Global Energy Management System Implementation: Case Study

Argentina

ABB S.A.

ABB Argentina, Valentin Alsina facilities.

Solar panels in the rooftop of Valentín Alsina facilities

"We expected to become the first site to certificate ISO 50001 in Argentina; not only we did it, we also became the first site for ABB in the world to do it"

—Carlos Bondoni, EnMS Management Representative

Case Study Snapshot	
Industry	Energy and Automation Engineering
Product/Service	Electric and automation products and systems
Location	Buenos Aires Province
Energy Management System	ISO 50001
Energy Performance Improvement Period	5 years
Energy Performance Improvement (%) over improvement period	28,5
Total energy cost savings over improvement period	125000 $USD
Cost to implement EnMS	55000 $USD
Payback period (years) on EnMS implementation	2,2
Total Energy Savings over improvement period	1839 MWh
Total CO_2-e emission reduction over improvement period	894

Business Case for Energy Management

ABB has been a pioneer in Variable Speed Drives, hence energy savings has always been a theme in our approach to our industrial customers.

Energy policies in Argentina from 2008 to 2015 disregarded worldwide trends, and encouraged uncontrolled consumption of cheap, heavily subsidized energy.

With the publication of ISO 50001 we understood that systematic approach to energy savings would become a must in the short term, and we strove to set a leading case despite the lack of the economic incentives.

In terms of Corporate Social Responsibility the project made sense as well as regarding employees' motivation. As a matter of fact, Energy Policy included the goal to promote EnMS, become a reference to all stakeholders, and be helpful with other organizations willing to follow our lead.

Furthermore we needed to comply with internal directives of annual energy savings in all ABB sites worldwide.

Organization Profile/Business Case

Investment required as well as savings were not relevant compared to our year budget. Therefore, the importance of the project was related to company positioning.

Anyhow, it was obvious that we were facing two clear potential situations for energy savings:

- Because of a countrywide culture of energy squandering there was a lot of room for improvement just by changing personnel's behavior.
- Energy efficiency improvements in lighting would have a reasonable return on investment because of a side effect in lowering maintenance costs due to longer lifetime and shorter time required to change the lamps.

To have an Energy Management System would be the proper means to formalize both changes, and having it certified by a third party would be of great help in next actions to promote rational energy consumption in our country.

"Pursue Energy efficiency and reduced environment impact is in the DNA of ABB and in the genesis of all products and solutions that we develop. With that in mind, nothing more natural than the implementation of the Energy management System in our plants to create a responsible habit of consumption in our people. Everyone at ABB is proud to help to 'Run the World without consuming the Earth' "

—Jose Paiva, Country Managing Director

Business Benefits Achieved

Business Benefits (Summary)

The most important benefit achieved during the implementation of our EnMS was the development of a unique mindset (at least within Argentina's boundaries) concerning energy waste. We had the chance to present our case in many events, being the most important of them Clean Energy Congress in Buenos Aires in 2012.

The idea that we promoted through energy efficiency presentations was "Energy Management: energy consumption control starts at the demand end".

We used the same idea inside the company and we reached our savings goals for the first year of the system almost without investment, based on the change of people behavior.

This new, more profound and systematic approach to energy consumption was a very good complement for the Energy Appraisals tools already in use at that time by ABB worldwide to cope with "low hanging fruits". We went deeper in energy savings potential within our own organization as well as in customers', and we were able to sell energy consumption analysis services to several customers.

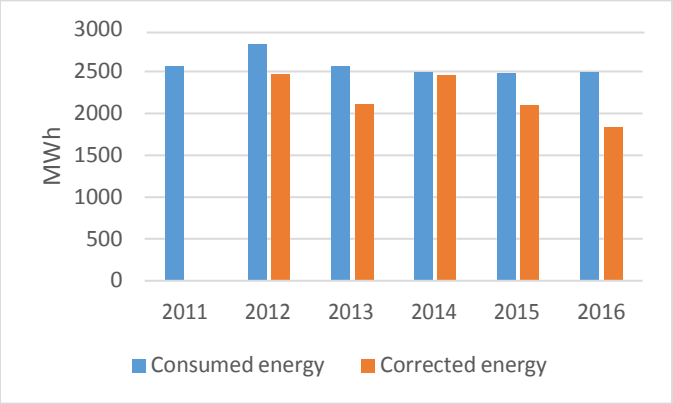


Figure above shows absolute electricity consumption (blue) and corrected values (orange) because of occupied building surface increase and degree-days compared to base line (2011).

