A_2 \bar{R}$$

LCL: Lower Control Limit

$$LCL = \bar{\bar{x}} - A_2 \bar{R}$$

- R Control Charts

CL; \bar{R}

$$UCL = D_4 \bar{R}$$

$$LCL = D_3 \bar{R}$$

(When $n \leq 6$, there is no need to consider LCL)

Values A_2 , D_3 and D_4 are numbers fixed by “n”, the sub-group size (see Figure 9.8c). For example, control lines for the control charts presented in Figure 9.8c are calculated as follows:

\bar{x} Control Chart

$$CL = \bar{\bar{x}} = 0.4388$$

$$UCL = \bar{\bar{x}} + A_2 \bar{R} \text{ (when } n = 3, A_2 = 1.023)$$

$$= 0.4388 + 0.145573 = 0.584373$$

→ Rounded off to 0.5844 (two more decimal places after the measured values)

$$LCL = \bar{\bar{x}} - A_2 \bar{R}$$

$$= 0.4388 - 0.145573 = 0.293227$$

→ Rounded off to 0.2932

R Control Chart

1. $CL = \bar{R} = 0.1423$

2. $UCL = D_4\bar{R}$ (when $n = 3$, $D_4 = 2.575$)
 $= 2.575 * 0.1423 = 0.366423$

→ Rounded off to 0.366 (one more decimal place after the measured values).

There is no need to consider LCL because $n = 3 (<6)$.

Step 8. Write in the control limits

Get a sheet of paper specially designed for control. Draw the vertical and horizontal axes on it. In the case of \bar{x} -R control charts, position \bar{x} control above R control charts. Scale the graduations so that the distance between UCL and LCL is about six times as long as the distance between sub-groups shown on the horizontal axis. There is no need to put an LCL on R control charts when $n < 6$. Therefore, set the bottom graduation on the horizontal axis to zero. This value is considered a substitute for LCL. Denote the central line with a solid line (-). In control charts used for analysis and management, indicate the upper control limit (UCL) and lower control limit (LCL) with broken lines (...).

Step 9. Write marks in the control charts

Calculate the " \bar{x} " and "R" values for sub-groups and plot these on the control charts. Use different marks "." and "x" to plot \bar{x} and R values so that the differences will be clear. Indicate marks that went outside the control limits as ⊙ and ● to make it easier to identify them.

Step 10. Write in the necessary items

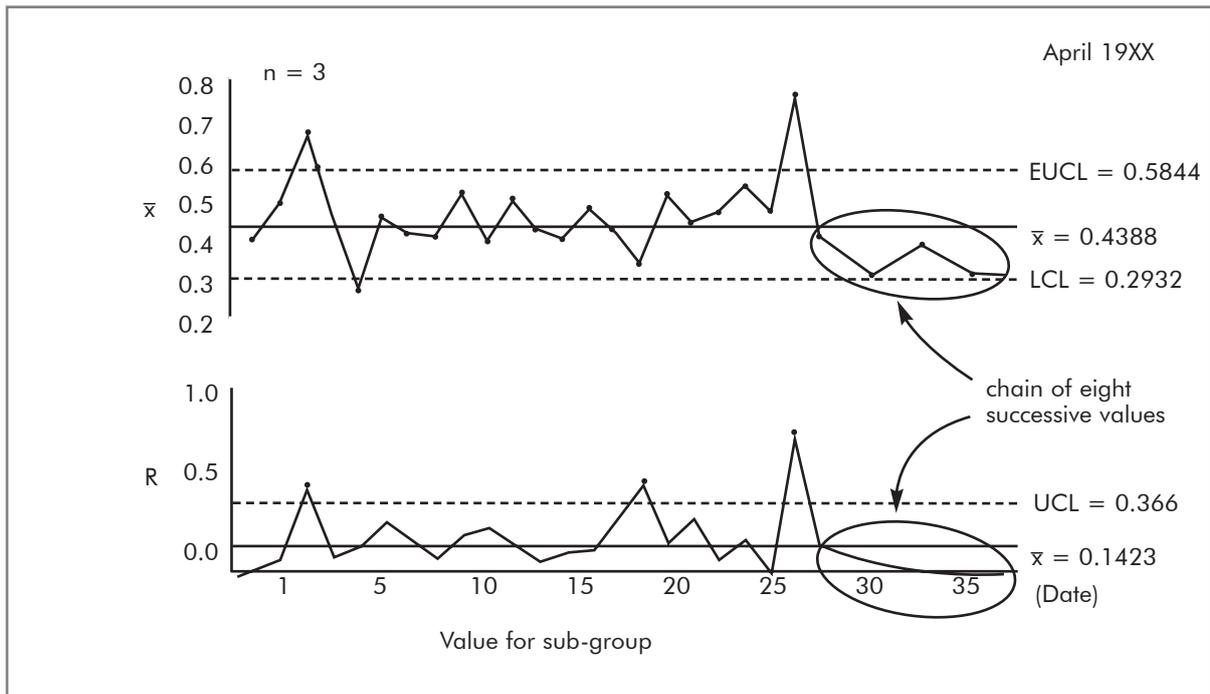
Write " \bar{x} " and "R" on the left edge of the control charts, and "n" on the top-left corner of \bar{x} control charts. In addition, give the quality characteristics, characteristic units, the names of those who entered data, technical standards, process names, and sampling methods.

