Organizational Change in Industry Through Strategic Energy Management: Results and Barriers to Success

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Simplified Ins and Outs of a Manufacturing Facility

Well managed with business practices

Labor

Materials

Energy

Products

Emissions
Inside a Manufacturing Facility

People

Equipment and Processes

Raw Materials and Energy Sources

Top Management

Energy, Environmental, Health, and Safety Managers

Production Managers and Staff

Controls

The Project Approach to Energy Efficiency in Manufacturing

Energy assessment to identify projects:
- Estimates of energy savings for a piece of equipment, system, or process

Projects are then:
- Competed for capital funds with other higher priority items
- Reliant upon a champion to drive them forward

Project savings:
- May not be quantified after implementation and communicated up or down the organization
- Are not well connected to overall facility energy
- Degrade
Connections and Priorities for Energy Performance Improvement are Lacking

Energy Needs a Foundation for Continual Improvement

Energy = Sunk Cost
Maximize Shareholder Value
Stay in Business

Energy Management System (EMS)
Control Based System

EnMS (Energy Management System)
Continual Improvement Business Practice

- Continual improvement business practices (EnMS) connect people, equipment, controls, and energy through feedback loops utilizing data, analysis, actions, reviews, and decision making processes.
ISO 50001 - Energy Management System Standard

- International developed standard
- Input from 56 countries
- Adopted by many as a national standard
- Foundation for continual energy performance improvement
- Connects people inside an organization
- Data driven decision making and review process

- Energy performance improvement targets set by the organization

Light blue text represents new data-driven sections in ISO 50001 that are not in ISO 9001 & ISO 14001

Superior Energy Performance® (SEP™)

- Externally set energy performance improvement targets
- Third-party ANSI-ANAB accredited verification
- National (U.S. DOE) recognition
In Their Own Words: Value of Superior Energy Performance

“SEP adds rigor, analysis, and gives good guidance. It’s one thing to have a target and objective, but SEP gives tools that empower you to be more disciplined and prove the impact certain activities have.”

-Nissan North America Energy Team

“SEP is the mechanism responsible for driving continuous improvement in energy performance.”

- Stephen Cannizzaro, Sustainability Manager, General Dynamics

“SEP participation helped reveal new energy savings opportunities and helped us to develop a formal and continuous energy management training program – ultimately strengthening all energy awareness activities.”

- Amy Bechtold, Compliance, Manager and Energy Management, Representative, Harbec Inc.

Energy Consumption of Facilities Included in Current Study

![Graph showing energy consumption and spend relationship]

Data availability:
- Monthly energy consumption and savings
- 4 quarters prior to first SEP training
- 7 quarters after first SEP training
- Baseline + achievement period
ISO 50001 helped facilities identify previously unnoticed operational (low or no-cost) improvements opportunities.

Impact of SEP - operational / capital energy savings split:
— Pre-first SEP training: 64 / 36 (operational / capital)
— Post-first SEP training: 74 / 26 (operational / capital)

All facilities implemented operational energy performance improvement actions.

3 facilities only implemented operational energy performance improvement actions.
Costs of Implementing and Certifying to Superior Energy Performance

Average SEP Implementation Costs

- Monitoring and Metering Equip.: $27,000, 15%
- External Tech. Assistance: $35,000, 19%
- ISO 50001/SEP 3rd Party Cert. Audit: $17,000, 9%
- Internal Facility Staff Time: $103,000, 57%

EnMS Development: $86,000, 48%
ISO 50001/SEP Audit Preparation: $16,000, 9%

Average SEP Implementation Costs: $180,000
An Improved Methodology to Determine Internal Staff Costs

- Labor costs attributable to SEP
  - 0.8 person/yr $103,000

- Total internal labor costs
  - 1.7 person/yr $217,000

- Sunk EnMS labor costs
  - 0.9 person/yr $114,000

A Representative Payback Function

- SEP Payback Period (years)
- Facility Baseline Annual Energy Spend ($ million)
- Silver
- Gold
- Platinum
- Fitted Curve
Success (and Barrier) Predictors to ISO 50001 and SEP Certification

- Top management commitment and communication of investment
  - Change in management or ownership
  - Top management does not participate in review
  - No previous ISO management system experience
- Energy team engagement
  - Reliance on singular energy champion
- Acceptance of data driven framework
  - Refusal to let go of historic practices
- Recognition of need to continually improve EnMS and energy performance
  - Prioritization of business practice or engineering over the other
  - “Implement and forget” attitude – treating process like a project