

Global Energy Management System Implementation: Case Study

México

General Motors de México SLP

EMS under ISO 50001:2011 certification by GM San Luis Potosi Manufacturing Complex



Business Case for Energy Management

General Motors Corporation as part of its sustainability strategy, established GM's 2020 manufacturing commitments. Reduce energy usage from facilities is one of the commitments, and the goal is 20% reduction from 2010 to 2020. GM Corp has an Energy management program to ensure the goal systematically on a yearly bases. Each year, for every facility are defined targets of an indicator expressed in energy usage per unit produced, the targets depend of the production annual volume forecasted, the energy performance in previous years and new conditions into the facility like a new products to be launched. Every facility is responsible to develop and execute an annual plan with energy savings initiatives to reach the targets.

San Luis Potosi manufacturing complex has been characterized by its total commitment to improve its energy performance. Energy conservation initiatives, best practices, people involvement are some of the

factors that have allowed the complex to be the benchmark for the plants of North American (NA) region since January 2012.

As it is commonly said that the difficult thing is not to get there but to stay, the top management of the complex requested to manufacturing direction a strategy to remain as the best plant in energy consumption per unit and guarantee the 2020 targets. The energy management task belongs to the Utilities group as part of the Global Facilities department into the GM's manufacturing organization. In that time, the Utilities group analyzed the strengths and weaknesses of energy management and the result was as follow: "we need an Energy Management System (EMS) that allow us to standardize and document the energy saving best practices that we already have, and that allows us to systematically improve our energy performance continuously, regardless of the person or group of people who are in charge of energy management." The action was proposed to the top management of the complex and a project to develop and implement an EMS under ISO 50001 was approved.

"The EMS implemented through ISO 50001 allow us to remains as benchmark in energy usage per unit in the GM NA region."

—Roberto Gallegos, Site Utilities Manager

Business Benefits Achieved

Several business benefits we have had since the EMS implementation.

- The first benefit was about meet the energy targets, its means energy and cost savings. The table below show this benefit per year.

Year	Energy Savings (GJ)	Cost Savings (\$USD)
2013	132,964	\$ 1,926,048
2014	224,419	\$ 2,183,073
2015	204,524	\$ 1,566,902
2016	129,550	\$ 950,351
Total	691,457	\$ 6,626,374

- The GM SLP manufacturing complex has two plants, the first one assemble vehicles and it is called "Assembly" plant, the second one machining parts and assemble transmissions, it is called "Transmission" plant. Since both plants started production, they have been in continuous growth. Major changes in infrastructure and process equipment have taken place in the complex, in the Assembly plant the production rate has increased from 30 to 60 JPH, and something similar has occurred in the Transmission plant. Notwithstanding the foregoing, both plants have remained as the best in energy performance into the GM NA region. How it was possible?, we are well aware that the EMS has contributed significantly to this achievement. The standardization and the Deming cycle approach, systematically lead to the achievement of the objectives.
- When we decided to implement the EMS under ISO 50001, we realized that we were going to be the second industry in México to get a certification under this standard and the first one of the automotive industry in México. This event means an improvement to the corporate image of the company, projecting an image of a

Case Study Snapshot

Industry	Manufacturing
Product/Service	Vehicles and Transmissions
Location	San Luis Potosi, México
Energy Management System	ISO 50001
Energy Performance Improvement Period	4
Energy Performance Improvement (%) over improvement period	7.3% Assembly 5.0% Transmission Usage/Unit
Total energy cost savings over improvement period	6.6M \$USD
Cost to implement EnMS	121, 313 \$USD
Payback period on EnMS implementation (years)	0.1 Year
Total Energy Savings over improvement period	691, 457 (GJ)
Total CO₂-e emission reduction over improvement period	(Metric tons)

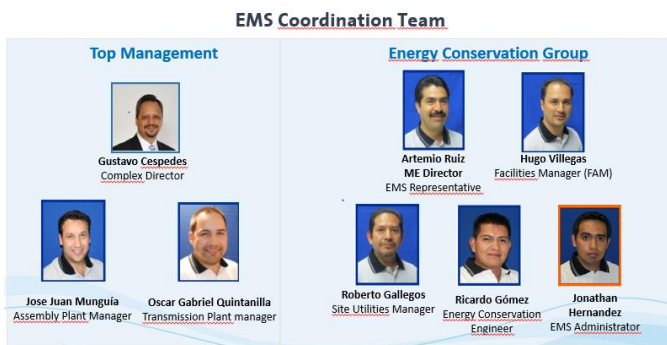
company that cares about the environment and is socially responsible.