Step 11. Study management conditions

Note the following in Figure 9.8d on page 28:

1. Both \bar{x} control charts and R control charts exhibit deviations from control limits in a chain of eight successive values. This process is "out of control".
2. There is a need to investigate causes of deviations from control limits that took place on the 3rd, 5th, 16th and 22nd of the month.
3. Both \bar{x} control charts and R control charts exhibit a chain of eight successive values from the 23rd to the 30th of the month. This situation is abnormal. However, this is a welcome abnormality. Once the causes of the abnormality are established and they prove satisfactory from the standpoint of intrinsic technology, it will be possible to reduce the amount of steam used.
4. Once causes of the abnormality after the 23rd day are identified and process conditions (location, equipment, employees, temperature etc.) clearly differ from those prior to that date, the central line and control limits must be drawn again using data from the 1st to the 22nd of the month.

Figure 9.8d Control chart for the amount of steam consumed in drying synthetic rubber B



Discussion

Study this text carefully, and discuss how you could make use of control charts in your company.

Action plan

Draw up an action plan to introduce the use of control charts in your company. You might like to use the outline described in the 6-Point Structure. Alternatively you may choose to prepare one action plan that draws on your discussions of several texts.

9.9 The QC Story I

Introduction

1. Sometimes we over-react to problems. We try to solve them immediately in whatever way we can. But over-hasty reactions often get us nowhere. We will handle problems much more effectively if we approach them systematically. For this we need to have a basic problem-solving procedure, and to follow it step by step. A QC Story is a good procedure for solving problems scientifically and rationally.
2. A QC Story consists of the following eight steps:
 - a. Select a theme to work on.
 - b. Clarify the problem and set targets.
 - c. Get a clear understanding of the effects that the problem has caused.
 - d. Analysis: investigate the causes.
 - e. Devise and implement recurrence prevention measures.
 - f. Confirm the effects of these measures.
 - g. Standardize the new methods.
 - h. Reflect on the problems left unsolved and consider future countermeasures.
3. QC stories were originally used in reports to explain past problem-solution cases in a way that was easy to understand. However, it was then recognized that the QC Story activities could themselves provide a neat problem-solving procedure - one that was clear and easy to follow, and that kept people on target. QC stories are now solidly established as the basic procedure for solving problems at work.

(Text 11.3.5 in Unit 11, Statistics, shows how the QC tools can be applied to the QC Story.)

Select themes

4. To select a theme, first of all identify all the problems in your workplace, compile them on a chart, evaluate them and select the most suitable as themes. To identify problems look at:
 - a. Tasks that constantly cause troubles.
 - b. Tasks that are difficult to carry out.
 - c. Tasks that have not been completed.
 - d. Tasks that present safety problems.
 - e. Tasks that often produce accidents or defects.
 - f. Tasks that frequently require reworking.
 - g. Tasks that take longer to complete than they should.
 - h. Tasks that no one is assigned to perform.
 - i. Problems that really need to be dealt with.
 - j. Areas of wastage of labor, money, materials, or time.
 - k. Demands and complaints from the preceding or subsequent production processes, or from other departments, sections or customers.

