

Global Energy Management System Implementation: Case Study

Canada

St Marys Cement - Bowmanville

First ISO 50001 Certified Industrial Facility in North America



St Marys Cement – Bowmanville ON, Canada

Business Case for Energy Management

St Marys Cement is a division of Votorantim Cimentos, a Brazilian company and one of world's top 10 cement producers. (Source: The Global Cement Directory 2016) The Bowmanville plant has been in operation since 1968 and recognized a need for a more systematic approach to energy management in 2006 with the formation of an energy management committee, E=MC2. The team consists of members from all disciplines including Production, Quality, Maintenance, Finance and Corporate. Since its formation the team set out to identify and implement initiatives that would help meet corporate production and cost targets, ever-evolving regulatory emission targets as well as demonstrate the company's dedication to sustainability and reduction in energy consumption. Prior to ISO 50001 certification in 2011 the committee sought to solidify the systematic approach already ingrained by ISO 9001, 14001, and OHSAS 18,001 certifications since 1996. In 2009 St Marys Cement Bowmanville became the first North American industrial facility to achieve the

Certification in Energy Excellence (CEE)– Silver Award. This certification, along with existing ISO systems already in place, provided the necessary foundation for ISO 50001 certification in 2011.

“ISO 50001 was the next logical evolution of our EnMS.”

—Kevin Hodgins, Electrical Maintenance Manager

Case Study Snapshot

Industry	Cement
Product/Service	Cement
Location	Bowmanville
Energy Management System	ISO 50001
Energy Performance Improvement Period	1 Year
Energy Performance Improvement (%) over improvement period	4.98%
Total energy cost savings over improvement period	\$2,071,309 \$USD
Cost to implement EnMS	\$46,129 \$USD
Payback period on EnMS implementation (years)	<1 Year
Total Energy Savings over improvement period	34,286 (GJ)
Total CO ₂ -e emission reduction over improvement period	46,211 (Metric tons)

Business Benefits Achieved

Since implementing ISO 50001 in 2011 the Bowmanville plant has re-certified in both CEE (Certification in Energy Excellence – Gold Award) 2013 and ISO 50001 in 2014.

In 2012, the first full year after ISO 50001 certification, the Bowmanville plant was able to produce 117,840 equivalent tons more product than 2011 while reducing energy consumption by 0.0063 MWH/equivalent ton resulting in a total annual energy savings of 34,286 GJ and a total energy cost savings of \$2,071,309 USD. A corresponding reduction of 46,211 metric tons of CO₂-e was also realized over the same period. These achievements further solidified our relationships in the community demonstrating our ongoing commitment to sustainability.

EnMS Development and Implementation

From day one the Bowmanville plant recognized that a successful energy management system would require support from all areas of the operation. Consequently the original E=MC2 committee included members from Production, Quality, Maintenance, Finance and Corporate. The experience gained from ISO 9001 certification in 1996, and ISO 14001 certification in 2006, provided the necessary framework to successfully implement ISO 50001 in 2011. Martin Vroegh, Corporate Environmental Manager at the time, got an advanced look at the new standard through his participation on the Canadian Industry Program for Energy Conservation Task Force Council. Once the new standard was approved St Marys Cement immediately began the certification process at the Bowmanville plant by retaining International Certification Services (ICS) to oversee the process. E=MC2 members Fabio Garcia, Operations Manager, Jim Storey, Electrical Maintenance Manager and committee chair, Jason Schultz, Quality manager and committee vice-chair, and Louis Kaye, Accounting Manager and committee vice-chair provided the necessary leadership that would lead to a successful certification in less than 6 months.

With management's support, E=MC2 developed a Sustainable Energy Plan, which included more than 100 action items, identified existing energy management activities, captured current tracking and measurement efforts, and helped guide the company's energy

efficiency priorities and investments. They reviewed 80 percent of their processes and procedures. Before initiating any projects, staff conducted fuel and electricity assessments and found that the Bowmanville plant consumes roughly 200 gigawatt hours of electrical energy and 5000 terajoules of thermal energy annually. These numbers set the baseline.

Many of the lowest cost projects yielded the biggest paybacks, including installing occupancy sensors, ceiling fans and programmable thermostats and using variable speed drives on motors. Other easy fixes included monitoring and control software, lighting upgrades and automating processes to turn off equipment when it is inactive. However, the single most important change was rescheduling certain plant operations to off-peak hours. The Bowmanville plant also participates in the Independent Electricity System Operator's (IESO's) Demand Response Program (DR3) – a contract-based program that pays companies to be available to reduce their energy consumption if/when called on, in response to electrical market demands.

“ISO 50001 has provided the Bowmanville facility with a strong framework for our Energy Management System.”

—Jason Schultz, Quality Manager/E=MC2 vice-chair

Because of the efforts and experience gained in achieving the CEE – Silver Award and the dedication the E=MC2 committee had demonstrated since inception in 2006, the cost to implement ISO 50001 was relatively low. Bowmanville plant staff spent 280 man-hours in preparation for the certification audit. The required metering and monitoring was already in place as a direct result of our long-standing commitment to energy management. The CEE audit, which laid the groundwork for the ISO 50001 certification, cost \$30,084 USD, plus an additional \$16,045 USD for the ISO certification audit meant the total cost of implementation was \$46,129 USD. As a result, the payback period was less than 1 year.

