

Global Energy Management System Implementation: Case Study

Argentina

Mastellone Hnos S.A.

Mastellone Hnos achieved a 3.2% of energy savings in 1 year.



Mastellone Hnos, the biggest dairy products company in Argentina. General Rodriguez Industrial Complex

Business Case for Energy Management

Organization Profile

Mastellone Hnos S.A. is a leader company of the food processing sector specialized in dairy products. It was founded in 1929 by the Mastellone family. It began with the production of only Mozzarella and Ricotta. In the present the company has a variety of products offer which include Ultrapasteurized, UHT and powder milk, ricotta, milk caramel, different kinds of cheese, among others sold with the brand “La Serenísima”. The total production is divided in 5 main industrial plants along Buenos Aires, San Luis and Córdoba provinces situated in General Rodriguez, Trenque Lauquen, Leubucó, Canals and Villa Mercedes.

Drivers

In 2016 and following the environmental care policy of the company, the senior Management decided to establish an objective on the implementation and certification of an Energy Management System under the ISO 50.001 standards. The first step for making this decision clear was to set as one of the main objectives in the company’s Policy, energy efficiency.

The present Senior Operations Manager has always believed in Management Systems and this was vital for taking this decision.

Case Study Snapshot	
Industry	Food Processing
Product/Service	Dairy Products
Location	Argentina
Energy Management System	ISO 50001
Energy Performance Improvement Period	1 year
Energy Performance Improvement (%) over improvement period	3.2%
Total energy cost savings over improvement period	65,658 \$USD
Cost to implement EnMS	41.963 \$USD
Payback period (years) on EnMS implementation	0.64
Total Energy Savings over improvement period	2,559.4 GJ
Total CO ₂ -e emission reduction over improvement period	263.1 MT

First steps in energy efficiency

In 2014 an improvement team was working in energy efficiency led by the biggest energy consuming area in Mastellone Hnos, “Industrial Services”. The main reason to build this working group was to find a solution to some services generation problems like refrigeration, compressed air and water supply. Trying to tackle these problems the team realized that the solution in many cases, without investing in more equipment and installations, was to improve the efficiency of the

generation systems. Along 2 years of meeting and working, this team achieved to implement 3 projects and had many others in study but without being effective in the implementation and maintenance of new projects, it was difficult to maintain the meeting frequency and participation. In clearer words, the improvement process was not systematic. Finally, this team was dissolved.

EnMS Implementation Plan

At the beginning of 2016 after the Senior Management decided to insert the Energy Management into the organization, a plan of a progressive implementation was made. The first step was to define the scope. This included production, conservation and expedition of dairy products within the limits of Armonía Plant (Processed Milk: 330 million litres per year; Energy consumption: 44 GWh per year) with a deadline set on February 2017. In a second stage, the limits would be extended to the whole General Rodríguez Industrial Plant (Processed milk: 1.200 million litres per year; Energy consumption: 400 GWh per year) before the deadline set on December 2017 and finally Trenque Lauquen and Leubucó Industrial Plants would be included before December 2018.

Business Benefits Achieved

The ISO 50.001 implementation has brought many benefits to the company since the beginning, not only economic outcomes, due to costs reduction or productivity increase, but also reputational and organizational ones.

First of all, economic results are composed mainly by the reduction of the energy consumption and in some cases even productivity enhancement. The electric energy acquisition cost has been reduced in 65.658 \$USD.

In energy development the organization reached a 3.2% improvement in the annual energy consumption. This represents a total of 710.947 kWh in a 1 year period. It also had its environmental and social benefits because it means a reduction of 263,060 kg of CO₂ emissions.

The company saw its reputation enhanced because of the actions taken to help the environment. This implementation case was shown to different schools and universities and, of course, to every worker in the company, so this environmental care message would be scattered among their families and friends.

Non-economic benefits for the organization were not less important. First of all, the energy management vision changed surprisingly into a systematic way, involving more people than expected in achieving the energy development improvement objective, enhancing the implementation and maintenance of energy improvement projects. Secondly, the energy review provided the organization a big amount of technical data about the present equipment and installation such as installed power and energy consumption by area, actual technology.

