ISO 50001/SEP Case Studies

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

Consumer and Office	Display and Graphics	Electro and Communications	Safety, Security and Protection Services	Health Care Business	Industrial and Transportation
4.2B Sales 0.8B OI	3.7B Sales, 0.8B OI	3.3B Sales, 0.7B OI	3.8B Sales, 0.8B OI	5.0B Sales, 1.5B OI	10.1B Sales, 2.1B OI

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

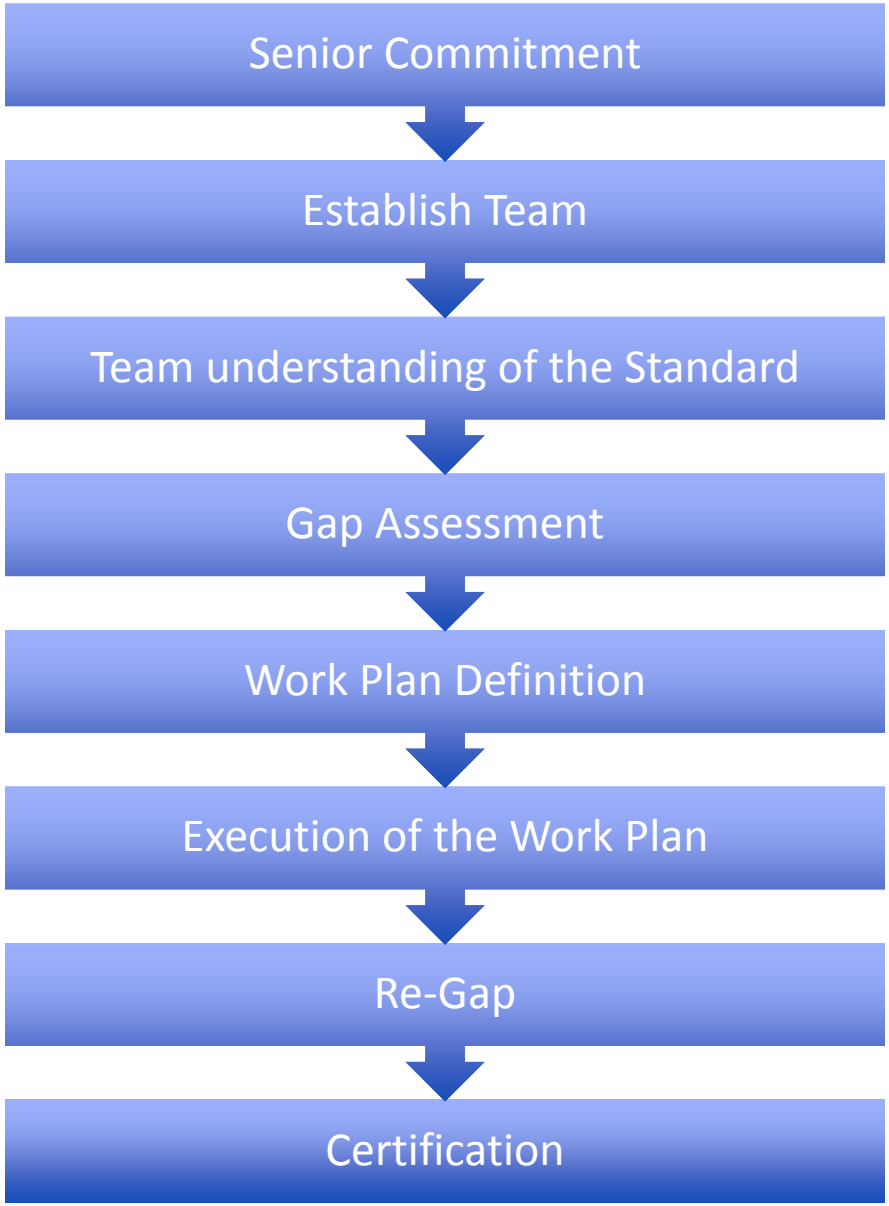
- 3M Cordova, IL (Midwest Pilot)
  - *Manufactures specialty adhesives and chemicals*
  - *560 acres, 550,000 square feet*
  - *4th largest energy using facility at 3M*
- 3M Brockville, Ontario, Canada (Global Superior Energy Performance Pilot)
  - *Manufactures pressure sensitive tapes*
  - *200,000 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



