

ISO 50001 Energy Management System Case Study

Argentina

MONDINO S.R.L.

One of the smallest SMEs in Argentina to certify ISO 50001



The whole staff

Organization Profile & Business Case

In the first half of 1980s, Norberto Mondino, along with his brother Daniel, formed “MONDINO S.R.L.”, a manufacturing company for producing refrigerated exhibitors. They always wanted to be not only a small enterprise, but a role model company.

Their first clients were grocery stores and minimarkets, but soon they started producing more types of exhibitors as responses to other clients’ requests.

As time went by they began to arise as a leading company as a result of accompanying its customers in the development of new projects regarding refrigerated equipments for commercial usage.

It is located in the heart of Southern Rosario, Santa Fe, with a surface of approximately 1880 m².

MONDINO’s clients are minimarkets, large supermarkets franchises, bakeries, hotels and company canteens and grocery stores. MONDINO was always characterized for being one step ahead from its competitors, a result of its leading vision.

Case Study Snapshot

Industry	Machinery Manufacturing
Product/Service	Commercial Refrigerated Exhibitors
Location	Rosario, Santa Fe
Energy management system	ISO 50001
Energy performance improvement period	2017-2018 (1 year)
Energy Performance Improvement (%) over improvement period	Electricity: 3.9% LPG: 13.87%
Total energy cost savings over improvement period	1700 \$USD
Cost to implement EnMS	16700 \$USD
Total Energy Savings over improvement period	34.27 GJ
Total CO ₂ -e emission reduction over improvement period	2.29 Tn

“The main value added obtained with this certification is to demonstrate the feasibility of implementing an EnMS in a small enterprise.”

—Marco A. Massacesi, MSc. Eng.
Integrated Management System Responsible
Management Representative

Considering this advantage, by the end of 2016 the possibility of implementing a QMS and an EnMS (both integrated) through a consultancy was presented at CEO’s office. While having a staff of no more than 30 employees (20 operators and other 10 in administrative

and technical areas), this implementation was a challenge in both training and feasibility.

However, the simple fact of having the possibility of implementing an EnMS was far from enough: it was required that every member of the organization took awareness regarding the importance of energy, its rational use and the impact on the reduction of GHG emissions. In this matter, our first action was training all the staff, from managers to workforce. These meetings allowed gaining consciousness about what was happening, so that we were all committed to care from the very beginning. The responsibilities of the entire plant staff vary from detecting compressed air leaks, on the one hand, and on the other hand, incorporating the energy as an element of production planning.

Business Benefits

Being a very small business (in terms both of staff and billing), the first doubt we had was: "how feasible would implementing an EnMS be?" We knew for sure that these types of activities could be quite expensive (and volunteered). Nevertheless, we were (and still are) sure we have the staff to achieve this goal.

We began reading material about these standards, especially ISO 50001, which was new to the company. Even though MONDINO was (and is) not an energy intensive user, management staff concluded that energy prices will continue rising, and we saw this as an excellent opportunity to start managing energy and include it as a strategy.

We knew that the impact of any management system is always positive. Considering this, the experience obtained in Energy Management was even more enriching as it allowed understanding how to use and consume energy, not only by applying the Energy Review chapter, but by making measurements and other analysis.

Among positive impacts we identify the following ones:

- An electric energy performance improvement of 3.9%, being Oct2016-Sep2017 the baseline period and Oct2017-Sep2018 the reporting period.
- An LPG energy performance improvement of 13.87% (LPG stands for "liquefied petroleum gas").
- An energy saving of 34 GJ.
- An energy saving cost of 1700 USD (see periods above).
- Implementing cost is an estimated total of 16700 USD and approximately 200 hours distributed throughout both periods.

One of our greatest goals was to become one of the first Argentinean factory of refrigerated exhibitors in certifying ISO 50001, as well as being within the 5 "small and medium businesses" all over the country in reaching such a milestone. It is therefore that a discrete publicity process began which sole end was to spread the standard, its viability to implement an EnMS and the certification reached.