EMS Development and Implementation

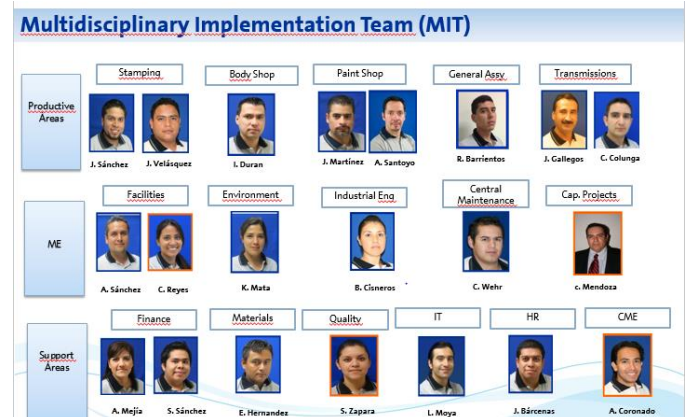
Once the project to implement the system was approved, a master plan was developed, the ISO 50001 standard was acquired and an Engineer was hired to start the project. When detecting that the standard contained several common elements with ISO 9000, ISO 14000 standards and the Global Manufacturing System (GMS) of GM, the strategy was to take advantage of the systems already implemented in the plants and only to refer them in the new EMS.

Organizational

An EMS coordination team was integrated from the top management and the Energy Conservation Group (ECG) in order to face the challenge. The top management responsibility was to allocate the necessary resources and commit themselves to the established Energy Policy. The Energy conservation group leads all the process to develop and implement the EMS. Just a new position was added to the Energy Conservation Group base line organization due to the EMS implementation. The new position was the EMS administrator, who is responsible to establish, implement and maintain the ISO 50001 standard requirements. The complete lead organization is showed in the figure below. The new position is shown with orange box:



To reach all areas of the complex where the system has applicability, a multidisciplinary implementation team (MIT) was integrated with key people from operations and support areas. The main role of this group: act as liaison between the Energy Conservation Group and the areas of the complex, facilitating communication and implementation of EMS requirements in each area. The MIT is showed in the below figure:



From the ECG and MIT an analysis was made to select the internal auditors. Formation and work experience were considered for this selection.

After integrating the teams, a plan of training was defined for all the people involved. The first course was "Interpretation of the ISO 50001 standard" and then for the internal auditors the course of "Training for Auditors". The human resources were ready for the implementation.

Energy, Review and Planning

The Energy management program of the GM Corp. has established key metric energy indicators for all the manufacturing facilities around the world. The definition is based in the bill of process established and the GM's construction standards. All the knowledge of its facilities have allowed to define the significant energy consumptions for which corporate controls have been established. Electricity, Heat and Total Energy expressed in MWh/Unit are the indicators used to track the energy performance.

$$\text{Total Energy (MWh/Unit)} = \text{Electricity (MWh/Unit)} + \text{Heat (MWh/Unit)}$$

For the EMS requirement, San Luis Potosi manufacturing complex, set the base line as the Total Energy indicator. On a yearly basis, the GM's Energy program set the targets through a model to fulfill with the 2020 manufacturing commitments based on historical data, annual volume forecasted and the specific condition of each facility during the year. The energy targets are deployed through the Business Plan

Deployment (BPD) across all levels of the plants for tracking. At the beginning of the year, according with the energy planning procedure of the EMS, significant uses are identified through a methodology developed in the system in order to establish the necessary operational controls to reduce energy consumption and achieve energy consumption targets per unit. Two energy saving workshops by plant are done during the year where key people is involved in order to identify energy conservation initiatives and energy efficiency projects. With the initiatives and projects detected, a sufficiency plan is developed in order to track the progress on a monthly basis. The GM's energy program works on yearly basis from January to December. A year was also the period of time that the implementation team set out to develop, implement and certified the EMS.



