

# Global Energy Management System Implementation: Case Study

Philippines

## CEMEX Philippines

*CEMEX facilities are the first and only cement plants to be ISO 50001 – certified in the Philippines.*



Figure 1. Aerial shot of the two CEMEX cement plants in the Philippines

### Business Case for Energy Management

Cemex Philippines is a part of the CEMEX group, a growing global building materials company that is present throughout the world. It has a total cement production capacity of 4.1 million tons of cement. It is the third largest cement group in the Philippines<sup>1</sup> that carries the locally well-recognized brands: Apo, Island, Rizal and Palitada King.

Sustainability values and efficiency culture are in Cemex's DNA globally. The company has been developing its sustainability arm since 1993 when it launched its eco-efficiency program. It has then extended to include a carbon emissions program in 1997. In 2015, the company has officially included sustainability as one of the four pillars of our global corporate strategy (alongside employees and customers). The two main objectives under this pillar

<sup>1</sup> Sourced from the Cement Manufacturers; Association of the Philippines (CeMAP) and CemNet.com (CEMNET)

Case Study Snapshot	
Industry	Manufacturing
Product/Service	Cement
Location	Rizal, Luzon Cebu, Visayas
Energy Management System	ISO 50001
Energy Performance Improvement Period	October 2015 to Present
Energy Performance Improvement (%) over improvement period	3%
Total energy cost savings over improvement period	1.9 M \$USD*
Cost to implement EnMS	0.4 k \$USD*
Payback period on EnMS implementation (years)	5 months
Total Energy Savings over improvement period	395,585 GJ
Total CO <sub>2</sub> -e emission reduction over improvement period	100,000

*“The effort to reduce energy consumption is part of our global business strategy. After all, the most important reason why we are doing this is for a more sustainable world.”*

—Eduardo Pons, Energy Director

specify that CEMEX (1) provide resilient, infrastructure and energy-efficient building solutions, and, (2) enable a low-carbon and resource-efficient industry. The Philippines (among the countries with highest electricity prices in Asia Pacific and with energy representing 50% of cost of goods sold) provides the perfect economic

ground for the initiative implementation. Global and local top management’s strong drive and commitment towards energy efficiency set the example for the rank-and-file employees to contribute to more sustainable, efficient operations.

The ultimate projects’s goal was to assure energy efficient, sustainable and continuously improving Cemex operations. Resources were deployed to execute a well-crafted plan in collaboration with the United Nations program. It has been a holistic project centered in an Energy Management System (**EnMS**) certified under international ISO 50001 standard.

**Business Benefits Achieved**

The company surpassed the initial goal of 2% improvement to achieve an overall 3% reduction in total energy consumption which is equivalent to 395,585 GJ. These savings amount to 1.9 M USD given the current local energy market prices (both electricity and fuel).

With its mission to create sustainable value by providing industry-leading products and solutions to satisfy the construction needs of our customers around the world, it has pegged sustainability as one of its long-terms goals. In terms of carbon footprint, the company has achieved a record-breaking alternative fuel substitution equivalent to around 20,000 tons of bituminous coal. In addition, the waste heat recovery facility that converts the excess heat of the kiln to electricity has avoided burning of around 20,000 tons<sup>2</sup> of bituminous coal. These initiatives contribute to the CO2 emissions reduction to amount to a total of 100,000 tons<sup>3</sup>.

<sup>2</sup> This is estimated with the annual production of the Waste Heat Recovery Facility, the Philippine electric industry fuel consumption rates (0.66 kg coal per kWh produced) and the current supply portfolio of CX Philippines which comprise currently of coal power plants in Luzon, Philippines.

<sup>3</sup> Computed based on the US Energy Information Administration, there are 205.7 pounds of CO2 emitted per million British thermal units (Btu) of energy from burning bituminous coal.

**EnMS Development and Implementation**

**The Energy Team & How It Came To Be**

The country’s rising energy costs were being monitored through energy related-performance indicators set at a Central Company level. Each year, a group of regional representatives meet to discuss how each of these long-term corporate targets was evolving. The plants were already part of an extensive operations network for energy-related best practices where there is access to key indicators used globally for benchmarking purposes. For this reason, even before ISO 50001 was in place, the Filipino energy practitioners in the plants recognized the project potential when they compared themselves to countries which had an EnMS in place. The framework of the ISO 50001 enabled to broaden the audience to the plant-based energy practitioners who increase the number and quality of the contributions and within their newly-created plant energy teams. The ISO 50001 gave these plant-based energy practitioners an avenue for enriching discussions which materialized in energy-saving initiatives. Inclusion of representatives from each section such as Finish Mills, Kilns or Maintenance was required to ensure that each section will have their respective contributions to the system.