Plan

Gaining commitment

Although it was the CEO who accepted the challenge for implementing both QMS and EnMS, it was not until a member of the staff that later became the management representative was trained on ISO 50001 that MONDINO S.R.L. began to acknowledge the standard true meaning and magnitude of its implementation.

Once the standard was fully understood, a meeting between the manager and the representative was conducted, in order for the latter to explain the profoundness of an EnMS. Thus, a question with two mutually exclusive answers was made, being: a) proceed by applying these standards in our plant and make a difference (benchmarking); or b) continue working with no implementation of ISO 50001 at all. The response, evidently, was the first one.

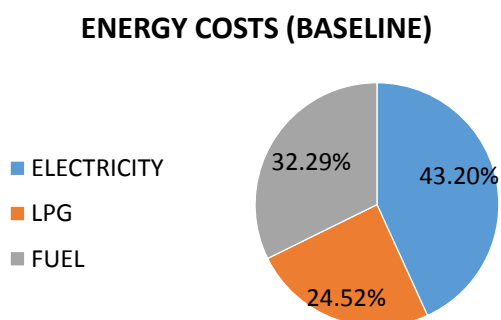
A whole new process (to us): analyzing energy

During Energy Review, a survey of every consuming-energy device was carried out, regardless of its energy source. The process was followed by an intensive analysis in which daily use and calculations allowed to estimate the energy consumption of such devices. In addition, electrical and LPG billings were used in order to make comparisons between estimated total use and what was billed to MONDINO according to its use.

In order to support the previous data with technical rigor, electrical measurements were done through power logger so a daily-energy-consumption profile was obtained (some of the “Do” actions). Also thermal imaging records in the heating presses area were performed in order to detect heat losses (fueled by LPG). In both cases, results showed normal usage of those equipments. Following ISO 50001 clauses, calibration certificates were collected, as well as results reports from those service suppliers were recorded.

Changing the point of view: analyzing energy costs

Once the percentage of every energy-consuming equipment was obtained, the same analysis regarding electrical billings, LPG billings and fuel billings was conducted. Results are shown in the following figure:



The beginning of it all [EnPIs]

As a consequence of the graphic shown above, the first guidelines for the development of opportunities for

improvement and their prioritization began to emerge. Among such opportunities were, on the one hand, discrete actions such as replacement of traditional lighting to LED, technical evaluation of solar projects (both photovoltaic and thermal), and, on the other hand, continual actions like constant review of compressed air leaks, production planning in order to manage energy, training to awareness and sensitize staff.

Energy Performance Indicators (EnPIs) complement quality indicators (KPIs) as parameters for decision-making. Such indicators were designed to be representative of this company, having the main goal to achieve the proposed objectives.

A list of opportunities for improvement was made, as well as modifications of aspects shared with ISO 9001 (for example, Maintenance & Repair Operations) in order to integrate as much as possible these standards. According to this, actions for Integrated Management System were developed, coordinated and carried out.

“We started to know the impact of our activities in energy costs and how to save resources at the same time.”

—Norberto Mondino, CEO

Do, Check, Act

Where to look at (and what to do) first

Every person at MONDINO was shown that MONDINO’s air compressor consumes 20%-25% of total energy, and every work station uses pneumatic tools, so one of our main ideas was *reducing-to-eliminate* habits that have negative impacts on energy, like repairing air leaks or changing accessories and parts of the air system, as well as qualified maintenance for the air compressor.

In addition, actions like production planning in order to save energy were presented and discussed. Moreover, detecting non-conformities is very important not only

for QMS, but also for ISO 50001 since every piece which does not fulfill its specifications during its production time, consumes resources from regular operations that *could be used to produce additional units*.