- l. How well sections and sub-sections have achieved their work targets.
 - m. How well production plans have been implemented.
5. Decide on your overall goals and describe these as concretely as possible, e.g. rather than say "Reduce measurement dispersion; shorten the period required to circulate documents", say, "reduce measurement dispersion by 50%; shorten the average period required to circulate documents from 10 days to five days." (In the next step, 'Clarify the problem and set targets', you will set more specific targets to achieve these goals.)
 6. You may choose to work on parts of a large problem as sub-themes. If you do so, include your overall goals in your description of the sub-themes. You should always keep the larger picture in front of you as you go along.
 7. Think carefully when you are selecting a theme. Here is an example of wrong selection: "Establish a preventive maintenance system to improve the operating ratio of facilities and equipment". However, the lack of preventive maintenance is not the only possible cause of a low operating ratio of facilities or equipment. The operations may have to be stopped frequently because product quality is unstable. Or the low operating ratio may be caused by the need for a long recovery period after operations have been suspended. So the first theme that needs to be addressed are the concrete problems caused by the prolonged suspension of the facilities or equipment. Such a theme leads naturally to the question, 'Why have the facilities or equipment been suspended?'

Clarify the problem and set targets

8. When you have identified the problem you are going to deal with, first try to see what exactly the problem is. Problems can be defined as unsatisfactory work results. For now, look only at these poor results. Later you can think about what may have caused them and how to solve this. First of all, free yourself from preconceptions and try to get a clear, objective view of the problem. If you begin by thinking about solutions you will be less likely to get to the basic cause and find the best solutions.
9. To clarify the problem, take the following steps:
 - a. First ask these questions:
 - i. Has the problem actually appeared or is it latent?
 - ii. Is it to do with maintenance or with an interruption of the production process?
 - iii. Is it a problem of: Q, C, D, S, or M. (Q: Quality, C: Cost, D: Volume and Productivity, S: Safety, M: Morale)?
 - iv. Is it restricted to my own department or section or does it also affect others?
 - v. How does it relate to corporate, departmental, or section policies?
(As well as using the data you already have, you may find that you need to gather further data for a certain period of time. A good way of collecting data is to use the 5W 1H questions: Why is data being collected? What data has to be collected? Who should collect it? When, where and how should it be collected?)
 - b. Then select the criteria to be used to judge the problem:
 - i. These should have been established in advance so that the assessment of the results of improvement will be objective.
 - ii. If you are using inspection items to identify abnormalities, standardise as the

criteria for judging problems, a) the inspection items, b) an allowable tolerance for each inspection item and c) the control limits (UCL and LCL) of control charts. (An allowable tolerance is the acceptable range given in technical standards and action limits for target values. The action limit is the limit represented by the highest or lowest value in a quality control chart. If the actual values fall outside these limits, a correction in the process is required and/or the cause of the change in the process must be determined. Target values are the desired outcomes from a process.)

- iii. For abnormalities where there are no inspection and checking items, establish the criteria creatively on a case-by-case basis, quantifying the data as much as possible.
- iv. Now set the target values and target dates for the solution of the problem, if these were not stated as part of the themes. Target dates are essential if you are to progress systematically through the problem solving activities.
- v. Classify the anticipated results of solving the problem into tangible and intangible effects in advance so that those in charge will have a shared understanding of what they are doing. (A tangible effect could be a reduction in the defect ratio, and an intangible effect could be improved teamwork.)

10. Remember that when employees get together to work out what exactly the problem is, they will have a shared sense of the need to solve it, and will be more likely to keep trying to find a solution.

Discussion

These discussion questions are different from those after other texts in this course. The QC Story is a procedure for solving problems. This text and the next two (9.10 and 9.11) provide you with guidelines for using this procedure. The most effective way to get a good understanding of these guidelines is to choose a theme from your own work processes and discuss how you would apply the guidelines to this problem. You may decide to change to a different theme after you begin, if the one you start off with does not give you enough scope to try out all the guidelines.

