

Global Energy Management System Implementation: Case Study

Canada, CAN/CSA-ISO 50001



Welding wire and equipment manufacturing plant cuts energy consumption by 22 percent in 2013



Motivated staff are a big reason for Lincoln Electric becoming the fourth Canadian company to achieve ISO 50001 certification.

Photo: Lincoln Electric

Energy Management System Overview

The Lincoln Electric Company of Canada's energy management policy recognizes that the uncontrolled consumption of energy can have a negative impact on the environment and on business performance. A company commitment to follow this policy is at the core of Lincoln Electric's energy management system (EnMS).

Led by a cross-functional team that includes a range of employees and managers, the EnMS focuses on continuous improvement to ensure that energy is managed efficiently. Cost-effective measures are employed to deliver ongoing improvements in energy performance. The EnMS assesses and prioritizes all proposed energy-saving measures by using the same criteria used for other investments. Energy-saving goals are set by management and monitored monthly. Energy performance indicators are reviewed quarterly.

Employees are encouraged to submit energy-saving ideas. They are also expected to embrace a corporate culture of energy efficiency. "We are a profit-sharing company, so that makes it easy to motivate staff to save money through energy efficiency," says Adel Mir, Director of Engineering

Case Study Snapshot

Industry: Welding wire and equipment manufacturing

Energy Management System (EnMS) guidance/standard: CAN/CSA-ISO 50001

Key driver for EnMS: Cost control and environmental sustainability

Improvement focus: Reducing the consumption of electricity and natural gas

Location: Toronto, Ontario, Canada

Product(s): Welding wire and equipment

Annual energy consumption savings: 22 percent energy savings in 2013

Employees: 250 to 300

Energy sources: Electricity and natural gas

Energy reduction goal: Reduce energy consumption at all facilities worldwide by 2 percent to 3 percent per year

Natural Resources Canada (NRCan)

Natural Resources Canada's ecoENERGY Efficiency for Industry program offers cost-shared assistance to industrial companies to implement energy management projects, including CAN/CSA-ISO 50001 Energy Management Systems standard and accelerates energy-saving investments. The program's partnership with industry, Canadian Industry Program for Energy Conservation (CIPEC), supports ISO 50001 implementation and the exchange of best-practices information within Canada's industrial sector.

Services at Lincoln Electric. Mir also cites the important leadership role played by Joseph Doria, President and CEO, and the senior management team.

Business Benefits Achieved

By implementing its EnMS, Lincoln Electric reduced energy consumption by 22 percent in 2013. “Our savings in our processes have mainly been targeted in our electricity use,” Mir says.

Some of the biggest benefits from implementing the EnMS come from establishing well-defined goals. The company has developed a structured approach to embed energy management in all facets of the organization – from purchasing to maintenance and engineering. The system also allows for continual improvement as the company builds a self-sustaining culture of energy management.

Mir also points to how a focus on energy efficiency has enhanced Lincoln Electric’s reputation, both within its wider corporate family and with customers and suppliers. The Canadian plant’s energy efficiency efforts were highlighted in the corporation’s 2013 annual report to shareholders.

Company Profile

The Lincoln Electric Company of Canada was founded in 1916. Its parent company opened its doors in Cleveland, Ohio, in 1895. Globally, Lincoln Electric has more than 10 000 employees across 48 manufacturing facilities in 19 countries. Combined, these facilities serve customers in more than 160 countries.

The Toronto, Ontario, plant is located in the Leaside Business Park. It has three divisions housed in one facility, each with different energy needs. Two divisions produce steel welding wire, and the third makes industrial welding machines. Lincoln Electric sells diesel-driven DC generator welding machines worldwide. They are used on an industrial scale for projects such as pipelines, heavy construction, bridge building and energy sector projects.

All three divisions are ISO 9001, 14001 and 50001 certified. In total, the plant measures just under 75 000 square metres, with 250 to 300 employees working in shifts on a 24/7, year-round schedule.