“An Energy Management System under ISO 50.001 standards is the only way to achieve energetic goals and sustain them in time”

—Luis Demicheli, Management Systems' Manager

EnMS Development and Implementation

Organizational background

Mastellone Hnos holds an integrated Management System that began in 1996 with the implementation of the ISO 9.001 quality management system, later in the 2000 decade were included the norms ISO 22.000, 14.001 and 17.025. It was crucial for the achievement of the ISO 50.001 to have a solid integrated management system which is nowadays contemplated in the daily activities of the organization.

Another important tool used by the company was the existing area called “Management Systems Coordination” which is dedicated fully to assist the production areas in implementation, maintenance, improvement and auditing all the different management systems.

Energy Management Team (Human Resources)

Top management support was vital for the implementation because it was the provider of the necessary resources that the EMT required.

All the necessary resources were provided from inside the organization. In the first stage (Armonía Industrial Complex) a 17 member EMT was created made up of employees from different areas and hierarchies.

Managers, Supervisors, Operators and Analysts from areas such as Production, Maintenance, Industrial Services, Electric Maintenance, Management Systems, Training, Engineering, Processes Improvement and Environment took part of the EMT.

Maintenance crew was the most active member of the EMT, it had to contribute with technical knowledge of the present installations, their usual activities and how they can be improved. Production members were the second in importance, their role was to apply their knowledge about present processes and the way they behave after any change. The other mentioned areas have assisted the implementation process contributing with their knowledge, experience and expertise and doing EnMS implementing activities such as analysis, measurement, data collect and supplying improvement opportunities.

Members from the management levels contributed taking important decisions and allowing resources from production's and maintenance's budgets. The Management Systems Manager was named as the Management Representative. He was the member who transferred problems, solutions and requests between the EnMT and the Senior Management.

In the second stage of implementation (General Rodriguez Industrial Complex) the number on EnMT members increased sharply to 80 people. So the team saw itself forced to create a complex structure of EnMTs, divided in 6 particular EnMTs with small boundaries plus one central EnMT which integrated all of them. Each particular EnMT developed tasks within its limits guided by an EnMT leader from the Maintenance area and then once a month, every particular EnMT leader meet together with other central EnMT members in a central meeting.

There were 2 vital roles in this structure: the EnMT leader from Management Systems Coordination and the EnMT leader from Maintenance. Their specific tasks were to plan and set action lines, coordination, communication, control and monitoring to each one of the particular EnMT and leaders actions and decisions.

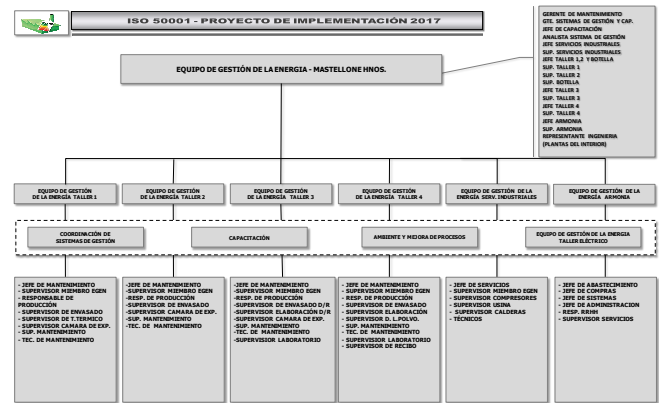


Figure 1 - EnMT structure

No external expertise was necessary for the implementation process. Suppliers' expertise was used in some specific improvement projects only.

Energy Review and Planning

A data sheet was used to gather technical information. The information gathered was: Unit ID, Sector, Area, Nominal Power, Current measure and Working hours. With this data, the energy consumed by equipment, area and sector could be calculated. In addition secondary technical data was collected: energy supply source, supply wire length and section, soft-starters and variable speed drivers.

The energy review process was the most extensive due to the enormous number of equipment, but it also was the most enriching one in terms of knowledge of the actual installations, energy consumption and a big amount of improvement opportunities. This process lasted approximately 3 months of work and involved not only members of the EnMT but also other workers of the maintenance crew. Information from a total of 13.916 electric devices was gathered.

Energy Improvement Projects

The energy improvement opportunities, identified by EnMT members or workers' suggestions, were written in a list. At the beginning there were 245 opportunities identified, they were such a big amount that exceeded the EnMTs analysis capacity, so they were punctuated in order to weigh them and set a priority. The punctuation criteria were "Potential Savings" and "Feasibility". Then, in this way the EnMT would face only those which had not only big savings but also those which could be done in a short period of time.