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The Team

3M Canada Team

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

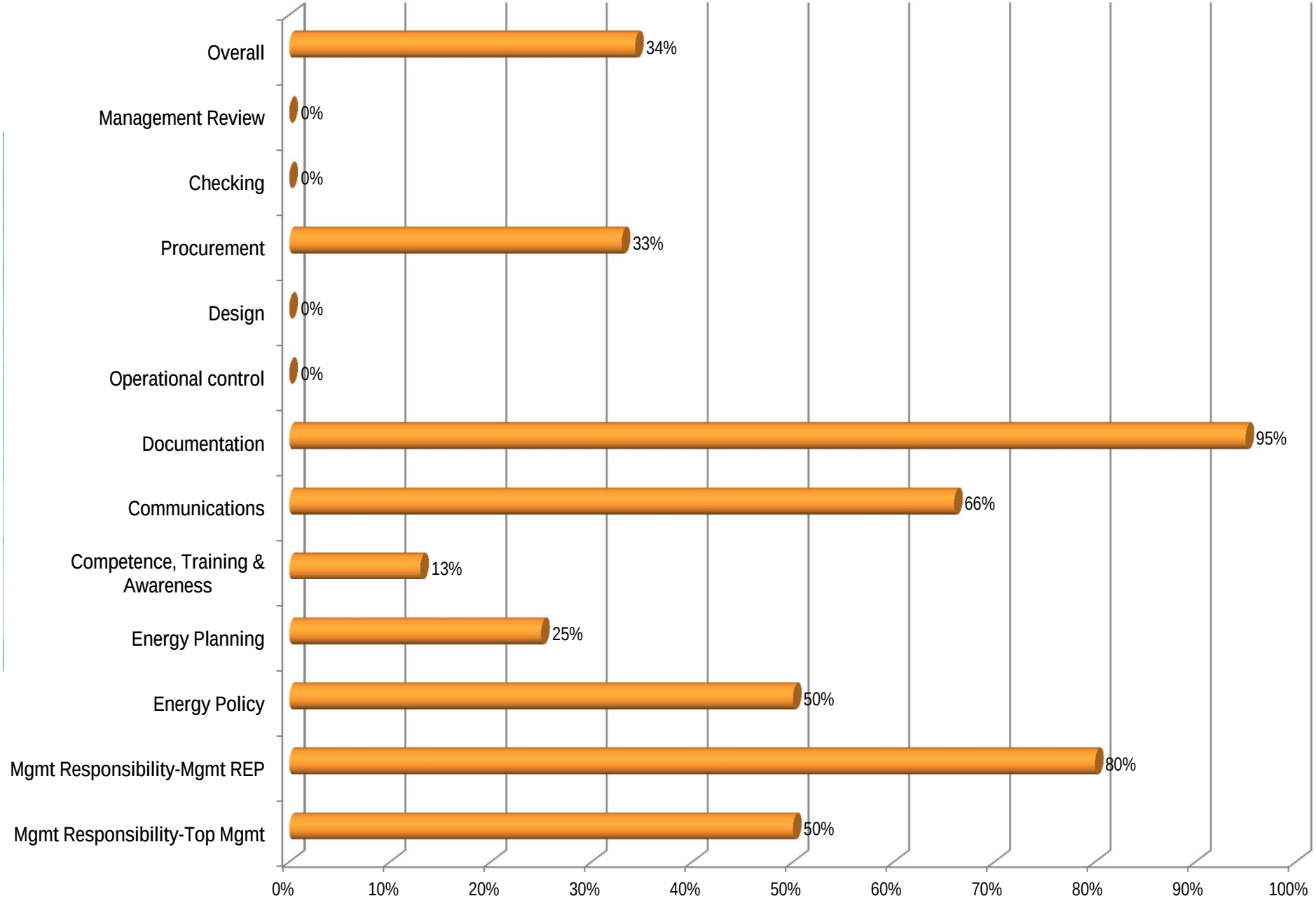
Consultant: Energy Performance Services (EPS/Canada) Inc,

