Food safety is still the major issue of food processing because of its health and economical importance. Regulatory authorities and producers are making major efforts to improve the hygienic quality of food. The control mechanism for production of safe food is now directed to safe production systems from the final product control. Based on this principle, Good manufacturing practices (GMP) are being applied to maintain the certainty of safety in the final product.

GMPs are minimum sanitary and processing requirements necessary to ensure the production of wholesome food. The system is based on four prescribed requirements. They are:

- Personnel practices
- Building facilities
- Equipment and utensils
- Production and process controls

Every person working in the food industry to produce, pack and distribute food for consumption has to understand and apply basic principles of sanitation. People are the most important variable in food processing. The maintenance of personnel is an important factor in GMP. For this purpose the plant management shall take all reasonable measures and precautions for:

- Disease control
- Cleanliness
- Education and training
- Supervision

Disease control is an important point in personnel management. Any person who by medical examination or supervisory observation, is shown to have, or appears to have an illness, open lesions or any other abnormal source of microbiological contamination should be excluded from any operations which may be expected to result in such contamination until the condition is corrected. In many countries providing a pre-employment and periodical medical examination is an obligation. However periodic physical examination of workers, reporting their illnesses to the management, is also important.

People might be a source of contamination even though they are healthy. Micro organisms can be present in healthy mouth and noses and on healthy skin. The only prevention from these micro organism sources is maintenance cleanliness of the personnel.

All personnel working in direct contact with food, food contact surfaces and food-packing materials shall conform to hygienic practices while on duty to extent necessary to protect against contaminated food. There important factors to maintain cleanliness of the personnel.

Clothing is an important prevention. Wearing suitable clothing to prevent the contamination of food, food contact surfaces and food-packing materials. Clean overalls designed with appropriate buttons and pockets are important. Head covers for all hair, including beard has to be provided. Clean and specified indoor foot wear should be used. Disposable gloves are an
important application if they are changed in appropriate interval and hands are thoroughly washed in between changes. The frequency of changing gloves is important because the sweat under the glove will cause a high humidity and faster multiplication of the microorganisms on the skin. Facial masks might be worn in critical operations. Although facial masks prevents air contamination they are uncomfortable and touching masks cause higher contamination. The personnel should be informed about the order of wearing clothing. The hair covers should be worn before the overalls are worn. The clothing should be made from light colour materials. This will provide the visibility of the soil and dirt on the clothing. Changing rooms should be provided. There should be appropriate closets and shelves to keep the personal belongings. The contamination between outdoor dressing and work clothes should be avoided by using a proper design. Personnel should have practice general hygienic aspects. They should take shower periodically. Have short fingernails.

Adequate personnel cleanliness has to be completed by, adequate hand washing facilities before starting work and certain intervals. Too frequent washing is not recommended because of its being time consuming and slowing the process. Skin antiseptics are important to use. Soap when used as skin antiseptics is generally ineffective. Alcohol is generally effective on bacteria but not on spores. For general usage 70% alcohol is recommended but not the best disinfection system because alcohol dries the skin and results with fractures and becomes a source of contamination. Iodine compounds combined with detergents are good antiseptics. The water supplies for hand washing should preferably be not hand manipulated to avoid cross contamination. Hand drying is as important because humidity provides a good condition for microbiological growth. Disposable paper towels might be use for hand drying. Using alcohol based, self-evaporating, jells are strongly recommended. The personnel should be trained on proper hand washing. Indicating figures and writings should be hanged on the walls.

The personnel should not eat and chew during the process to avoid contamination. Smoking should also be prohibited.

The presence of loose jewellery is a very high risk for foreign body presence in food products. Only single chain wedding rings might be allowed. Other jewellery including any type of body piercing should be prohibited. Similarly face make up, nail varnish are sources of foreign bodies in the product. Injuries from stones present in the food product are very common. These foreign bodies may cause injuries, they may be a source of contamination and finally they are loathsome for consumer. Perfume or after shave worn by the personnel are as important because they cause odour contamination.

In many cases very simple mistakes made during food handling and cleaning procedures results with important outbreaks. Handling of processed material after raw material (cross contamination) is a very important contamination factor in food processing, mainly occur with incomplete applications. Similarly wrong applications during sanitation become a reason for contamination instead of cleaning. Personnel responsible for identifying sanitation failures or food contamination should have a background of education or experience or combination to perform the responsibility.

Supervisory personnel who have all the compliance with the previous requirements should be present in the plant. Performing regular inspections are also important.

Providing Food processing plants has to be constructed in the condition that they should be
easy to clean and have the right design to prevent contamination. The grounds walls and ceilings should be made from materials that are easy to clean. Wood is not recommended material to use in construction of food processing plants because it is porous and absorbs moisture. It allows the migration of microorganisms in its pores. Iron is also not recommended for the reason of rusting. Rusts causes foreign bodies and allows microbiological growth. The most common material for processing plants is stainless steel. It is smooth and the nature of the material is suitable for cleaning and disinfecting. The joints of the construction should be continues. The angles of corners have to be appropriate. Sharp corners are difficult to clean and provide very good spaces to microorganisms to hide. Rubber and rubber compound are good for sealing. The design of the equipment used in the processing is important. They should be easy to maintain and they have to be suitable for complete cleaning. The condition of electrical and pipelines have to be maintained well.

Ventilation in the area is very important. The ventilation will minimize odours and vapours to minimize the contamination of food. The airflow in the establishment is very important. Filters should be used for incoming air and they should be changed frequently. Otherwise they may be a very good source of contamination. The moisture level and the temperature of the environment are also important. It must bear in mind that water and heat are very important factors for microbiological growth.

