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Leadership and management Practices in Industrial Energy Efficiency

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Industrial Systems

- **Worldwide, steam and motor-driven systems account for more than 50% of final manufacturing energy use.**
- **Energy savings potential from cost-effective optimization of these systems for energy efficiency is estimated at 10-12 EJ of primary energy¹**
- **A global effort to cost-optimize industrial systems for energy efficiency could achieve these energy savings through**
 - **the application of commercially available technologies**
 - **in existing and new industrial facilities**





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Why are these systems so inefficient?

- **Most managers are unaware that these systems are energy inefficient**
- **System performance is not measured**
- **No data = no way to assess performance or performance improvement**
- **Management focus on production, not energy efficiency**
- **Separate budgets for equipment purchases and operating budgets**





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Additional barriers to energy efficiency

System optimization training works, but--

- **the 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**
- **By the end of 2004, more than 670,000 certified facilities in 154 countries participating in ISO 9001:2000 and 90,500 certified facilities participating in ISO 14001 ***

** From The 2004 ISO Survey*



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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 (targeted agreements, incentives, recognition)**
- **Training (both awareness and expert level)**
- **Tools (system optimization library)**



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Industrial Standards Framework

Goal:

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

Industrial Standards Framework

| <i>Policy Objective</i> | <i>Policy Response</i> | <i>Market Response</i> |
|--|--|--|
| Establishing National Goals for GHG Reduction | Voluntary or Target-setting Agreements; Tax incentives | Companies commit to energy intensity reduction targets |
| Capacity Building | System Optimization Training of plant engineers/consultants/ suppliers/ ESCOs | Trained experts conduct plant assessments, sell system services |

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| Integrating Energy Efficient Practices | Energy Management Standard, Guidance, Training | Plants actively manage energy like other resources |
| Identifying Energy Saving Projects | Trained System Experts System Optimization Library Standardized Assessments | Plant managers use trained experts to identify projects |

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| Implementing Energy Efficiency Projects | Financial incentives, loan guarantees & subsidies, energy efficiency credits, ESCOs | Plants implement more projects, buy system services, accrue credits |
| Documenting for Sustainability | Energy Management Plan System Optimization Library Measurement & Verification | Energy savings continue through project lifetime & are tradable as credits |
| Market Recognition | Recognition Programs, Energy Efficiency Credits, Certification | Companies & financial institutions value energy efficiency |



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Energy Management Standard?

- **Most energy efficiency in industry is achieved through changes in *how energy is managed* in an industrial facility, rather than through installation of new technologies;**
- **An energy management standard provides a method for integrating energy efficiency into existing industrial management systems for continuous improvement;**
- **All existing and planned energy management standards are compatible with ISO 9000/14000¹;**
- **Companies who have voluntarily adopted an energy management plan (a central feature of an energy management standard) have achieved major energy intensity improvements².**

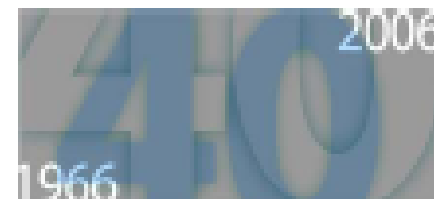
1 International Organization for Standardization (ISO)

2 Btu/lb of product



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Business Benefits

Assists a company to:

- **Develop a baseline of energy use**
- **Actively managing energy use and costs**
- **Reduce emissions without negative effect on operations**
- **Continue to improve energy use/product output over time**
- **Document savings for internal and external use (e.g. emission credits)**



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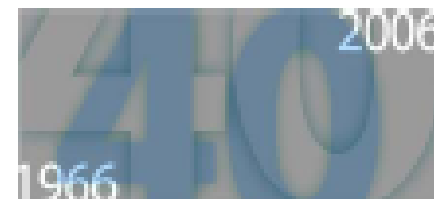
Energy Management Results

- **3M's** Global Energy Management Program has cut energy use 30% per net sales since 2000; now seek to reduce total energy use by >40% from 2000 levels by 2008
- **Dow Chemical** achieved 22% improvement (\$4B savings) between 1994 and 2005, now seeking another 25% from 2005 to 2015
- **Toyota's** North American (NA) Energy Management Organization has reduced energy use per unit by 23% since 2002; company-wide energy-saving efforts have saved \$9.2 million in NA since 1999.
- **Dupont** applied "Six Sigma" energy management to complete >75 projects saving \$250,000 annually per project and reducing GHG emissions by 68% since 1990—exceeding their 2010 target of 65%. Corporate-wide energy use has remained flat since 1990, despite a 35% increase in production.
- **United Technologies Corp** reduced global GHG emissions by 46% per dollar of revenue from 2001 to 2006, now seeking an additional 12% reduction from 2006 to 2010



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Industrial Standards Framework

Top Down

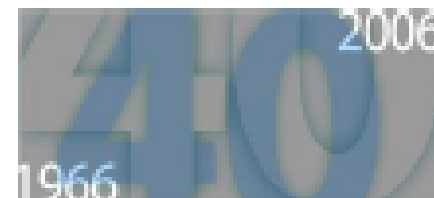
National governments:

- **Issue an energy management standard**
- **Provide access to training on how to comply with standard**
- **Provide access to tools (*Industrial Systems Optimization Library*) to document compliance**
- **Recognize companies that make outstanding efforts to improve their energy intensity**
- **Develop agreements with industrial sectors that establish plant-specific energy efficiency targets**



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Industrial Standards Framework

Bottom Up

- **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**
- **Engage existing supplier/customer relationships to promote greater energy efficiency**



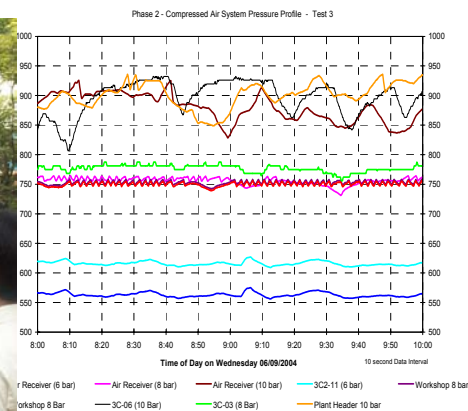
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Role of Trained Experts

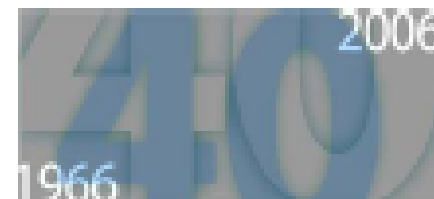
- **Train consultants and suppliers to support a system-based approach**
- **Check results- regular audits by ISO ensure that companies comply with their plans**





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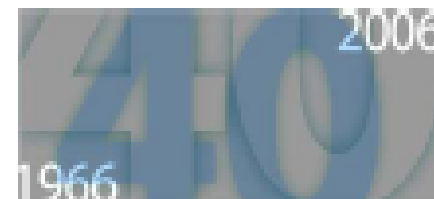
Independent Verification of Compliance

- **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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Outcomes

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



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Thank You.

For more information:

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