Figure 2. Solid & Apo Energy Teams with the SGS Auditors

**The Planning Process**

To aid in a revamped planning process, the team enlisted the help of the central planning department in setting the baseline with the historical data available. A corporate energy team member was

deployed to the plant at least once every week to help the plant energy team cope with the planning stage. Due to new installations and different strategies being enacted in the past 5 years, the team decided that the most appropriate baseline would be the previous year. As the global corporate office sets annual targets for the energy indicators, the plant team focused on looking for initiatives that will support the current targets. They did an in-depth audit with the assistance of external consultants to identify additional opportunities. Then, they focused on zero capital projects as well as current projects that are helping the plants reach their energy targets. The biggest project was a joint research study being done by the Philippines' quality team and the operations team in determining the optimal raw material mix for the cement. This initiative has been under development since 2015 but only fully implemented in 2016. A new project was the equipment parameter check and modification done under the ISO 50001 system.

**The Energy Matters Campaign**

The team launched “Energy Matters” campaign wherein they reinstated Energy as one of the plant’s focus areas, beside Safety, Quality and Environment. A kick-off campaign was launched for “Energy Matters”, a new company policy that explicitly stated and included Energy as the one of the company’s top priorities. The energy champions per section were introduced in the program so that the general population will be able to identify them as “the energy guys”. Multiple games and gimmicks were used to engage the employees in learning about the new core focus of the plant. The plant also distributed hard hat name stickers with the Energy Matters logo as a daily reminder to the team that energy is now a top priority.



Figure 3. Hard Hat with the Energy Matters sticker

However, the crowd favorite was that of the photo-booth wherein actual pictures were printed and

later were seen posted in the desks of employees. These pictures can be seen in all offices in the plant, some individual pictures and others as group or team photos.



Figure 4. An employee's desk displaying some pictures

The plant energy teams, then, focused on getting the rest of the plant on-board with the direct and detailed effects of the energy planning to both the plant and to each respective department. They attended multiple toolbox and morning meetings to orient all operations personnel to the new system. A 15-minute presentation was done in all areas to ensure that everyone will be aware and in the loop. The teams organized other trainings and meetings with each section (especially those in charge of high impact initiatives). There were several follow-ups with the project heads to keep up with the stringent timelines. Another resource used was the United Nations’ trained experts recommended by the Department of Energy (DOE). These experts assisted in both the documentation and implementation of the EnMS. They visited all the departments to help in integrating the EnMS to the current Quality and Environmental Management Systems. They also helped the sector heads to accomplish the possible proposals for future projects. The energy team then directed their efforts to including EnMS as part of the Training Gap Analysis with Human Resources. They worked on including the energy training and the competency training especially for the Significant Energy Users (SEU). For example, the kiln operators were designated extensive Real Life Experience programs from more experienced employees (managers and leaders). They also focused

on the development of programs toward being more energy-oriented. In kiln operation training, a part of the course is now dedicated to which parameters affect energy consumption the most. The would-be operators are conditioned to monitor more closely these parameters with the recently acquired energy perspective.

*“Having the 9001 and 14001, quality and environment teams, helped us to understand how a 50001 based system could benefit our energy performance”*

— Joseph Jurado, Solid Plant EnMS Manager

The team succeeded in fully implementing the system within six months. This short implementation period was enabled by the previous system that was implemented. As the original small energy team (corporate + plant-based) was already developing less detailed energy review and planning, the core plant energy team was assisted and guided throughout the process. The plant leaders adjusted to the EnMS quite well as it did not differ much from the previous system that was being implemented. The EnMS mainly became an avenue for the previous system’s ratification & audit. The Quality (ISO 9001) and Environment (ISO 14001) teams also stepped up to provide valuable support by integrating most of their documentation, processes and even initiatives in the EnMS. They assisted in orienting all new team members with the ISO implementation. They were very quick to identify processes that were already part of the system that made the system integration easier for everyone.

**The EnMS Projects & Their Profitability**

Given the company drive of optimizing capital expenditure, the current system focused on zero to low capital projects for the EnMS. They utilized the field experience of the engineering community present to use the plant parameter optimization to lower the energy consumption. The team also experimented with adjusting parameters of the equipment to determine the best setting to reduce energy consumption. The key

initiatives and their contribution to the overall decrease in energy consumption can be seen in the following graph.

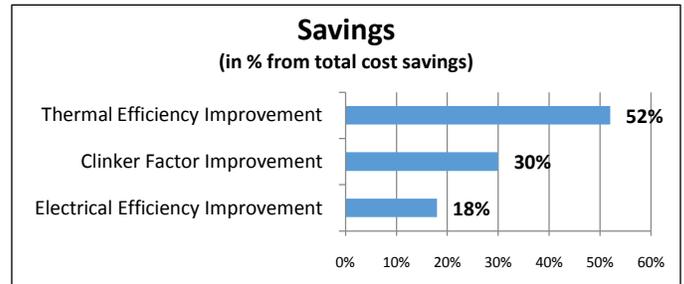


Figure 5. Cost savings realized per project

In the first initiative of clinker factor reduction, the quality and energy team worked together to achieve a less energy-intensive raw material mix. Clinker, an energy-intensive raw material, comprises at least 70% of cement. The team focused on lowering this percentage by replacing clinker with less energy-intensive materials while maintaining product quality. The total savings were validated using the total tons of clinker and total tons of other raw materials compared to the total tons of cement measured in the weight conveyors.