- 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

Initial Gap Analysis



The Work Plan

Clause by clause list of requirements

Gap closure action items, dates, responsibility

EPS

		ISO Standard Reference	*ISO 50001 Standard clause*	Actions	Action Type	Comple	Responsit	Status	Completion %
					No action require				54%
Energy Policy	*Energy Policy*	4.3.g	*Define energy policy*	Complete	Amend existing EnMS	Jul	Rich	Complete	100%
Energy Policy	*Energy Policy*	4.3.g	*is documented and communicated at all levels within the organization;*	Complete	Communication	Oct		Active	100%
Energy Policy	*Energy Policy*	4.3.g	*is documented and communicated at all levels within the organization;*	Complete	Integrate energy into existing business system	Jul	ET	Complete	100%
					No action required				100%
Energy Planning	*General*	4.4.1	*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.*	*enms 100 Energy Planning procedure documents the Energy Planning process*	Design new procedure	Jul	ET	Complete	100%
Energy Planning	*Legal & other requirements*	4.4.2	*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.*	Will be addressed through the Energy Planning Process	Integrate energy into existing business system		EPS	Complete	100%

Periodic assessment & tracking

Roles & Responsibilities Matrix

EnMS Deliverables

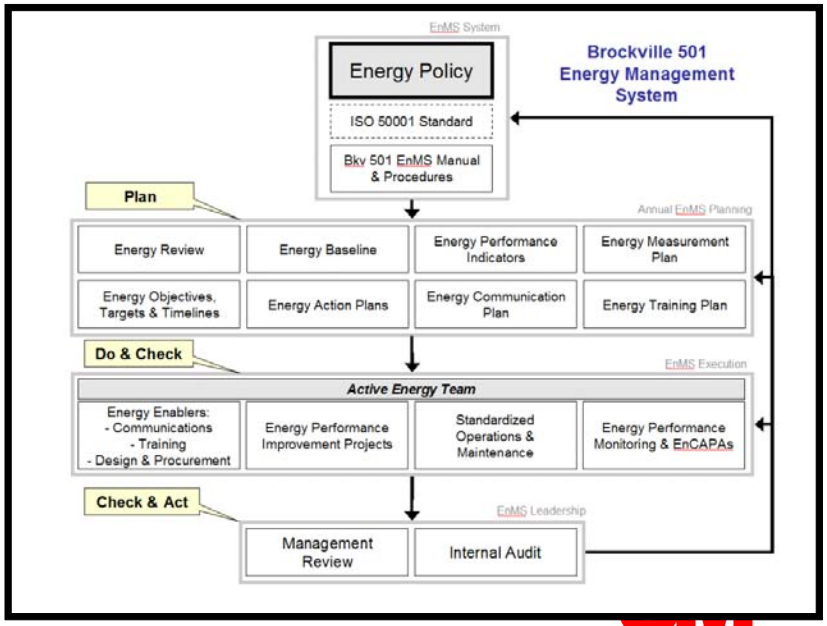
EnMS Roles

R&R Level:
A - Accountable
R - Responsible
S - Support
C - Consulted
I - Informed