Business Case for Energy Management

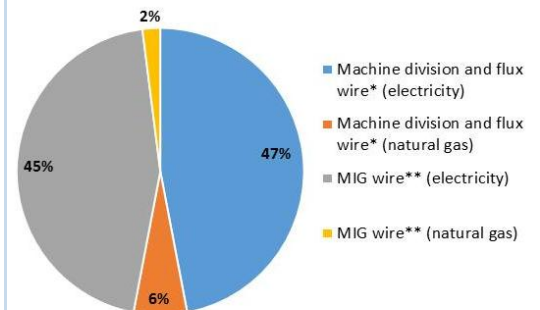
Lincoln Electric sees energy efficiency as a key contributor to remaining viable as a Canadian manufacturer. This view encouraged the company to seek ISO 50001 Energy Management Systems standard certification.

“ISO 50001 fits well with our company philosophy that energy management is a cost-containment activity, and as a way to remain competitive as a Canadian manufacturer,” Mir says. “Energy management also allows us to manage a part of the business that may be overlooked during traditional cost-containment and cost-reduction activities.”

About CAN/CSA ISO 50001 Energy Management Systems standard certification

ISO 50001 provides organizations with a structured framework to manage energy in such a way that it can increase energy efficiency, reduce costs, and improve energy performance. This standard is based on the common elements found in all the ISO management systems standards, assuring a high level of compatibility with ISO 9001 (quality management) and ISO 14001 (environmental management). Based on the Plan-Do-Check-Act cycle, this standard integrates both technical and managerial activities.

Energy cost by division



* Flux wire is used in arc welding, which uses an electric arc to melt metals at the welding point.

** MIG wire is so named because it is used in “metal inert gas” welding to join metal structurally.

Rising energy prices, particularly for electricity in Ontario, was another key driver of the business case for energy management. The more the plant can reduce its exposure to price volatility, the more management can execute long-term business plans. In fact, Lincoln Electric views effective energy management as a core component of an effective risk-management strategy.

Taking a systematic approach to energy management also allows plant staff to identify problems with equipment before they happen and reduce the load and operating hours of machinery and equipment. This practice can boost productivity, reduce labour costs and extend the productive life of the equipment.

Mir was able to make the business case for energy management by avoiding borrowing to finance projects. Instead, a combination of funding from governments and utilities, together with savings generated by the projects themselves, was relied on.

Energy Management System Implementation

Lincoln Electric was introduced to ISO 50001 through a 2011 pilot project that was funded by the Conservation Fund of the Ontario Power Authority and delivered by consulting engineers from Hatch Ltd. At the end of the pilot project, Hatch estimated improvements in electricity use intensity at the plant ranged up to 16.5 percent, with concurrent reductions in greenhouse gas emissions of up to 950 tonnes annually.

As part of the pilot project, an energy assessment of key systems at Lincoln Electric was done. As well, customized training, measurement and analysis support, templates, and coaching on all aspects of the requirements for attaining ISO 50001 certification were provided.

The plant had already started complying with the U.S. Management System for Energy (MSE 2000) standard before developing an EnMS. MSE 2000 is widely seen as the forerunner of ISO 50001. “Starting with MSE 2000 meant moving to ISO 50001 certification was the next logical step within our continuous improvement model. We also had ISO 14001 in place,” Mir says. Laying the groundwork for an EnMS paid off quickly when it came to achieving ISO 50001 certification in March 2013. “We worked flat out for five months.”

Steps to Earning the ISO 50001 Designation

1. Gain commitment from senior management and staff.
2. Select a team and an EnMS coordinator.
3. Define the project scope.
4. Collect baseline data on energy use, production and management practices.
5. Develop an energy policy.
6. Develop energy metrics, goals and targets.
7. Provide technical and procedural training.

Key energy management plan components

- Ensure adequate resources are provided for energy management programs.
- Undertake periodic reviews of the business to identify areas where energy reductions can be made.
- Ensure controls are in place to effectively maintain equipment and sustain energy efficiency initiatives.
- Review the energy management policy regularly to remain committed to continuous improvement.



A welder works on a wind turbine. Lincoln Electric is one of the world's largest suppliers of welding and cutting equipment to the wind tower industry.

Energy Team

Lincoln Electric relied on a cross-functional energy team to drive the EnMS. The team benefitted from technical and procedural training provided by Hatch and used Six Sigma techniques and tools for process improvement. Lean manufacturing principles also dovetailed nicely with the continuous improvement ethos of ISO 50001.