Then, this list was used as a database of energy efficiency projects to analyse. A program supported in Visual Basic was developed with the organization's own IT staff in order to follow the action plan for each project. In this software different actions and tasks were established adding a responsible and a deadline, also energy, cost savings and payback period were calculated for each on-going project.

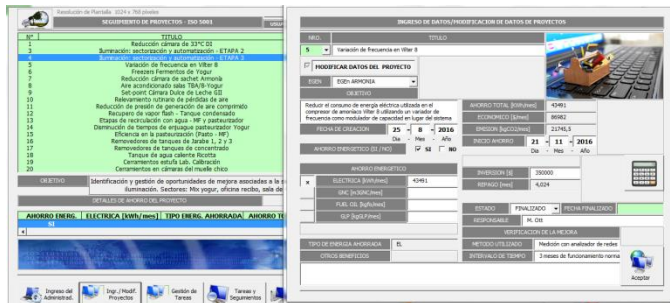


Figure 2 – Energy Efficiency Projects Monitoring Software

Just five improvement projects were needed for achieving the energy performance improvement target for the first year and almost no investment was needed for executing them.

Energy Efficiency Project	Investment [USD]	Potential Savings per month	
		Energy [kWh]	emissions [kgCO2]
Lighting: sectorization and automatization	-	9.400	3.478
Driver implementation in ammonia compressor	20.000	43.500	16.095
Freedzed ferments storage optimization	-	138	51
Refrigeration chamber's set-point modification	-	8.600	3.182
Leaks identification in Compressed Air Systems	-	4.500	1.665

Figure 3 – Energy Efficiency Projects Implemented during the first stage

At the present, during the latest implementation more than 100 efficiency projects are being analysed and some of them are almost implemented.

Financing

Financial programs or benefits for ISO 50.001 implementing organizations, exist in Argentina, but Mastellone Hnos did not meet the requirements. Because of the low cost of the implementation, all financial resources were taken from the company annual budget.

Duration

The first stage implementation process lasted 10 months comprising 41 weekly meetings, what meant a total of 859 man-hours. The second stage lasted 8 months what means that the second process was much efficient owing to the first acquired experience. In this phase the EnMTs met 203 times resulting in a total of 2.500 man-hours.

Implementation Costs

The costs during the implementation are composed by only three categories: man-hours spent, training courses and external audits costs. Total costs of implementation 41.963 \$USD (4.882 \$USD course + 12.941 \$USD h/h implementation + audits 4110 \$USD+ 20.000 equipment)

Cost-benefit analysis

As shown previously, the implementation of the EnMS have a high cost- benefit ratio. The total cost of energy savings were superior to the investment made (savings: 65658, investment 41963 \$USD). The pay back period was calculated in 0.64, expressed in years (Payback period= Cost to implement EnMS/ Annual operational energy savings)

Energy Performance Indicators (EnPIs)

The only reliable energy measurement equipment for both electrical and natural gas, were those provided by the national companies (light and Gas). The measure used was total consumed energy. Finally, there could be only 1 EnPI for each energy source, one for electric energy and the other for natural gas.

Energy Baselines (EnBs)

Dairy production behaves with an annual cycle in which milk production falls from January to June and rises from July to December. Then, the baseline period was

established as 12 months. The same criteria was used to establish the reporting period for the EnPIs and deadlines for the objectives and targets. The relevant variables were identified while doing the energy review. Each consumer unit was related to their own relevant variables and at the end of the review all the identified variables could be grouped in only 3: cooling degree days (CDD), heating degree days (HDD) and total production level. Once the relevant variables were identified, a regression analysis was made using the Microsoft Excel data analysis tools comparing energy consumption and the relevant variables. Finally, the Energy Baseline is constituted by a variable energy consume due to heating or refrigeration, a variable energy consume due to total production level and a constant energy consume that depends of no variables.