BKV 501 EnMS Role

PDCA	EnMS			Plan								Do					Check		Act		300
	Energy Policy	ISO50001 Standard	EnMS Manual	Energy Reviews	Energy Baseline	EnPIs	Energy Measurement Plan	Energy Objectives, Targets & Timelines	Energy Action Plans	Energy Communication Plan	Energy Training Plan	Communications	Training	Design & Procurement	Energy Projects	Standardized O&M	Energy Performance Monitoring	EnCAPAs	Mgmt Review	EnMS Audits	Compliance Score
Plant Mgr	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	S	A		A	200
EnMS Mgmt Rep	R	R	R	R	R	R	R	R	R	R	R	R	S	S	S	S	S	S	R	R	105
EnMS Coord	S	S	S	R	S	S	S	S	S	S	S	R	S	S	S	S	S	R	R	R	75
Plant Engg Ldr	S		C	S	C	C	S	S	S	C	S	S	R	R	R	R	R	R	S	S	71
Operations Ldr	S		C	S	C	C	I	S	S	C	S	S	R	S	S	R	R	R	S	S	63
Technical Ldr	S		C	S	C	C	I	S	S	C	S	S	R	R	R	S	C	S	S	S	59
Corp. Energy Mgr	S	S	C	C	C	S	C	R	S	C	C	S	S	S	S	C	C	C	S	C	53
Area Coaches/Mtc Spvr	S		I	S	I	I		I	S	C	S	S	S	I	S	R	R	R		S	49
EHS Ldr	S		I	C	I	C		C	C	C	C	S	S	C	S	R	C	S	S	S	45
EnMS Energy Team	S		I	C	I	I		I	S	C	C	S	S	S	R	S	S	C	I	S	43
Lean Six Sigma BB	S		I	S	I	I		S	S	C	C	S	S	C	R	S	I	I	I	S	42
Techs	S		I	S	I		S	I	S	I	C	S	S	S	S	S	I	S		I	38
Supply Chain Ldr	S		I	I	I	I		I	C	C	C	S	S	C	C	R	I	I	I	S	36
Engineers	S		I	S	I	I		I	S	I	C	S	S	S	S	S	I	S		I	36
Shift Supervisors	S		I	C	I	I		I	C	I	C	S	S		S	S	R	S		I	36
Operators	S		I	C	I	I		I	C	I	C	S	S		S	S	S	S		S	35
Trainers	S		I		I			I		I	S	S	S		S	S		C			24
Business Dvlpmt Ldr	S		I	I	I	I		I	C	I	S	S							S	I	21
EMIS Support	S																				18
Corp. Lead Auditor	S	S	I																	R	16
IT Support	S		I																		15
Product Developers	S			C																	14
EHS Staff	S		I																		14
Plant Buyer	S		I																		13
Corp. Engg Mgr	S																				10
Corp. Execs & Depts	S																				10
Others	S																				6

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



Documents & Supports:
-Performance Expectations
-Communications
-Training
-Resource Planning

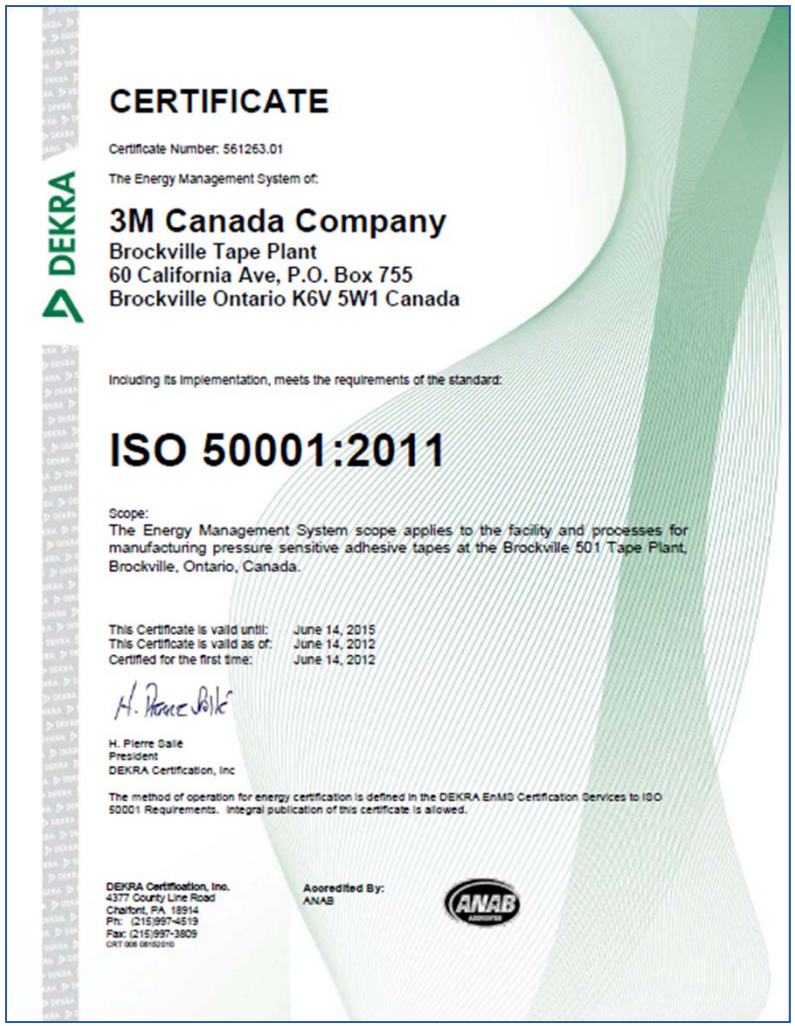
Energy

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



CERTIFICATE

Certificate Number: 561263.01

The Energy Management System of:

3M Canada Company
Brockville Tape Plant
60 California Ave, P.O. Box 755
Brockville Ontario K6V 5W1 Canada

Including its implementation, meets the requirements of the standard:

ISO 50001:2011

Scope:
The Energy Management System scope applies to the facility and processes for manufacturing pressure sensitive adhesive tapes at the Brockville 501 Tape Plant, Brockville, Ontario, Canada.