The five-member team is led by Mir and has representatives from engineering, finance, production, maintenance, purchasing, and environmental health and safety. The team meets monthly and conducts an energy review – its overall focus is on cost containment. A running list of action items helps drive day-to-day activities. Every quarter, the energy team reviews key energy performance indicators. Mir acts as a conduit between senior management, the energy team and the rest of the plant. A key driver in this initiative is the support of Lincoln Electric’s president and CEO.

Energy performance is tracked monthly against predicted energy performance. This predicted performance is based on regression modelling completed in the energy review.

Motivated Employees

All Lincoln Electric employees must be familiar with the corporate energy management policy. The EnMS garnered wide support from employees early on because it was portrayed as a cost-containment initiative. This aspect appealed to employees because they enjoy a profit-sharing arrangement at Lincoln Electric. “Our profit-sharing plan includes everyone from the assemblers to the CEO. When everyone reaps the profits of energy management, it makes integration of energy management into the corporate culture that much easier,” Mir says.

The company also operates on a piece-work model. This model further supported the EnMS because employees understand that energy efficiency equals production efficiency. So the more efficiently they can produce products, the more they earn.

The high volume of employee suggestions speaks to the popularity of the EnMS. The energy team also works hard to see that employee ideas are treated with respect and acted on wherever possible. “Ninety percent of the suggestions are accepted, although the ones with a long payback period and high investment may take longer to execute,” Mir says. Typically, projects must have a two-year payback period. But Mir says longer payback periods can be accepted if the project offers compelling value and aligns with longer-term business goals.

Energy-Efficient Suppliers

Lincoln Electric encourages its suppliers to incorporate energy-efficient alternatives into their operations and to offer energy-efficient products and services. This attitude is significant because a large portion of the plant’s environmental footprint is directly related to the supply chain. Lincoln Electric has added an environmental section to its supplier report cards. This new section highlights suppliers that share the company’s vision of energy efficiency.

Lincoln Electric Energy Team

Members	Duties
Engineering and maintenance	<ul style="list-style-type: none"> Initiate, track and make progress on energy conservation projects
Finance	<ul style="list-style-type: none"> Support energy management initiatives Conduct lifecycle cost assessments
Production	<ul style="list-style-type: none"> Support project training Run operational controls Submit energy savings ideas
Purchasing	<ul style="list-style-type: none"> Oversee energy management Evaluate the energy profile of products from suppliers
Environmental health and safety	<ul style="list-style-type: none"> Coordinate ISO 14001 systems Track documentation Conduct audits Address corrective action requests

- Lincoln Electric Canada won the corporation’s premier North American award for exceptional environmental, health and safety performance in 2013.
- Profit-sharing drives employee engagement in energy efficiency.
- Typically, 90 percent of energy project suggestions from employees are accepted.

Third-party contractors must familiarize themselves with the company's energy management policy. Special awareness of the policy must be demonstrated by contractors that do work relating to significant energy use at the plant. They can also use the employee energy efficiency suggestion program.

Purchasing for Energy Efficiency

The plant has modified its purchasing forms to include lifecycle cost analysis. This feature helps the finance department evaluate the energy efficiency characteristics of new capital equipment and replacement parts.

Customer Involvement Helps Build a Corporate Energy Culture

Lincoln Electric's Green Initiative Awareness Program promotes the company's initiatives to reduce the environmental impact of its manufacturing processes and products. The continued investment in technological advancement for its welding products, which has resulted in lower energy use and reduced environmental impacts for its customers, underlines the company's commitment to creating products that help customers reduce welding costs and adhere to environmental standards. To help customers easily identify the products connected to these initiatives, Lincoln Electric is labelling them with a new "Green Initiative" logo that clearly states the product's green advantage.

Submetering

The plant's three divisions have different energy needs. The two divisions that produce steel welding wire run 24/7. The third division makes industrial welding machines and operates during regular business hours, Monday to Friday. Installing submeters allowed the energy team to get a clear picture of each division's energy needs.

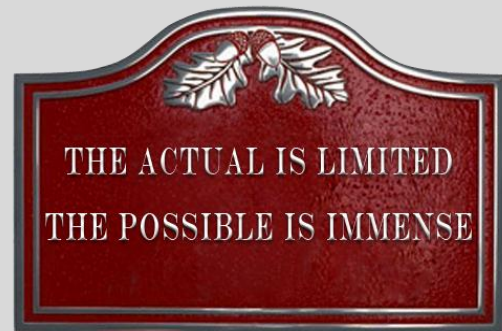
Maximize Energy Conservation

Lincoln Electric relied on a network of agencies from government and provincial utilities to help make the journey to ISO 50001 possible.