Note: Always include in your discussion any tables or charts referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1: What approach is taken in your company to solving problems in work processes? What are the shortcomings, if any, of this approach? How do you think this approach could be improved?
- b. Parag. 2: Before looking at each of these steps in more detail, discuss briefly how they might be applied to a typical problem that you have experienced.
- c. Parag. 4: Give examples of these from your own workplace.
- d. Parags. 5, 6 and 7. Select a problem from your own work place that you can use as a practice theme for this discussion.
- e. Parags. 8 and 9: Apply these ideas to the problem that you have selected.
- f. Parag. 10: Have you also found that when employees together to work out what the

problem is, they are more likely to keep at it until they find a solution? If yes, why do you think this is so?

Action plan

You will be invited to write an action plan after you have discussed all three QC Story texts.

9.10 The QC Story II

Introduction

1. This text presents the next two stages of the QC Story:
 - a. Get a clear understanding of the effects of the problem.
 - b. Analysis: Investigate the causes.

Get a clear understanding of the effects of the problem

2. It is important to have a clear picture of the negative effects that the problem has caused, before you attempt to analyse it - analysis comes in the next step. And remember to distinguish between the effects of the problem, and the causes. To get a clear picture of the effects, make an objective evaluation of the dispersions in the data related to the problem, and the differences that you can see among the various phenomena (the immediate visible problems).
3. Study the following four points:
 - a. Time: Check if the effects vary according to the time of day, the day of the week, or any other time factors. For example:
 - i. Disorders of XX equipment are concentrated during the two-hour period from 4 p.m. to 6 p.m.
 - ii. There are many complaints about products manufactured on Mondays and Fridays.
 - b. Place: Check the specific parts or places where abnormalities occur. For example:
 - i. Accidental colouring during storage is most intense in the upper sections of product X.
 - ii. Scratches on product Y are concentrated in the upper left corner.
 - c. Symptoms: Study the symptoms or characteristics of the abnormal conditions and the circumstances in which they appear. For example: the burst bag for product Y is caused by either scratches or wear. There are many more cases of scratches than of wear.
 - d. System: Check if the effects differ when different machines and different employees do the same work. For example: Product Z is manufactured using three systems known as A, B and C. The defect ratio for system B is about half the ratio for systems A and C.
4. Use sound research methods.
 - a. Study data that is based on facts – see Text 9.6.
 - b. Pay attention to positive dispersions: dispersions are not always negative. Exceptionally good conditions are also abnormal. Positive dispersions often help observers come up with ideas for improvement.
 - c. Inspect the actual items on the spot.

Analysis: investigate the causes

5. The purpose of analysis is to investigate the real causes of the problem. Carry it out in two steps:
 1. Identify different possible causes.
 2. Decide which of these are the genuine causes.

6. Identify possible causes:
 - a. Investigate as thoroughly as possible whether the abnormalities that have been identified are caused by any changes that may have taken place:
 - i. Have the operators changed?
 - ii. Have the facilities, equipment or machines changed?
 - iii. Have the base materials or other materials changed?
 - iv. Have the operational methods changed?
 - v. Has the working environment changed?In the example in parag. 3d above, the chances are that factors which differ between systems A and B, are the genuine causes.
 - b. Look at the concrete facts and ask the question "Why?" five times (see the example in Figure 9.4a). This will lead the investigation beyond superficial causes to identify possible root causes.
 - c. Use cause and effect diagrams and other QC tools (See Unit 11 Statistics) to examine the possible causes that emerge in steps a. and b. This may lead to the identification of more possible causes. Then organise all of these possible causes systematically.

7. From all these possible causes identify the genuine causes:
 - a. Establish which of these possible causes have a substantial effect on the problems. Use cause and effect diagrams to narrow these down and construct an hypothesis on how the abnormality may have developed.
 - b. Check this short-list of possible causes against the facts to identify which of them are the genuine causes. If possible carry out experiments to show the relationship between these possible causes and the effects. If experiments are not possible, look carefully at the effect these possible causes have on later operations.

Figure 9.10a Procedure for problem resolution and easy QC methods. This chart shows how the QC tools can be used with the QC Story, but note that it uses a slightly different description of the steps in the story.

8. The QC Story may be presented at a QC assembly. (See Unit 10.8.)

Discussion

Continue with discussing your theme (or problem) from Text 9.9:

- a. Parag. 2: Can you give any examples from your own experience where you found yourself focusing on the causes of a problem before you had a good grasp of its effects?
- b. Parag. 3: Discuss how you would examine the problem that you have chosen in Text 9.9 for this discussion with reference to these four factors. Alternatively, give examples of problems that have already been solved in your workplace, and discuss how they exemplify these factors.