Sanitation is the main process for a safe food production. Buildings, fixtures and other physical facilities shall be kept in a sanitary condition and in adequate condition to avoid any adulteration of the food. Appropriate substances should be used in appropriate conditions to maintain cleaning and sanitizing.

Water supply should be sufficient for the operations intended and should be derived from an adequate source. The quality of water should be drinking water. The water supply should be safe and the temperature and pressure should be appropriate. Water disruption system must be designed to prevent contamination. The pipelines should be protected from the entrance of rodents and birds.

All sanitizing and cleaning chemicals, toxic chemicals and pesticides should be stored in a manner that protects against any sort of contamination. They should be locked if possible and the entrance should be controlled. The rooms should be designed to prevent leakage. They have to be ventilated well and not have direct open to the food area.

Toilets should be readily accessible. The number of toilets should be sufficient to the number of personnel. It is recommended to use a plan for a toilet for every 15-20 employees. They have to be designed to prevent contamination of food line. They should not have direct open to the food area. The toilet flashes are very important points for contamination. The foot pedal flushes are preferred.

The cleaning procedure is one of the main responsibilities of the management for GMP. A very detailed plan must be prepared and it must show details of the information about chemicals, methods and safety, who will do the cleaning, the points for inspection of the process for all equipment and environment. The personnel should be encouraged to remove the products from the line during breaks and good keeping of the line they are responsible. Because washing causes aerosols to food contact surfaces the cleaning procedure should not be performed during production. Before the cleaning starts all the electrical contact of the equipment should be switched of. The fat and soil should be removed from surfaces by
mechanical cleaning with brushes, scrapping or vacuum. The pre-rinsing should be performed with cold water. Hot water might be used for fat removing. But using very hot water will coagulate proteins. A pre-cleaning and disinfection should be performed. The concentration of the disinfectant, the temperature and the contact time is important. In general most disinfectants are required to reduce bacterial population by 5 log in at least 5 minutes. For spores or moulds the contact time should be 15-60 in total by repeated applications. In general there is a sigmoidal curve relation with the concentration of the disinfectant and the microbial death. In some cases hot water and steam is used for cleaning but in such applications the proper use (contact time and temperature) is very important. The application of disinfectant is generally recommended after wet cleaning. The recommended disinfectants are, chlorine, and chlorine compounds, iodophores, acid anionic surfactants and amphoteric surfactants. The pH and hardness of the water used is also important for the activity of the disinfection procedure. The frequency and the system of cleaning should be detailed in cleaning procedure of the establishment. The responsibilities have to be determined and the monitoring of the cleaning procedure has to be monitored periodically. Using cleaning charts are important. The efficiency of cleaning and disinfections can be controlled by laboratory tests periodically performed in the establishment. The sensory assessments and the new developed rapid methods or direct epifluorescence filter technique can be used. The acceptable limit of microorganism for surfaces are relate to the process. The personnel responsible from cleaning should be trained to perform the process properly.

The presence of pests in the plant should be avoided for several reasons. Presence of pests in the plant has two main affects. Economical effect; they eat the product and equipment, and damage the system. They are a source of many diseases and a vehicle for contamination. The prevention of pests should be made with a very professional plan. The management most prepare a good pest control plan or the pest control process should be taken from a professional provider. The storage of pest control chemicals is very important because of their being highly toxic.

Waste control should be performed with restricted rules. They have to be collected in a separate non-clean area. The contamination to the food area should be avoided. The loading space of waste should be planned in a way to easy to clean.

All the equipment food contact surfaces and utensils should be made from adequate cleanable materials. They have to be designed in a way that they should not be any source of contamination and any source for foreign body in the product.

Raw material and other ingredients have to be inspected and segregated or handled under condition that they will not cause contamination. They shall either contain low level microorganisms or processed effectively to lower the micro organism count to an acceptable level. They shall be free of toxic contamination. They shall be kept in appropriate humidity and temperature, frozen raw material and ingredients shall be kept frozen, thawing should be done in suitable way. The management preferably determine the criteria they will use for buying raw material to certain the safety of their final product.

During the manufacturing operations, equipment and utensils and finished food containers shall be maintained in an acceptable condition through appropriate cleaning and sanitizing. All food manufacturing, including storage and packing, shall be performed in appropriate way to control micro organisms growing. Measures such as temperature, Aw, pH, shall be
performed continuously and properly. Processing shall be performed in a way that contamination is prevented.

Storage and transport have to be maintained under conditions that will protect foods against physical, chemical and microbiological contamination. The chilled and frozen storage rooms should be maintained under general sanitation aspects. The temperature control of these rooms should be monitored regularly and recorded. The design of such rooms should be prepared to avoid contamination. Storage must be made with a practical order to provide the system called first in first out. Raw material and finished products should be separated. The airflow and the humidity of these rooms are also important to perform appropriate cooling or freezing.

The management have to perform periodical internal or third part audits or inspections to validate the application of GMP. Record keeping is another appropriate process for GMP to monitor the compliance of the system. For safety of the final product every personnel taking place in every step of processing line has a responsibility for the production of safe food. This responsibility has to be well explained to the employee. Training of the personnel in every step of the line is important. The management must have goal for their product. The goal must start from the purchase of the material, processing and distribution. This goal must be well understood by the every single personnel of the establishment. GMP is a continuous process. Any negligence in one of the steps will result with an inadequate and unsafe food product.

References:
