ISO 50001/SEP Case Studies

Energy Efficiency
a Competitive Advantage

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2011 Corporate Overview

- 3M is one of 30 companies in the Dow Jones Industrial Average and a component of the S&P 500 Index
- Sales: $29.611 B
- Net income: $4.283 B, 14.5 % to Sales
- International sales $19.583 B (66% of company total)

- Operations in 28 states and more than 65 countries
- Sales in nearly 200 countries
- 84,198 employees (61% OUS)
- 55,000+ products
- 45 established technology platforms
- 514 U.S. patents issued in 2011

More than 35 business units, organized into Six Market Leading Businesses

<table>
<thead>
<tr>
<th>Consumer and Office</th>
<th>Display and Graphics</th>
<th>Electro and Communications</th>
<th>Safety, Security and Protection Services</th>
<th>Health Care Business</th>
<th>Industrial and Transportation</th>
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</thead>
<tbody>
<tr>
<td>4.2B Sales, 0.8B OI</td>
<td>3.7B Sales, 0.8B OI</td>
<td>3.3B Sales, 0.7B OI</td>
<td>3.8B Sales, 0.8B OI</td>
<td>5.0B Sales, 1.5B OI</td>
<td>10.1B Sales, 2.1B OI</td>
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3M's 2015 Sustainability Goals

**Environmental Stewardship**
- Reduce Volatile Air Emissions 15% by 2015 from 2010 base year
- Reduce Waste 10% by 2015 from 2010 base year
- **Improve Energy Efficiency 25% by 2015 from 2005 base year**
- Reduce Greenhouse Gas Emissions 5% by 2011 from 2006 base year *
- Develop Water Conservation Plans When 3M is Located in Water Scarce and Stressed Areas

**Social Responsibility**
- Develop Community Stakeholder Engagement Plans at Select Facilities
- Promote an EHS Management Framework at New 3M Sites

**Economic Success**
- Review at least 80% of Supplier Spend by 2015 to Drive Conformance with 3M EHS, Transportation & Labor/Human Relations Standard
- Further Enhance Environmental Sustainability Attributes of New Products

* Goal established in 2007
Why Pilot ISO 50001?

- Projects are only a part of an effective energy management program
- Learn more about ISO 50001, the process of becoming certified, and the resources necessary
- Employ a more rigorous approach to systematically save energy
- Benefit from external resources provided to assist
- Further imbed energy management into plant operations
- Determine if the effort is worthwhile
Two 3M manufacturing Plants Participating

- **3M Cordova, IL (Midwest Pilot)**
  - Manufactures specialty adhesives and chemicals
  - 560 acres, 550,000 square feet
  - 4th largest energy using facility at 3M

- **3M Brockville, Ontario, Canada (Global Superior Energy Performance Pilot)**
  - Manufactures pressure sensitive tapes
  - 200,000 square feet
  - Smaller energy footprint, but strong interest in efficiency
Manufacturing Operations
Brockville Tape, Ontario Canada
Motivations

- To build on the substantial energy performance gains achieved through earlier energy projects
- To improve our ability to sustain energy performance gains over the long term
- To respond to increasing energy cost pressures
- To reinforce our reputation with customers as an environmentally responsible supplier
- To provide US-Canada requested support for the GSEP initiative of the Clean Energy Ministerial www.cleanenergyministerial.org
- To ensure 3M’s competitive position in the marketplace
- ISO 50001 is a standard that drives results directly to the bottom line by systematically driving down energy costs to improve competitiveness.
Brockville Tape ISO50001 Program Phases

1. Senior Commitment
2. Establish Team
3. Team understanding of the Standard
4. Gap Assessment
5. Work Plan Definition
6. Execution of the Work Plan
7. Re-Gap
8. Certification
The Team

3M Canada Team
- Plant Engineering Leader (EnMS Mgmt Representative)
- Master Technologist (EnMS Coordinator)
- Energy Manager 3M Canada
- 3M Canada Corporate Lead Auditor

Consultant: Energy Performance Services (EPS/Canada) Inc.
- President
- Senior Consultant – Member of CSA for ISO 50001
- Training Expert