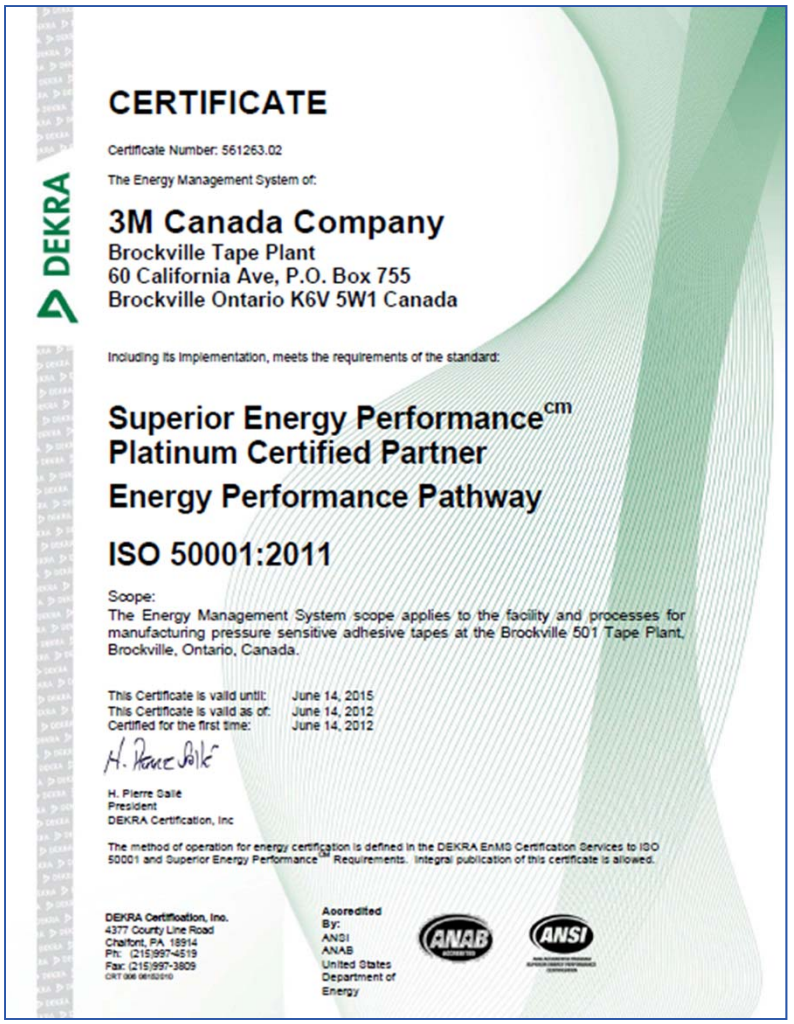
This Certificate is valid until: June 14, 2015
This Certificate is valid as of: June 14, 2012
Certified for the first time: June 14, 2012

H. Pierre Dallé
President
DEKRA Certification, Inc

The method of operation for energy certification is defined in the DEKRA EnMS Certification Services to ISO 50001 Requirements. Integral publication of this certificate is allowed.

DEKRA Certification, Inc.
4377 County Line Road
Chalfont, PA 18914
Ph: (215)997-4519
Fax: (215)997-3809
CRT 006 06152010

Accredited By:
ANAB



CERTIFICATE

Certificate Number: 561263.02

The Energy Management System of:

3M Canada Company
Brockville Tape Plant
60 California Ave, P.O. Box 755
Brockville Ontario K6V 5W1 Canada

Including its implementation, meets the requirements of the standard:

Superior Energy Performance℠
Platinum Certified Partner
Energy Performance Pathway

ISO 50001:2011

Scope:
The Energy Management System scope applies to the facility and processes for manufacturing pressure sensitive adhesive tapes at the Brockville 501 Tape Plant, Brockville, Ontario, Canada.