Gaining awareness

We believe that every person can carry out some of these actions at their own homes, which gives an enormous potential for energy saving. This is the so called “multiplying effect”, also known as positive feedback. Thus, training awareness and sensitize our staff is one of the main goals for both company and Integrated Management System. In every training or sensitization, management staff was present. Even though every management system starts with ‘management responsibility’, considering that MONDINO is a small family company, their presence was important in order to demonstrate commitment.

Every training at the factory included a subject of energy rational use. In this aspect, staff was encouraged to detect compressed air leaks, to optimize energy consumption at heating presses by keeping plates closed as much as possible and occupying surface pressing at its maximum, switching off every equipment that is not being used, whenever possible use natural light, cleaning and lubricating tools and every other action regarding energy saving always considering minimum interference on the manufacturing processes.

Understanding EnPIs

Five EnPIs were defined to measure the energy performance of this plant. On the one hand, less significant EnPIs are: EnPI#3 (fuel used by both forklift and truck per produced unit, although these are not-so related variables), EnPI#4 (referring to procurement processes) and EnPI#5 (which counts non-conformities regarding energy waste). On the other hand, most significant EnPIs are: EnPI#1 (*electric energy*

consumption per produced unit [kW.h/u]: “electric energy intensity”) and EnPI#2 (*LPG consumption per produced unit [litres of LPG/u]: “heating energy intensity”*).

As every target regarding the EnPIs was achieved, the goals defined for the following period are maintaining those values “as low as possible”. Since “consumption” is the numerator and “units” is the denominator for both EnPI#1 and EnPI#2, improvements on energy efficiency are shown whether consumption is lesser for the same production, or production is greater by consuming the same energy. Thus, in both cases, value for each EnPI reduces (“the less, the better”).

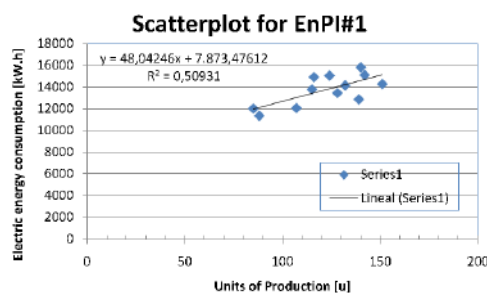
Improvement on EnPIs

To determine whether there have been energy improvements we used the following formula for both EnPI#1 and EnPI#2:

$$\left[\frac{\text{Baseline Period Energy Consumption} - \text{Reporting Period Energy Consumption}}{\text{Baseline Period Energy Consumption}} \right] \times 100$$

A better way to determine this improvement is by calculating a regression analysis model, where relevant variables may vary for each EnPI, although one of them is always “energy consumption”.

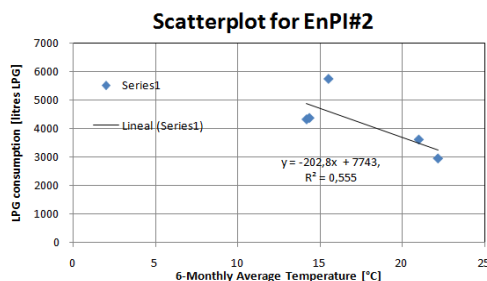
According to the formula, the energy performance improvement for EnPI#1 is 3.9%.



The left figure shows a linear regression model for EnPI#1. Though the improvement calculated this way is 4.3%, it is stated that $R^2 > 0.5$ barely, indicating a medium model fitness. Further statistical validity checks were not as strong as desired.

The formula for EnPI#1 resulted in an energy efficiency improvement of 3.9%, a bit lower than 4.3% by using a regression model. On the other hand, there is no HVACR equipment needed for producing regarding electricity.

Electricity is billed every two months and LPG is purchased when needed. This difference turns EnPI#2 to be measured per year since there are moments, like e.g. during summer, in which no LPG may be requested to our supplier. As a result, there is not enough data for a regression model (nevertheless, a very preliminary linear regression shows $R^2 = 0.55$). Instead, the formula was used and the improvement was almost 14%



(13.8%). This EnPI#2 reflects the influence of weather conditions on MONDINO's EnMS.