“The EMS through ISO 50001 help us take care of the environment because we save energy”

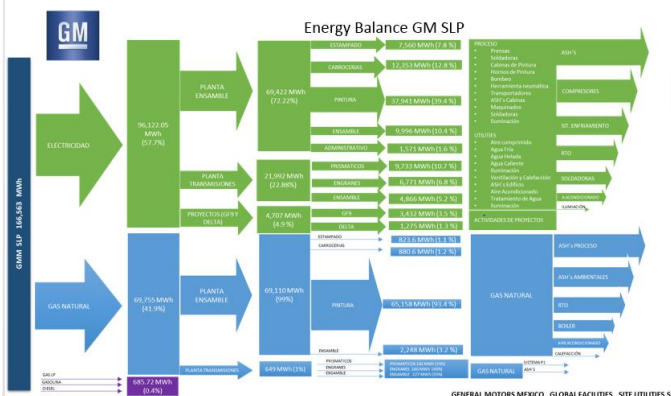
—Ricardo Gomez, Environmental Coordinator

Cost-benefit analysis

Because GM Corp. already has a culture on energy savings several years ago, the measurement and monitoring infrastructure is already part of its building standards. Thus, for this case study, the monitoring system is not considered as a cost associated with the EMS implementation project. The table below, shown the cost associated from 2013 to 2016.

Concept	Cost (USD)
ISO 50001 Standard adquisition	\$ 117
EMS administrator	\$ 53,991
ISO 50001 interpretation Course	\$ 19,437
Auditor Training	\$ 21,597
Communications	\$ 4,049
External Audit	\$ 22,121
Total	\$ 121,313

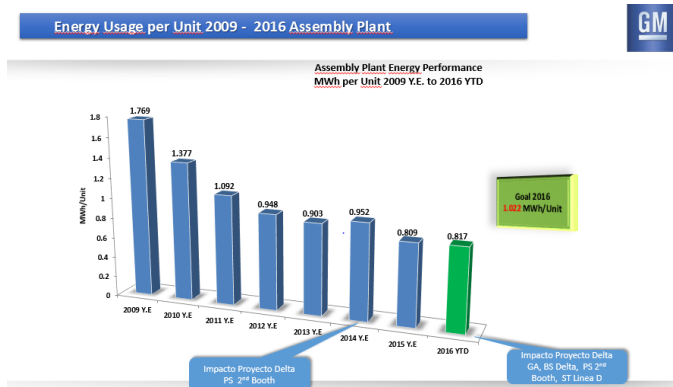
Energy Planning



Energy Saving workshop

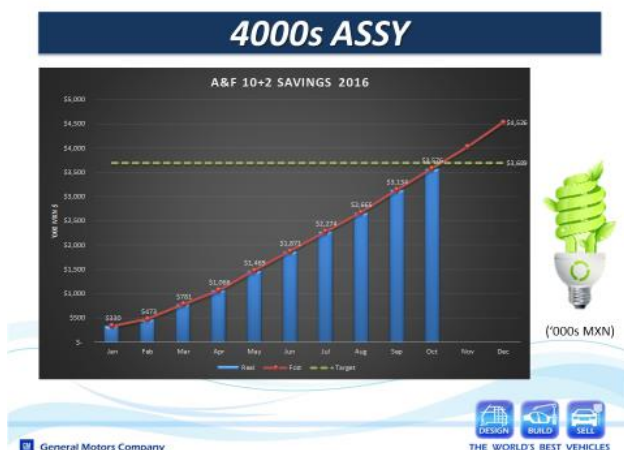
Energy performance improved approach.

The approach used to determine whether energy performance improved is tracking the energy indicator on yearly basis. The targets are established through a model that consider annual production volume forecasted, production scheme, product size, weather, new projects, etc. Reach the targets means energy performance improvement.