- c. Parag. 4: How important do you think these three research methods are? Are there any others that you would include?
- d. Parags. 6 and 7: Apply these guidelines to the problem you have chosen. Alternatively discuss how they would helped with problems that you have already dealt with.

Action plan

You will be invited to write an action plan after you have discussed all three QC Story texts.

9.11 The QC Story III

Introduction

1. This text presents the final four stages of the QC Story:
 - a. Devise and implement recurrence prevention measures.
 - b. Confirm the effects of these measures.
 - c. Standardise the new methods.
 - d. Reflect on the problems left unsolved.

Devise and implement recurrence prevention measures

2. It is important to distinguish between emergency actions and recurrence prevention measures. Emergency actions are taken to eliminate the phenomena (the immediate, visible problems, e.g. stop more non-conforming products being made) while recurrence prevention measures are taken both to eliminate the phenomena and investigate the causes identified in the Analysis stage. Both emergency and recurrence prevention measures should be taken even if symptoms weaken or disappear temporarily. (See also Text 9.3)
3. In devising recurrence prevention measures:
 - a. Devise measures against each confirmed cause.
 - b. Brainstorm as many measures as possible, without thinking at first of how useful they will be.
 - c. Assess all these measures and narrow them down to those you will implement. Examine the following points carefully:
 - i. If the anticipated effects can be achieved.
 - ii. If the costs are acceptable (cost-effectiveness).
 - iii. If the plan is technically feasible (technicality).
 - iv. If the tasks can be performed adequately (operability).
 - v. If there are any safety problems (safety). Test and confirm items that affect quality and safety.
4. Prepare implementation plans: Determine who should do what and by when. Remember that the implementation of recurrence prevention measures can sometimes have a negative effect on other departments and sections. If this is the case, the improvements they bring about will be meaningless. Predict fully the negative effects on other departments and sections and get their approval before going ahead with implementation.

Confirm the effects of the measures taken

5. There are two types of effects that can result from the actions taken, both of which should be confirmed:
 - a. Tangible effects: those that can be quantified, e.g. A reduction in the defect ratio and costs, and in the time required for delivery – which numerical values can clearly confirm.

- b. Intangible effects: those that cannot easily be quantified such as improved teamwork and quality consciousness.
6. To confirm the tangible effects compare the actual figures with the target figures.
- a. Confirm whether the target values were achieved.
 - b. Use the same criteria that were used to get a grasp of the present situation.
 - c. Confirm the effects of each countermeasure.
 - d. If the problem is part of a larger problem, take the broader influences into account.

Standardize the new methods

7. When the recurrence prevention measures have proven effective standardize them as new operational methods, otherwise their good effects will not last.
- a. Establish standards, including regulations, revise them and scrap whatever may not be appropriate.
 - b. Investigate the effects on upstream and downstream operations, and revise the standards to take these into consideration.
 - c. Make sure that related departments and sections are fully informed of the new standards.
 - d. Clearly specify who, what, where, when and how.
 - e. Specify the implementation period.
 - f. Clearly record the reasons for establishing and revising the standards.
 - g. Educate and train employees in using the standards.
 - h. Follow up on the results: Use control charts and control graphs to monitor the continuation of the good effects.

Reflect on the problems left unsolved

8. Problems are rarely solved completely. Always make clear which problems have been resolved and which have not. Then make plans to handle the unsolved problems in the future.
9. Analyse the methods that were used to solve the problems so that these can be improved in the future:
- a. Compare the actual figures produced in the attempt to solve the problems with the action plans and identify the differences.
 - b. Reflect on the methods used for making plans, setting targets, and improving activities, in order to find out the reasons for these differences.
 - c. Put together themes for future activities.

Discussion

Continue with your theme from Texts 9.9 and 9.10.

- a. Parag. 2: Give one or two examples from your own experience that clarify the distinction between emergency actions and recurrence prevention measures, and that show how important it is to make this distinction.
- b. Parags 3 and 4: Either apply these guidelines to the problem you chose earlier, or give examples that illustrate their usefulness.
- c. Parag. 5: Which of these effects, tangible or intangible, are most likely to occur when you solve some of your typical problems? Give one or two examples.