Support from:
- Federal Government of Canada - Natural Resources Canada
- Enbridge Gas Distribution
- Hydro One Networks
### The Work Plan

<table>
<thead>
<tr>
<th>EPS</th>
<th>ISO 50001 Standard clause</th>
<th>Actions</th>
<th>Action Type</th>
<th>Complete</th>
<th>Responsible</th>
<th>Status</th>
<th>Completion %</th>
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</thead>
<tbody>
<tr>
<td>Energy Policy</td>
<td>Energy Policy</td>
<td>4.3.g</td>
<td>Define energy policy</td>
<td>Complete</td>
<td>Amend existing EnMS</td>
<td>Jul</td>
<td>Rich</td>
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<td>is documented and communicated at all levels within the organization;</td>
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<td>Active</td>
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<td>4.3.g</td>
<td>is documented and communicated at all levels within the organization;</td>
<td>Complete</td>
<td>Integrate energy into existing business system</td>
<td>Jul</td>
<td>ET</td>
</tr>
<tr>
<td>Energy Planning</td>
<td>General</td>
<td>4.4.1</td>
<td>The organization shall conduct and document an energy planning process. Energy planning shall be consistent with the energy policy and shall lead to activities that continually improve energy performance.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Energy Planning</td>
<td>Legal &amp; other requirements</td>
<td>4.4.2</td>
<td>The organization shall identify, implement, and have access to the applicable legal requirements and with other requirements to which the organization subscribes related to its energy use, consumption and efficiency.</td>
<td></td>
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### Roles & Responsibilities Matrix

#### EnMS Deliverables

- Performance Expectations
- Communications
- Training
- Resource Planning

#### R&R Level:
- **A** - Accountable: Ultimately answerable for correct and thorough completion.
- **R** - Responsible: Charged with doing or ensuring the work is properly carried out.
- **S** - Support: Provides key expertise, insight, direction and input on the work.
- **C** - Consulted: Provides significant effort and resources toward work completion.
- **I** - Informed: Provides status updates and summary information on the work.

#### EnMS Roles

- **Plant Mgr**
- **EnMS Mgmt Rep**
- **EnMS Coord**
- **Plant Engg Ldr**
- **Operations Ldr**
- **Technical Ldr**
- **Corp. Energy Mgr**
- **Area Coaches/Mtc Spvr**
- **EHS Ldr**
- **EnMS Energy Team**
- **Lean Six Sigma BB**
- **Techs**
- **Engineers**
- **Shift Supervisors**
- **Operators**
- **Trainers**
- **Business Divgmt Ldr**
- **EMIS Support**
- **Corp. Lead Auditor**
- **IT Support**
- **Product Developers**
- **EHS Staff**
- **Plant Buyer**
- **Corp. Engg Mgr**
- **Corp. Execs & Depts**
- **Others**

#### Responsibility Description

- **A** Accountable: Ultimately answerable for correct and thorough completion.
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#### Documents & Supports:

- Performance Expectations
- Communications
- Training
- Resource Planning

#### EnMS Roles

- **BKV 501 EnMS Role**
- **Energy Policy**
- **ISO 50001 Standard**
- **EnMS Manual**
- **Energy Baseline**
- **Energy Objectives & Targets & Timelines**
- **EnMS Management Plan**
- **EnMS Training Plan**
- **EnMS Project Plan**
- **EnCA Plan**
- **EnMS Audits**
- **EnCA Performance Monitoring**
- **EnMS Audits**
- **EnCA Performance Review**
- **EnCA Audits**

#### EnMS Role

- **PDCA**
- **EnMS**
- **Plan**
- **Do**
- **Check**
- **Act**

#### Responsibility Score

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Energy Management System - EnMS

External Audit Results

- First ISO50001 / SEP EnMS in Canada certified by an ANAB accredited Certifying Body
- Achieved ‘Platinum’ level for SEP
  - Externally verified, statistically validated energy performance improvement exceeding 15% over three years (2007 to 2010)
  - Second ISO 50001/SEP platinum level in the world
ISO50001 Certification
Results

- Engagement of top management
  - Plant leadership team actively involved

- Increased awareness of energy performance
  - Communication, training, dashboards to make energy visible, daily review, etc.