Natural Resources Canada (NRCAN), through the Office of Energy Efficiency, provided \$25,000 in cost-sharing to help with ISO 50001 certification. NRCAN's Canadian Industry Program for Energy Conservation (CIPEC) also helped Lincoln Electric with access to energy conservation tools and services.

As a member of CIPEC, Lincoln Electric has become a CIPEC Leader that gives back to its industry peers. The energy team members from Lincoln Electric were among approximately 100 people from industrial firms across Canada that participated in a January 2013 webinar hosted by NRCAN's Industry and Transportation Division. Participants learned about the ISO 50001 Energy Management Systems standard and its implementation in Canada.

The Ontario Power Authority's Conservation Fund covered the cost of the pilot project delivered by consulting engineers at Hatch to help Lincoln



This sign over the front door at The Lincoln Electric Company in Cleveland, Ohio, quotes founder James F. Lincoln. All employees, including the CEO, walk under it each work day.



Lincoln Electric's welders can survive the harshest environments from the desert to cold temperatures. Pictured above are pipeliner welders joining a pipe. This picture hangs on the walls of the factory to remind the employees where our products are used.

Electric work toward meeting the requirements the ISO 50001 standard. Toronto Hydro and Enbridge Gas helped defray the costs of submetering.

Barriers

Having already attained MSE 2000 and ISO 14001 certification simplified Lincoln Electric's journey to ISO 50001 certification. However, there were still barriers to overcome.

Having submetering installed was essential because the plant is housed in a 1930s-era building. Its older electricity and natural gas meters do not provide the data necessary to proceed with ISO 50001 certification.

Although Lincoln Electric senior executives understand the value of energy conservation, funds to invest in energy efficiency projects are limited. Energy projects must compete against other business priorities for funding. Management support is a key driver in the success of ISO 50001, and the belief in the value of energy management needs to come from the top. Company managers and executives played an active role in supporting energy conservation, including participating in energy management events such as employee meetings and NRCan's Dollars to Sense Energy Management workshops.

Lessons Learned

Mir and his team learned several lessons that other energy management teams can benefit from:

- The amount of paperwork associated with ISO 50001 certification is manageable.
- Build a corporate culture where everyone – not just the energy team – thinks about conserving energy.
- Establish energy efficiency as an important driver of cost control.
- Establish detailed baseline energy data.

Results

The bake oven used in wire production was discovered to be the biggest single user of energy. Changes were made to the production schedule to reduce the peak demand costs for electricity. The bake oven was also optimized, which reduced its electricity consumption by 8 percent.

The wire drawing line was also optimized because submeters gave a better picture of the drawing line's energy consumption. Drawing is the metal-working process used to shape a wire by pulling it through a forming die.

The plant installed a fume extraction system that keeps heated air in the plant by filtering it inside rather than wasting heat by venting air directly outside. The EnMS also established aggressive limits and reduction targets for water use.

Other energy projects included converting old steam boilers to more efficient natural gas heating for plant heating, changing DC motors to AC, and retrofitting lighting.

Keys to Success

- The company developed a structured approach to embed energy management in all facets of the organization – from purchasing to maintenance and engineering. The system also allows for continual improvement as the company builds a self-sustaining culture of energy management.
- All Lincoln Electric employees must be familiar with the corporate energy management policy. The EnMS garnered wide support from employees early on, because it was portrayed as a cost-containment initiative. This aspect appealed to employees because they enjoy a profit-sharing arrangement at Lincoln Electric.
- "Our profit-sharing plan includes everyone from the assemblers to the CEO. When everyone reaps the profits of energy management, it makes integration of energy management into the corporate culture that much easier," Mir says.¹

1. For more details on Incentive management, refer to Harvard's case study on Lincoln Electric, and the book **Spark**, by Frank Koller

Next Steps

The Toronto plant is upgrading its aging compressed air system. An employee contest to spot the air leaks “Catch the Energy Thief” is the first step in optimizing the entire system.



The Global Superior Energy Performance (GSEP) initiative was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC). Through GSEP’s 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. For more information, please visit <http://www.cleanenergyministerial.org/energymanagement>