Energy performance improvements are easily monitored and analyzed in real-time using existing metering and compared against existing key performance indicators (kpi's) set for the Bowmanville plant by Votorantim Cimentos North America (VCNA) as well as those set for all other VCNA plants. Performance data is analyzed and reported monthly to ensure annual results can be validated prior to reviewing/adjusting kpi targets for the following year. The targets are normalized to production rates for ease of comparison and these comparisons promote best-in-class analysis between all VCNA plants and help identify improvement opportunities in energy performance.

Since the formation of the E=MC2 energy management committee, including the certification process for ISO 50001, all identified improvements have been tracked using the committee's action plan. Since inception the action plan has documented over 300 action items. All items are reviewed by the committee and results of the improvements tracked against operation measures. The action plan, along with our Sustainable Energy Plan, Energy Policy, committee member profiles, and real-time Bowmanville energy data are available on our company intranet, available for the entire company to view at any time. Preparation and verification for the ISO 50001 certification audit included a pre-audit assessment by International Certification Services (ICS). Since we'd already been through a similar process with our 360 Energy certification and our experience with ISO 9001 and ISO 14001 meant the process was familiar.

“ISO 50001 standardized process ensures routine controls aren't missed.”

—Phil Giroux, Production Manager



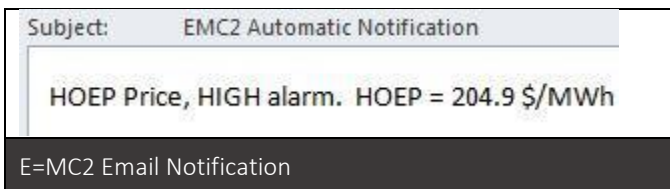
E=MC2 Intranet Website

The Bowmanville Plant has published and continuously updates its Sustainable Energy Plan. This document, maintained by the E=MC² Committee, outlines the energy program at the plant. Items in the plan include the energy policy as well as procedures for results validation, saving opportunity assessments, goals, measures and planned actions. Energy management is part of new employee orientation to emphasize the importance of this program. The E=MC² committee meets weekly to review open action items as well as to explore new items that may improve the energy program. Process energy data is displayed on our control system screens for the operators and an energy management display was created to provide immediate energy status information at a glance. In addition to this, process alarms were created within the control system as well as the company email system to notify management of changing energy costs or abnormal conditions.



Energy Management Dashboard

Periodic updates of energy action initiatives are provided to all employees to keep them up to date with the evolving energy program. A survey was recently conducted of all plant personnel to gauge their knowledge of the energy program. The information gathered will be used to develop training packages in the future for areas of identified weaknesses. The Bowmanville plant holds an annual Sustainability Week where employees are encouraged to participate in various information sessions presented by sector specific experts. These sessions have been very successful in garnering employee input and commitment to energy management and conservation efforts. Management has shown commitment to the program by having an energy committee that is made up of members of all functional areas of the plant. This enables input to be received from many different perspectives that may identify issues that would not be apparent to others. Guest speakers are invited to attend meetings so that committee members can develop their expertise and knowledge.



Sustainability Week

The plant uses a number of tools to monitor current energy use and methods for monitoring opportunities for energy savings. External energy information is pulled from various web-based resources and integrated into our control system. This information, combined with our internal power monitoring equipment, is then used to provide real-time consumption data for our operators and to generate alarms if operation or energy supply conditions change. This assists the plant management to make timely decisions on power reductions to maximize saving due to the fluctuating cost of power. Power meters are installed on all major equipment groups to monitor current energy use. The monitors are a useful tool to optimize energy use so that staff can ensure that all equipment has been shut down when a major area has been taken off line. Implementation of these controls followed the same principals already familiar to plant staff through implementation of ISO 9001 and ISO 14001. Successful utilization of these controls has allows the Bowmanville plant to take full advantage of IESO programs like Demand Response as well as Hydro One billing opportunities related to global adjustment costs that are directly affected by 5 critical peak mitigation. As a Class A customer of Hydro One, the Bowmanville plant can reduce it's portion of the global adjustment billing

by reducing its coincident demand during the 5 highest Ontario peak demand days. The Bowmanville plant also takes advantage of incentive programs offered by Hydro One for energy conservation projects like lighting retrofits.

“ISO 50001 validates our existing energy management systems and ensures our routine management is more deeply ingrained to provide long term sustainability and improvements.”

—Jim Storey, Operations Manager

Keys to Success

- Obtain management support.
- Build a team (E=MC2).
- Develop a sustainability plan.
- Establish an energy baseline.
- Identify and act on opportunities (project checklist).
- Monitor and measure energy use (energy management information system [EMIS]).
- Verify performance (EMIS).
- Recognize achievements.
- Perform an ISO 50001 assessment.

Lessons Learned

Initially the main challenge to implementing ISO 50001 was finding a qualified accreditation body as the standard was so new. Since we had existing ISO certifications we were quickly able to identify the steps needed to make this happen. Our existing 360 Energy certification also meant that we were well positioned for the ISO certification pre-assessment and audit. Being prepared was the single most important factor leading to a successful certification. The success realized at the Bowmanville plant has translated to implementation programs being initiated at other VCNA facilities in Charlevoix, Michigan and St Marys Ontario.

Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visit www.cleanenergyministerial.org/energymanagement.