- d. Parag. 6. Discuss how you would apply these points to your problem, or describe an example that shows their usefulness.
- e. Parag. 7: Do you normally establish standards for new methods of preventing problems recurring? Apply the RADAR questions to the steps given in this paragraph.
- f. Parag. 8: What would you normally do about problems that have been left unsolved? Take one or two examples and discuss how they might be handled in the future.
- g. Now that you have gone through all the steps of the QC Story, discuss its overall usefulness, and how you would apply it in your company. You may like to use the RADAR questions as a framework for this discussion.

Action plan

Draw up an action plan for introducing the QC Story in your company, using the 6-Point Structure.

9.12 Preventing problems arising

Introduction

1. The best way to avoid problems is to anticipate them, and stop them before they happen. This is known as preventive action. It is especially important at the planning stage. All employees should be on the alert for any factors that can lead to problems, and should be ready to take appropriate action when they do spot them.
2. These factors should then be examined carefully in workplace meetings, assessed, and one or more of the following types of countermeasure taken. For example, with a problem that has emerged where two passage ways cross:
 - S. Get rid of the operation in question (e.g. replace it with a two-level crossing).
 - A. Remove the possibility of recurrence (e.g. attach a cut-off).
 - B. Reduce the possibility of recurrence (e.g. install an automatic alarm device).
 - C. Increase the level of caution (e.g. post a "Caution" sign).
3. If you consistently implement measures of the S and A type you will have a stable work environment. Creating a workplace where employees are aware of the possibility that problems can always arise is the best preventive measure of all.

Methods for predicting problems

4. The ability to predict problems is normally directly proportional to the amount of experience that people have of such problems. However, there are also creative ideas and methods that allow us to predict problems even if we do not have a vast store of experience.
5. One method is to focus on a narrow range of possibilities. For example, it may be hard to predict the problems that could emerge while driving a car, but it becomes easier if we restrict ourselves to predicting problems that can result from opening and closing the car door. This can be narrowed down even further to problems that can result from opening and closing the door when there are children in a car. This procedure enables employees to take a more concrete focus, and thus makes predictions easier.
6. FMEA (failure mode and effects analysis) uses this approach to predict problems that could arise with product components. FMEA is widely employed as a design method for increasing reliability. It attempts to predict problems by focusing on specific units in the manufacturing process. Simply list the types of problems that could occur within a restricted range, predict the occasions in which they could emerge, and assess the chances of them occurring and their possible impact. In this way we narrow down the points that may need to be acted on.

Discussion

The following questions ask you to think about how the ideas in the text could be applied in your company. Some of the ideas may not be relevant to you. Concentrate on what is relevant. Keep notes of your conclusions – you will need them to prepare your action plan afterwards. Where appropriate ask yourself the RADAR questions.

Note: Always include in your discussion any figures referred to in the text, **if** you feel these are relevant to your company.

- a. Parag. 1: Give one or two examples of occasions when employees in your company have anticipated problems.
- b. Parag. 1: Give examples of some factors that could lead to problems in your workplace and that alert employees could spot. What kind of action would normally be taken to prevent these leading to problems?
- c. Parag. 2. Which of these four types of countermeasures would be appropriate for your examples in question a. above?
- d. Parag. 3: Would you say that your employees are always aware of the possibility of problems arising? If not, how could you encourage them to be so?
- e. Parags 4, 5 and 6: Apply FMEA to predicting typical problems that could arise in your production process.

Action plan

Take the ideas you have found useful in the text, and in your discussion, and present them in a well-structured action plan for introducing improvements in your company. You might like to follow the 6-Point Structure.

Test

Answer these questions using **only** the information given in the text. For each question one, two or all three answers may be correct. Tick the answer or answers you think are correct for each question. Each question carries 3 points – you get one point for each correct answer that you tick, and one point for each wrong answer that you do not tick.