What we used (Instruments)

Measurements were made with instruments such as “Fluke 1735 Power Logger”, or “Testo 875-1 Thermal Imager”. Other resources used were no different than those found in any other factories or offices, such as computer software (word processors, spreadsheets), calculators, reference books, as well as modifications performed by request on the company's ERP system.

Regarding operational control, this ERP was modified in order to add activities related to energy use. At the same time, maintenance planning was reinforced, especially to those mechanisms/appliances/equipments classified as “Significant Energy Uses” (SEU).

Energy Team

Energy Team was led by MSc. Eng. Marco A. Massacesi,

who led the implementation of the Integrated Management System (especially ISO 50001 standard) and Eng. Carolina Pistelli, who helped with the implementation of ISO 9001 standard mostly. The Energy Team was completed with production processes supervisors (Gustavo Guzmán, Eduardo Galarza and Armando Legal, Raúl Rojas), as well as with Daniel Mondino (Partner and Production Manager, thus gaining additional support to the EnMS).

The team kept regular meetings in order to coordinate activities and to achieve full integration with simultaneous ISO 9001 implementation.

What we've done (and what we are doing)

ACTION/PROJECT	INVESTMENT	PAYBACK
Training staff on Best Practices (operators, managers and drivers)	(continual)	
Revision of habits and methods	(continual)	
ISO 9001 assistance	(continual)	
MRO for heating presses*	600 USD	6 mo
Luminary replacement for LEDs	550 USD	12 mo
MRO for compressed air system*	250 USD	4 mo
Solar Thermal Project (gen: 100%)	20000 USD	Stand-by
Solar PV Project (gen: 50%)	40000 USD	Stand-by

*Qualified preventive maintenance not included (they are not exclusive to the EnMS implementation).

Every action indicated above was presented at CEO's office before applying, not only for obtaining resources, but for demonstrating commitment to the EnMS.

Our reality

Unlike ISO 9001, the implementation of ISO 50001 requires some technical knowledge, so it becomes necessary that some employees receive training on energy management.

In addition, since 2017 energy prices in Argentina began to reflect the real costs. Nevertheless, many energy

investments still have an estimate of 5-10 years payback times, and many local companies decision makers consider those periods non-viable since there was little financial support regarding energy efficiency.

In this matter, procurements processes according to the ISO 50001 standard requirements still have a long way for development.

Once the first internal audit was carried out in November 2017, everything was prepared for external audit. By May 28th, the original certificates arrived, which we proudly are showing in our office and on the website (<http://www.mondinosrl.com/certificados.php>)

Transparency

After the original certificates arrived, e-mails with such a success were sent to customers and suppliers.

In August 2018, an advertisement in a booklet for students of Industrial Engineering was published, alongside with multinational companies' ads. In that booklet, MONDINO appears showing its certifications.

In December 2018, a sustainability report was uploaded to the website. It allows knowing a little bit of the whole implementation process, providing an insight about its action plans, measurements through instruments, results achieved, key indicators and certificates. The following images are extracted from this report:



Keys to success

- Make emphasis on measurements, aiming to take more of them in order to obtain the best picture.
- Understand as best as possible the whole layout, facilities and daily requirements of energy.
- Reinforce M&R Ops, but most important evaluate alternatives to improve productivity, which outcome is part of the most significant indicators.
- There are always possibilities for improvement which do not necessarily cost money (like analyzing how the existing equipment is being used or new and creative ideas designed by qualified operators).

Lessons Learned

- Gaining commitment from the top level at the very beginning helps obtaining resources for the EnMS.
- Training on staff at the very beginning and including qualified operators in the Energy Team help saving resources rapidly and implementing the EnMS.
- Retrieving all the data at first helps saving time.

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.