This Certificate is valid until: June 14, 2015
This Certificate is valid as of: June 14, 2012
Certified for the first time: June 14, 2012

H. Pierre Dallé
President
DEKRA Certification, Inc

The method of operation for energy certification is defined in the DEKRA EnMS Certification Services to ISO 50001 and Superior Energy Performance℠ Requirements. Integral publication of this certificate is allowed.

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Chalfont, PA 18914
Ph: (215)997-4519
Fax: (215)997-3809
CRT 006 06152010

Accredited By:
ANSI
ANAB
United States Department of Energy

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)

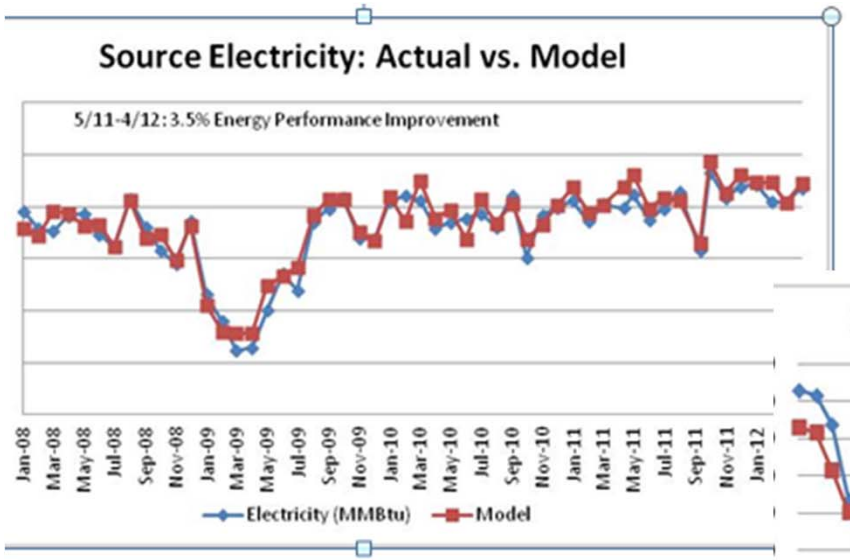
Implementation Status

- 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.
- DEKRA certification audit August 28-31, 2012.
  - *Recommended for ISO Certification – SEP Silver*

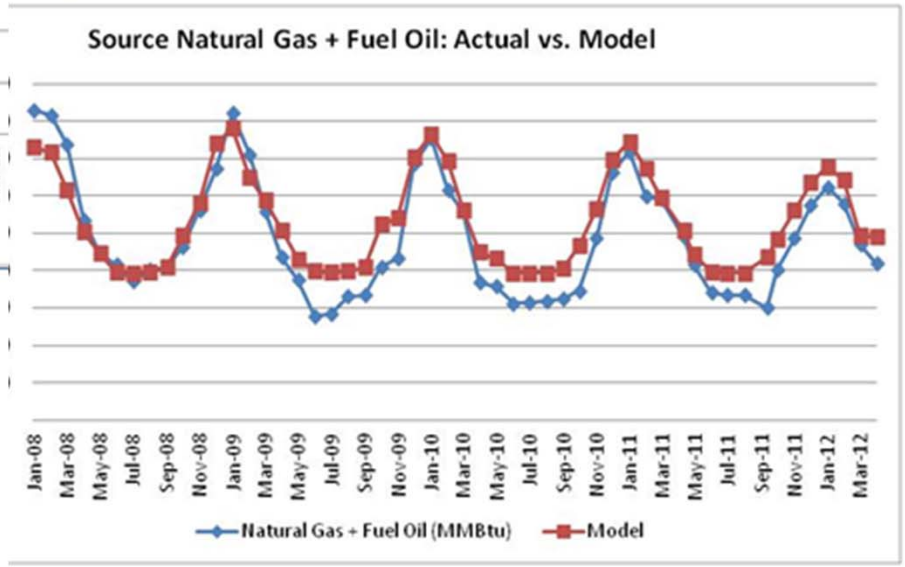
Benefits of Pursuing ISO 50001/Superior Energy Performance Certification

- 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: ¾ person for 1 ½ 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*