9.1 Recognising abnormalities

1. Abnormalities can be defined as:
 - a. Deviations from abnormal conditions.
 - b. Defects.
 - c. Deviations from normal conditions.
2. Problems occur when abnormalities:
 - a. Occur.
 - b. Are not noticed.
 - c. Are ignored.
3. Abnormalities may be:
 - a. Discovered by inspectors during the inspection process.
 - b. Discovered by employees conducting their own inspection.
 - c. Indicated by control charts.
4. In inspections the present values are examined against:
 - a. Target values.
 - b. Standard values.
 - c. Normal values.
5. Dispersion may be caused by:
 - a. Abnormalities.
 - b. Control charts.
 - c. Chance.
6. When an employee thinks that a machine sounds different s/he should:
 - a. Keep quiet about it.
 - b. Report it.
 - c. Wait for a day or two.

9.2 Reporting abnormalities

7. To encourage employees to develop a habit of reporting abnormalities managers should:
 - a. Explain that if managers do not know all the unpleasant facts the employees themselves will suffer.
 - b. Establish a relationship of trust with employees.
 - c. Give concrete instructions that even minor abnormalities should be reported.
8. Very minor abnormalities should be reported:
 - a. Always.
 - b. Sometimes.
 - c. Never.

9. Abnormality reports should be delivered in writing:
- a. Always.
 - b. Often.
 - c. Never.
10. The three-point procedure to carry out before reporting the abnormality is:
- a. Confirm the problem, select the report format, fill it in precisely.
 - b. Get a fellow employee to confirm the problem on the spot as quickly as possible.
 - c. Confirm the problem on the spot in a realistic way.
11. Reports that are aimed at preventing abnormalities causing further problems may require:
- a. Suspending production.
 - b. Freezing shipments.
 - c. Isolating abnormal products.

9.3 Emergency actions with non-conforming products

12. When abnormalities produce non-conforming products, the first priority is to:
- a. Find out what is causing the problem.
 - b. Stop more non-conforming products being made.
 - c. Remove the abnormalities.
13. To prevent abnormalities escalating, decide in advance:
- a. Who is in charge.
 - b. Who is responsible for taking countermeasures.
 - c. What countermeasures should be taken.
14. To prevent non-conforming products being used or shipped, make clear:
- a. The methods for identifying these products.
 - b. The methods for segregating them.
 - c. The procedures for preventing them recurring.
15. The methods that the ISO 9000 series introduces for processing non-conforming products include:
- a. Reworking the products.
 - b. Using them for an alternative application.
 - c. Scrapping them.

9.4 Preventing the recurrence of abnormalities

16. An examination of secondary and third level causes of different abnormalities lead:
- a. Often to a variety of root causes.
 - b. Often to the same source cause.
 - c. Always to a variety of root causes.
17. In the definition suggested in this text, an abnormality is not regarded as a recurrence if it appears again:
- a. After six months.
 - b. After one year.
 - c. After three years.
18. The stages in which recurrence prevention measures can be taken include:
- a. Measures aimed at operations in which problems have been identified.
 - b. Measures aimed at similar operations.
 - c. Measures aimed at the overall system.

9.5 Rules for processing abnormalities

19. When abnormalities appear they should be classified into ... ranks depending on the impact they have.
 - a. Three
 - b. Four
 - c. Five
20. Enter abnormalities as soon as they appear in a Prompt Report of Abnormality Situations, giving:
 - a. The nature of the abnormalities.
 - b. The root causes.
 - c. Any action taken with products.
21. Medium-level abnormalities should be reported to:
 - a. The CEO.
 - b. The manufacturing plant director.
 - c. The section manager.
22. Abnormalities are registered as chronic deficiencies when:
 - a. They cause non-conforming products.
 - b. Targets for measures to prevent their recurrence are not met.
 - c. The non-conforming products they cause have to be scrapped.

9.6 Base problem solving on facts

23. Subjective impressions:
 - a. Should be ignored.
 - b. Should be objectified.
 - c. Can be helpful.
24. The steps to be taken to establish the facts about abnormalities include:
 - a. Examine the actual spot where the problem occurred.
 - b. Clarify the objectives for which data is being collected.
 - c. Use statistical techniques to analyse the data.