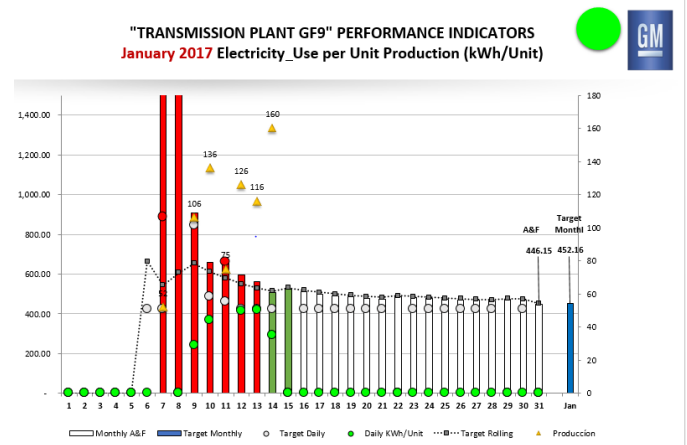
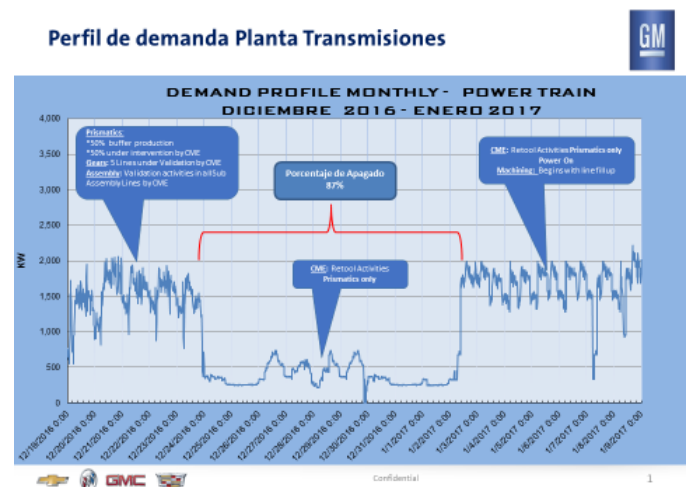
Results Validation.

The approach used to validate results is the internal and external audit. The EMS implemented has been certified by Bureau Veritas. The certification means that the EMS fulfill the ISO 50001 standard. On the other hand, The best validation is the cost savings achieved by comparing the actual cost with the initial approved budget.

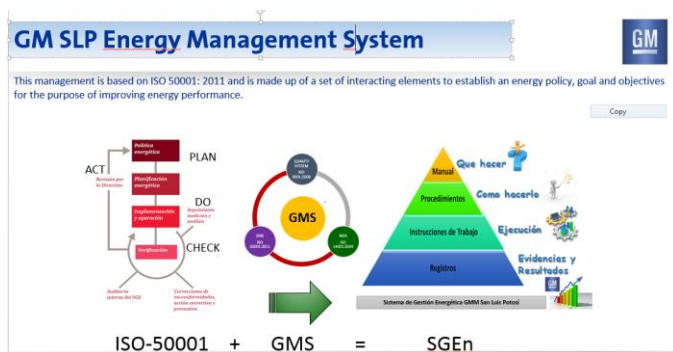


Operational control and energy performance improved

The tracking of the energy indicators on daily and monthly basis through energy committee meetings, staff meetings and BPD review, allow us to ensure reach the targets month by month and finally achieve the annual target. If a consumption goes out of control, daily administration allows us to react and take actions to bring consumption into control. Procedures and work instructions of the EMS, help to standardize the operational controls.



The energy performance improvement is part of the GMS of GM. This condition allows through onboarding process that all the new employees and business partners be aware of energy objectives, the existence of an EMS and the importance of energy saving for GM. For the energy conservation group and auditors team, specialized training was given to assure the EMS requirements fulfilment. In our case, professionals from Bureau Veritas taught the courses about ISO 50001 interpretation and training auditors.



Lessons Learned

The main lessons learned was to realize that it is needed to involve key people since de beginning of the implementation.

Keys to Success

- Top management committed
- Take advantage of the ISO systems already implemented.
- Energy management professionals involved
- All levels people involved

Tools & resources.

Tools and resources used for implementation were GM's employees with experience as ISO 14000 and ISO 9000 auditors. For monitoring and management are used Energy On Star and GM2100 database. Both tools are corporate and are very useful for measurement monitoring in real time and manage the energy indicators on monthly basis. The ISO systems (14000 and 9000) already implemented and the GMS were used to simplify the development, implementation and monitoring of the system.

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.