EnMS Development and Implementation

There were two important reasons that could have discouraged the implementation of our EnMS: energy price in Argentina in 2011 was low and, because of an operation mostly dependent on engineering and sales, energy was not a significant production cost for us. Anyhow, we assumed that sooner or later energy consumption control would become important for our society. The idea was presented to our CEO and he embraced it immediately and asked us to prepare a project draft for the next Country Management Team monthly meeting. After project presentation all team members supported the initiative (September 2011).

It is worth remarking that, once energy efficiency future scenario was put to consideration, all key players within the organization foresaw the importance of the matter and made the required decisions to make EnMS come true.

Organizational

Nomination of management representative as well as the authorization to gather EnMS team across the organization took place during said Management Team meeting.

Sample of communication campaign

In order to organize the team some points were established:

- Building Manager as well some members of Quality, Environmental and Health & Safety should be part of the team.
- All other members should volunteer

The project was communicated very fast to the organization and all company employees were invited to participate. (November 2011)

EnMS team was formed and started regular meetings also in November

By the end of November a draft of Energy Policy was issued.

During January 2012 Energy Revision was held; base line, performance indicators and objectives and targets were set on February. All technical aspects of the system were established, and only some documents were lacking.

On March 2012 the system was established. On April the Internal Audit was held; it showed a very strong system concerning technical point of view of the standard, but some deviations related to poor quality of documents. Documents were revised with the help of people already involved in ISO 9001 documentation and third party Certification Audit happened between April 30th and June 1st; first system certification was issued on June 13th, 2012.

Energy review and planning

By the end of December 2011 energy invoices had been analyzed: significant energy costs were related to electricity, while gas costs were about 11% of total.

First agreement among team members was to keep the system as simple as possible. Since this was the first attempt in the country to deal with Energy Management Systems (there were no previous standards considered in the country) and there were no local references to learn from, it was evident that a simple system that could evolve as new knowledge was incorporated, was the most intelligent approach to follow. Besides of that only 4 team members have roles directly related to energy consumption while the others were enthusiastic persons but their main roles were not related to building issues.

Because of simplicity, a significance criteria for gas consumption was not to analyze it unless gas costs had reached 20% of electricity's.

A second simplification supposition was discussed with Certification Body and agreed with them. This was to focus in nominal power of equipment rather than in actual energy consumption, allowing us to implement the system based on energy billing. We could delay, then, investment in meters to a later occasion. This assumption meant that duty cycles were the same for all energy uses, not 100% true but good enough to start with a simple system.

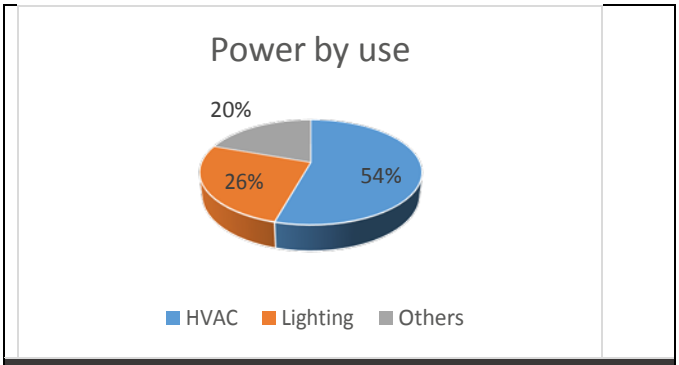
Energy uses were grouped in three main types:

HVAC: most significant use. Mostly dependent on ambient temperature

Lighting: second significant use. Mostly dependent on occupied building surface and human behavior (manual turn on and off)

Others: grouped all other uses; mainly elevators, pumps, hand tools, PC and printers. Mostly dependent on personnel head count.

Energy consumption data sources were the invoices of energy suppliers.



Energy review - Jan 2012

Base line was set with energy consumption, occupied surface, cooling degree-days (CDD), heating degree-days (HDD) and personnel head count belonging to 2011.

Complete energy correction formula can be found in Annex (bottom)

Objectives:

- Increase energy efficiency of the site on a continual improvement basis;
- Deepen existing knowledge about significant uses and consumption of energy;
- Find out the relationships that better explain the impact of external factors (ambient temperature, head count, etc.) in energy consumption

Targets:

- Install energy-meters in distribution panels to increase the information on energy consumption profile;
- Update technical building information;
- Study potential improvement in HVAC systems and prepare a replacement plan;
- Reduce energy consumption per head count by 2,5% annually;
- Reduce CO2 emissions by 3% annually

Energy performance indicators of the system are:

- Energy consumption. Total energy consumption (yearly and monthly)
- CO2 emissions
- Normalized energy consumption
- Energy vs. sales
- Energy vs. total production costs
- Ration energy / occupied building surface
- Ratio energy / head count

Electricity invoices split consumption in three different time segments: base (5 a.m. to 6 p.m.); peak (6 p.m. to 11 p.m.); valley (11 p.m. to 5 a.m.). Because of this segmentation it was very easy to relate HVAC consumption to occupancy time, almost coincident with base period.