9.7 Managing dispersion

25. Averages are a way of:
 - a. Conveying a true picture of what the data means.
 - b. Interpreting the data.
 - c. Measuring dispersion.
26. Countermeasures need to be taken if:
 - a. The range of dispersion is too wide.
 - b. There are outliers.
 - c. There is a range of dispersion from the technical standards.
27. If the materials and work methods are those prescribed in the standards.
 - a. There will be no dispersion.
 - b. There will be some dispersion.
 - c. There will always be dispersion.
28. Dispersion may result from:
 - a. Employees not following the operational standards.
 - b. Changes in materials.
 - c. Inexperienced employees replacing experienced employees.

9.8 Control charts

29. Control charts have:
- a. One line.
 - b. Two lines.
 - c. Three lines.
30. When all the characteristic values plotted on the chart lie between the lower control limit and the central line:
- a. The process is out of control.
 - b. The process is under control.
 - c. The process can be both out of control or under control.
31. Which of the following are discrete values?
- a. Length.
 - b. Weight.
 - c. Number of defects.
32. \bar{x} -R control charts respectively represent:
- a. Sub-group average and sub-group range.
 - b. Sub-group range and sub-group average.
 - c. Defect variation and defect ratio.
33. p control charts are used:
- a. When the ratio of defects is considered.
 - b. When the number of samples is constant.
 - c. When the number of samples is not constant.
34. A process is out of control when:
- a. Five or more points form a chain above or below the central line.
 - b. Seven or more points form a chain above or below the central line.
 - c. 10 out of 11 consecutive points are on one side of the central line.

9.9 The QC Story I

35. The QC Story follows eight consecutive steps. Which of the following are correct?
- a. The second step is to clarify the problem and set targets.
 - b. The fourth step is to investigate the causes.
 - c. The eighth step is to standardize the new methods.
36. If you adopt parts of a large problem as a sub-theme you should:
- a. Specify the overall aims of the larger theme in the sub-themes.
 - b. Specify new aims for the sub-themes and focus only on these.
 - c. Do not specify anything new.
37. To clarify the problem you should first ask these questions:
- a. Has the problem actually appeared or is it latent?
 - b. Is it to do with maintenance or with an interruption of the process?
 - c. Does it concern other departments?
38. When inspection items are used to identify abnormalities, the criteria for judging problems are indicated by:
- a. The inspection items.
 - b. An allowable tolerance for each inspection item.
 - c. The central line of control charts.

9.10 The QC Story II

39. Before you attempt to analyse the data you should have a clear picture of:
- a. The negative results that the problem has caused.
 - b. The likely causes of the problem.
 - c. Possible recurrence prevention measures.
40. To get a clear understanding of the effects of the problems study the following points:
- a. Time, place, symptoms, and system.
 - b. Time, place, machinery, and system.
 - c. Time, place, symptoms and storage.
41. Abnormalities may be caused by differences in:
- a. Employees.
 - b. Facilities.
 - c. The working environment.
42. If it is not possible to use experiments to confirm the relationship between possible causes and the results:
- a. Use cause and effect diagrams.
 - b. Use control charts.
 - c. Look carefully at the effects these causes have on results in subsequent diagrams.

9.11 The QC Story III

43. To devise recurrence prevention measures:
- a. Devise measures against each confirmed cause.
 - b. Be careful not to devise too many possible measures.
 - c. Assess these measures and narrow them down for implementation.
44. To confirm tangible effects of the actions taken:
- a. Confirm whether the target values were achieved.
 - b. Use the same criteria that were used to get a grasp of the present situation.
 - c. Confirm the effects of each countermeasure.
45. To standardize the new methods:
- a. Make sure that related departments are fully informed of them.
 - b. Clearly record the reasons for establishing the standards.
 - c. Use control charts to monitor the continuation of the good effects.
46. To analyse the methods used to try to solve problems that were, in the end, left unsolved:
- a. Compare the results of the attempt to solve the problem with the earlier results caused by the problem.
 - b. Reflect on the methods used for making plans, setting targets, and improving activities.
 - c. Put together themes for future activities.

9.12 Preventing problems arising

47. When factors that can lead to abnormalities have been assessed the actions that may be taken include:
- a. Get rid of the dispersion.
 - b. Reduce the possibility of recurrence.
 - c. Remove the possibility of recurrence.

48. FMEA attempts to predict problems by:
- a. Focusing on a broad range of units in the manufacturing process.
 - b. Focusing on specific units in the manufacturing process.
 - c. Increasing the reliability of specific components.



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