- Increased idea generation
  - Employee suggestion system
  - Energy review output tripled ideas in hopper

- Improved O&M practices
  - Start-up and shutdown, leak reduction, PMs, service contracts, etc.
Results

- Renewed project activity
  - *LED lighting, compressor efficiency, CW load matching, HVAC, etc.*
  - Many projects moved from hopper to implementation stage

- Improved procurement and engineering practices
  - Awareness training and expectations for engineering
  - *Engineers actively incorporating energy performance in specifications and design plans*
  - Vendors routinely advised of energy performance criteria

- Improved Energy Performance
Key Success Factors

- Top management commitment
- Selection of team members
- Expert consultant support
- Government and LDC support
- Rigorous project tracking
- Existing Quality and Environmental management systems
- Prior investments in metering, data collection and reporting
- Legacy of corporate leadership in sustainability
- Availability of approved standards
3M Cordova, Illinois
Energy Team

- Management Representative
  - Plant Engineering Manager

- Energy Team Leader
  - Energy Champion - LSS Black Belt

- Core Team Members
  - Contract Engineer
  - Utility Engineer
  - Production General Supervisor

- Consultant
  - Georgia Tech Enterprise Innovation Institute
  - Georgia Manufacturing Extension Partnership (GaMEP)
Implementation Status

- Began implementation August, 2010 with initial training by Georgia Institute of Technology.
- Final training by Georgia Institute of Technology in October, 2011.
- Energy Management System currently in-place.
- May 2012 - completed internal audit of system.
  - Recommended for ISO Certification – SEP Silver
Benefits of Pursuing ISO 50001/Superior Energy Performance Certification

- Energy regression analysis is a better way to measure energy efficiency improvement.
- Increased organization and structure around energy improvement activities.
- Increased visibility of plant’s energy improvement activities.
- Increased organization and visibility help to assure that gains in energy performance are maintained.
Measurement and Verification Tool - EnPI Tool

Linear regression tool that incorporates all the factors that affect energy use and statistically isolates each factor’s influence on energy use.
Key Lessons Learned

- Engagement by management staff is essential.
- Sub-metering important to have in-place to help analyze energy data.
- Focused resources helpful. (Estimated resources: \(\frac{3}{4}\) person for 1 \(\frac{1}{2}\) years).
- Existing Quality and Environmental management systems.
- Identify and track significant energy components of all improvement projects.
Challenges

- Engaging executive management support
  - Demonstrate alignment of EnMS with organizational goals
  - Needed to show business case to gain significant commitment of resources

- Draft standards
  - Standards still developing as we worked
  - Needed to seek clarifications & interpretations
  - Decisions on application, scope and rigor for our operation
  - No prior implementations for reference

- Resource constraints
  - Initial team didn’t include plant leadership rep & coordinator
  - Active plant operational demands and competing priorities
  - Experience with other standards, energy management and statistical techniques for modeling need to come together – not that easy to do
  - Auditors – internal and external – are new to the standards as well

- Losing energy performance focus while implementing EnMS
  - Resources that were driving progress were partly consumed with EnMS
Lessons Learned & Advice to Others

- Build a robust system that will keep working long term
  - Management commitment – make it important
    • Allocate resources – people, time, money
    • Set EnMS-related job expectations – all levels

- Use Project Management techniques
  - Set deliverables, milestones, action plans, due dates, assigned responsibilities, follow-up, etc. to drive implementation progress

- Objectives, Targets & Energy Review are critical
  - Know what you want from the system
  - Get to energy review quickly – energy map, SEUs, team engagement, etc. are very powerful

- Energy Mgmt Information System (EMIS) is a major asset
  - Prior investments in submetering and electronic data collection and reporting provided excellent data to support the EnMS
Lessons Learned & Advice to Others

- Build on what you have
  - *Use and integrate with existing systems – docs, training, etc.*
- ISO 50001 does not require much documentation
  - *Notably less than other standards*
- Our Energy Management Information System (EMIS) was a major asset
  - *Prior investments in submetering and electronic data collection and reporting provided excellent data to support the EnMS*
Thank You