HVAC equipment replacement would not be possible because of low energy price made it impossible to have a sound IRR. Anyhow HVAC could not be disregarded at all due to the significance of this use. An audit on the HVAC system was included in building expenses budget as well as energy efficiency to be included in purchase decision making process for HVAC equipment and services.

Energy efficiency became an item in decision making process of lamps and electric motors, as well. In order not to need Purchase Department personnel to be trained in technicalities of energy efficiency, the procedures stated that requests for purchase of significant uses of energy (within the scope of the system) would be issued by qualified people of Building Management Department.

Cost-benefit analysis

A lamp change project was already ongoing based on maintenance costs savings. Heavy lamps with short lifetime were being replaced by lighter lamps with longer lifetime, reducing man-hour needs. Since these new lamps were more efficient, EnMS received the benefits of this change while costs were provided by maintenance budget.

The main costs during implementation of the system were related to training.

Energy efficiency: call to training

During first year of the system a consultant company was hired to perform an audit on our HVAC system and provide improvement plan basis.

Other investment was the installation of power meters. They were included along different years.

Costs summary

Team training	USD 8.000.-
Personnel training	USD 6.000.-
Staff devel / implem time	USD 20.000.-
Staff audit time	USD 4.000.-
HVAC consultancy	USD 9.000.-
Additional metering	USD 2.000.-
Third-party auditing costs:	USD 6.000.-

Approach used to validate results

As of June, 2014 EnMS is integrated in a single system that deals with Health, Safety, Environment and Energy.

Relevant information is recorded and follow-up is done in a monthly basis for all three standards (14000, 18000 and 50000). System performance and final EnPI analysis are done on a yearly basis and included in the report for internal audit, management review and third-party audit.

Steps taken to maintain operational control and sustain energy performance improvement

In order to sustain energy performance improvement following have been implemented:

- Specific procedures and training requirements for own maintenance personnel and HVAC maintenance contractor.
- Besides of HVAC, cleaning and security contractors are considered personnel working on behalf of the organization that can affect energy performance. Both companies are included in specific EnMS training.
- HVAC, cleaning and security companies are subject of both internal and externa audits.
- Personnel training: every person hired by the company has to attend a training on energy management system, and the responsibilities assigned to all employees.
- System procedures regulate procurement of products and equipment associated with significant energy uses, and defines who and how issues technical specifications.

Development and use of professional expertise, training, and communications

ISO 50001 training offer in Argentina in 2012 was not abundant. Anyhow, since most of team members had a technical background in electricity, electronics and control, team training aimed at understanding ISO 50001. Thereafter we could build the skills required to implement the system, and no external consultancy was required.

All site personnel, including own and HVAC, cleaning and security contractors' were trained in the impact of the behavior on energy consumption, and in the development of good practices.

This was supported by a one year of internal communication campaign to reinforce the awareness about energy consumption. Since then, at least one event (spot communication campaign and / or complementary training) takes place on a yearly basis within the organization.

Tools & resources

System implementation was organized on data gathering and calculation based on Excel spread sheets.

Existing knowledge about Quality Management Systems was included during implementation period. Environmental and Health & Safety were considered, as well, and later integrated into one system certified after three standards.

Lessons Learned

System doesn't need to be perfect. It is important to try to keep the system as simple as possible. Trying to implement a sophisticated system without haven't actually tried one can be discouraging.

Second: Implementing team must have leadership and attitude towards change. This is mandatory for team leader. However, after the system is running smoothly, those with the will to change might feel a little bit bored, and that is the moment to replace those members that don't see the challenge anymore.

EnMS of Valentin Alsina facilities could be easily replicated in ABB's Tucumán facilities (1000 km from Buenos Aires) some years later, because the approach was based in this tow pillars.

Another way to improve the system is to be helpful to others in implementing their own EnMS. Trying to explain to someone else what has been done is an excellent way to find flaws and correct them.

Keys to Success

- Top management involvement.
- Fervent ones detection and empowerment
- Motivation