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Industrial System Framework Overview

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Industrial Systems

- For this discussion, the term “industrial system” refers to motor-driven systems found in virtually all factories
- Globally, motor-driven systems consume more than 70% of global manufacturing electricity (2194 billion kWh) annually





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System Savings Opportunity

- Both markets and policymakers tend to focus on motor system components, which typically offer a **2-5%** efficiency improvement potential
- But the optimization of motor systems offer a **20-50%** efficiency improvement potential
- Similar savings opportunities also exist for steam systems



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Elements of System Optimization

- Evaluating work requirements
- Matching system supply to these requirements
- Eliminating or reconfiguring inefficient uses and practices (throttling, open blowing, etc)
- Changing out or supplementing existing equipment (motors, fans, pumps, compressors) to better match work requirements and increase operating efficiency





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Elements of System Optimization

- Applying sophisticated control strategies and variable speed drives that allow greater flexibility to match supply with demand
- Identifying and correcting maintenance problems
- Upgrading ongoing maintenance practices



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Why aren't industrial systems more energy efficient?

- Industrial markets focus on components, not systems
- Factories are primarily concerned with production, not energy efficiency
- Most industries have a budgetary disconnect between capital projects (equipment purchases) and operating expenses (energy and maintenance)





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Why aren't industrial systems more energy efficient?

- Technical skill is required to optimize motor-driven systems- a one-size-fits-all approach misses most of the savings
- Although training and educational programs in the U.S., U.K., China and elsewhere have proven effective in teaching these skills
 - these efforts are resource-intensive
 - only reach a small portion of the market



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Additional barriers to efficiency

- System optimization knowledge resides with the individual who has been trained- it is not institutionalized
- Trained individuals leave or transfer and take this knowledge with them
- Processes change over time and inefficiencies can re-occur

How can system energy-efficiency be maintained in this complex, changing environment?





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Learning from Process Management

Successful industrial processes are also complex and changing, but they are:

- Consistent
- Adaptable
- Resource efficient
- Continually improving



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Learning from Process Management

These goals are often achieved through widespread adoption of a management system to maintain and improve quality, such as:

- International Organization for Standardization (ISO)
- Six Sigma
- Total Quality Management

What if system energy efficiency were fully integrated into these management systems?





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Why ISO?

Why select ISO as the management system of choice?

- Widely adopted in many countries
- Serves as an international trade facilitation mechanism
- Accepted as a principal source of standards for energy-consuming industrial equipment
- Well-established system of independent auditors to assure compliance and maintain certification



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Why ISO?

- More than 566,000 companies in 149 countries were participating in ISO by the end of 2003*
- This includes more than 100,000 Chinese companies and xxx companies in SE Asia

* From *The ISO Survey of ISO 9000 and ISO 14001 Certificates- Thirteenth Cycle: Up To and Including December 2003*





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Linking ISO and Energy Efficiency

Use a top-down, bottom-up approach to industrial motor system efficiency through implementation of an **Industrial Standards Framework**, which includes:

- Energy-efficiency standards (energy management, industrial systems)
- Energy efficiency policies (targets, agreements, recognition)
- Training (both awareness and expert level)
- Tools (system optimization library)



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Why is a Standards Framework Needed?

A standards framework would:

- Provide achievable energy efficiency targets
- Be complementary to systems optimization training
- Offer technical guidance to factory personnel
- Require written procedures and documentation to ensure that energy savings will be sustained





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Industrial Standards Framework

Goal:

integrate energy efficiency projects into existing ISO management structures for continuous improvement



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Industrial Standards Framework

Top Down- Market Pull

National governments:

- Issue broad-based standards for industrial energy management written in ISO-compatible language (example: *Management System for Energy- MSE 2000*)
- Provide access to tools (*Industrial Systems Optimization Library*) and training for plants on how to comply with the standards
- Recognize companies that make outstanding efforts to improve the operation of their motor systems





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Industrial Standards Framework

Top Down- Market Pull

National governments:

- Develop energy efficiency agreements with industrial sectors that establish plant-specific energy efficiency targets tied to units of production
- Issue energy efficiency standards for motor-driven systems
- Provide training for compliance with agreements and standards



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Industrial Standards Framework

Bottom Up- Market Push

- Build on existing industrial plant commitments to ISO certification
- Create an *Industrial Systems Optimization Library* with documentation that companies can easily incorporate into their QEM Manual
- Provide training to plant personnel and energy efficiency organizations- how to identify system improvement opportunities and use the library





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Industrial Standards Framework

- Train suppliers to support a system-based approach
- Check results- regular audits by ISO ensure that companies comply with their plans



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Industrial Systems Optimization Library

- Complementary to system optimization training (awareness or expert level)
- Designed to the “80/20 rule” for achieving *persistent* energy savings in systems of moderate complexity
- Highly complex systems still require the use of a system optimization expert





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Industrial Systems Optimization Library

- Provides guidance on project implementation once an energy-efficiency opportunity has been identified
- Allows for an incremental approach to implementation
- Reduces time and resources required for documentation
- Can be used with or without ISO certification



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Industrial Systems Optimization Library

- Collection of expert experience of all motor-driven systems
- Cataloged for easy reference by consultants and/or trained factory personnel
- Easily customized for specific factory needs





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Independent Verification of Compliance

- ISO 9000/14000 programs aimed at consistent operating culture and continuous improvement
- Audit requirements verify compliance to written procedures and policies
- *Efficient operation becomes factory culture*



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Implement by Industrial Sector

- 1) Develop Energy Efficiency Targets by industrial sector and identify factory-specific goals
 - Voluntary or mandatory, depending on needs
- 2) Factory training on techniques to meet goals:
 - Corporate Energy Management
 - Industrial Systems Optimization
 - Compliance w/ Operating Standards
 - Use of System Optimization Library
- 3) Technical support from qualified experts as needed to implement projects
- 4) Benchmark results against factory and industry goals





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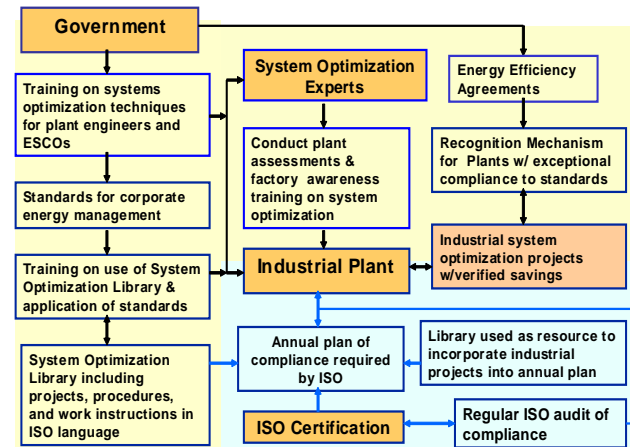


Results

- More completed energy efficiency projects
- Project results are periodically checked by independent auditors
- Improved energy efficient industries
- Sustainability



Proposed Industrial Standards Framework





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Next Steps

- Develop a regional project for the Industrial Standards Framework
- Provide system optimization training to engineers and vendors
- Work with national governments to develop and publish energy management standards, industrial system standards, and energy efficiency agreements



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Next Steps

- Engage trained system optimization experts in demonstrating the Systems Optimization Library
- Integrate System Optimization Library experience with standards, agreements, and system optimization training to create an Industrial Standards Framework





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