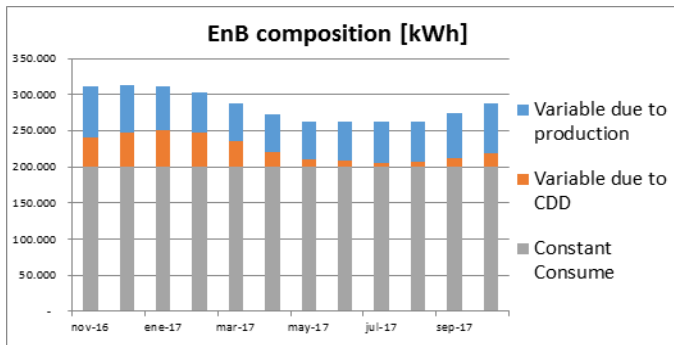


Figure 4 – Energy Baseline Composition

EnPIs and EnBs monitoring

Energy Performance Indicators and Energy Baselines were monitored using a Microsoft Excel workbook. Monthly every relevant variable and measure value was uploaded in this workbook to calculate the EnPIs and EnBs and compared them through a run chart. Then the energy development improvement was calculated as the difference between the monthly value of each one of the EnPI and EnB, and the total difference. The monthly difference was monitored every 3 month span in order to identify trends and annually control the target achievement. In case of any deviation to the EnB the EnMT would have been forced to treat it as nonconformity, identify root causes and corrective actions to solve them.

Measurement equipment

As explained before, the industrial plant didn't count with much energy measuring equipment. Because of this a portable energy analyser was used to measure the improvement in efficiency use of energy. This equipment has its own specific applications. The accuracy of these equipment was tested periodically to ensure its results.

Despite of the lack of energy measure this was not a problem certification could be achieved nonetheless.

Internal Audit

Internal staff was trained on ISO 50.001 audits so the EnMT had internal auditors not only to perform in internal audits but also to face external audits. A total of 30 internal auditors were trained from different particular EnMTs who allowed the organization to do impartial internal audits and unify the EnMS functioning even more. As expected, there were nonconformities to solve and they were very useful because every internal auditor saw the EnMS from a different point of view. The nonconformities were studied and solved to remove root causes.

Sustaining Energy Performance

After the Significant Energy Uses (SEUs) had been identified the next step was to establish activities, documents and people related to them. As projects were moving on, different work instructions were being established on those documents. With this information the EnMT faced 3 actions: establish preventive maintenance as critical and identifying them in the maintenance software, process set-points revision and adjustment and personalized communication to staff directly related to SEUs.

EnMT Training

The first training course was the mentioned ISO 50.001 Internal Auditor course taken by almost all the EnMT. Then there were some specific training in technical issues such as: measurement techniques and energy efficiency in steam installations. And some other in specific activities in energy management such as: a Diploma in Energy Management and an Energy Efficiency Journey in Germany for some key roles in the EnMT. Some other activities done by the EnMT were:

courses of “Drivers Solutions” by ABB, “Drivers Solutions” by Danfoss, “Efficient Electrical Motors” by WEG and “Electric Measurement” by Fluke; visits to ABB’s and Schneider Electric’s installations two of the firsts organizations to obtain an ISO 50.001 certificate.

Employee Engagement

Internal staff motivation was achieved mainly by a fluid communication between the EnMT and the rest of the organization. Three main communication channels were used through the implementation: the energy efficiency course, communication boards with suggestions mailboxes and “Transfer Trainings” (directly to the person).

The energy efficiency course deserves a special mention because it was one of the most important tools that the EnMT used to build awareness on all employees. The key topics in to achieve this aim were: firstly talking about the energy consumption and how the individual consumption behaviour results in more fuel burned in generation plants and how emissions would affect the environment; secondly showing the person how they could save energy in their houses and how this contribute to the environmental care and their own money savings; finally, a summary of the EnMT activities (energy review results, improvement projects, research, etc.) and how this would impact in their daily tasks. More than 1.400 employees took the course achieving the “Personnel Awareness” target.

“Integration and coordination between involved areas and employee awareness and motivation were our keys to success in our ISO 50.001 EnMS”

—Federico Alcalde, EnMS Implementation Leader

Lessons Learned

- Cultural change in daily work is the cheapest improvement Project. Many inefficient tasks are normally made because nobody has never analysed them and teach the workers how to do things in a more efficient way.
- Employees can be motivated in energy efficiency if potential results in environmental care and money savings are shown.
- A big objective can be achieved in short terms if every area works as an integrated team.
- ISO 50.001 helps the organization not only to improve energy development but to gain technical information and consumption behaviour of the industrial complex in depth.

Keys to Success

- Leadership, support and decision of Senior Management
- Team working among the different areas which are involved
- Achieving employee awareness and motivation
- Integrated and mature Management System with an ISO 9.001 base
- Training on ISO 50.001 for the EnMT members
- Interdisciplinary EnMT with a mixture of technical, management formation, experience and different hierarchies

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.