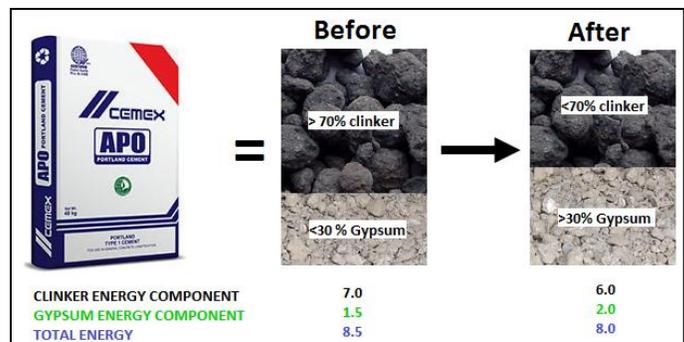


Figure 6. Clinker factor reduction infographic\*

\*Numbers in this picture are for illustrative purposes only

Next, the energy team also re-designed the fuel mix being fed into the cement kiln that led to more efficient combustion, thereby increasing thermal efficiency.

Lastly, the team focused on the grinding of the material to produce the powdery consistency of

cement. This grinding process is the most electricity-intensive process in the plants. The grinding parameters were fine-tuned to achieve a higher electrical efficiency. The savings from this initiative were validated with the equipment-group-specific electricity meters and the actual production of the cement mill.

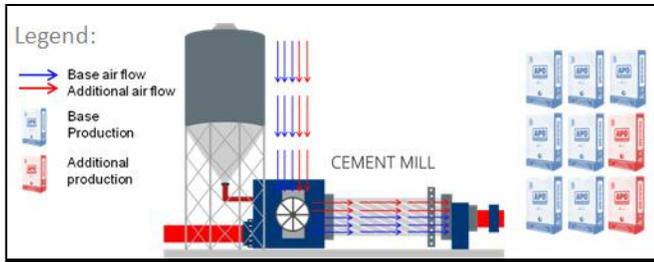


Figure 7. Simplified diagram of the cement mill efficiency project\*\*

\*\*Numbers in this picture are for illustrative purposes only

**Resources**

The company utilized mostly internal as well as external human resources to implement the projects. They were assisted by UN-trained experts being recommended by the Philippine Department of Energy. The Philippine Industrial Energy Efficiency Project or PIEEP of the government (in partnership with the UN Industrial Development Organization or UNIDO) also provided experts to help present and introduce ISO 50001 to corporate and plant management. CX Philippines enhanced the experience through hiring private consultants to help in the system initial audit and implementation.

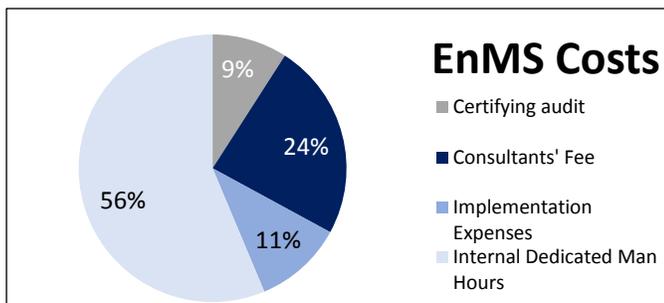


Figure 8. Expense allocation for EnMS implementation of both Solid & Apo

The external costs of the company for implementation consisted of the consultants' fees as well as the certifying audit expenses. Internally, the

costs for dedicated man hours were bigger given the training, planning and implementation that was undergone by all the areas. Given the huge project benefits and minimal overall costs, the computed payback amounted to only 5 months.

**Project Results and Validation**

The system around the plant is very focused on measurement of the plant parameters especially with energy as it makes up 50% of the cost of every ton of cement sold. To aid in the improvement of the system, the plant has installed multiple meters and instruments to measure the energy inputs being used by the system. They have also purchased and installed several additional meters to measure the new parameters and verify the profitability of energy-related investments. Weight feeders are also installed, and calibrated regularly to ensure that the fuel and production measurements are accurate.

To measure overall improvement, the plant closely monitors energy performance every month to ensure that the initiatives are performing as expected. The initiatives are highlighted to the plant director while the respective Energy Performance Indicators (EnPIs) are reported to the Regional President of Asia. As the energy reduction enforced in the EnMS are also recognized and targeted at corporate level, the operations experience pressure to re-align their processes to further achieve decreases in consumption.

To even out the factors affected by production levels (as 2016 levels are lower than 2015), the plant chose indicators that are efficiency indicators which change based on production levels. The current EnPIs are electricity and thermal efficiency. Since these are total consumption by the total production, the risks of variable production affecting the performance marginally decrease. The target EnPIs are also cross-checked with performances from previous years (of production with the same level as 2016) to check whether performance has actually improved.

## Lessons Learned

### Keys to Success

- Top management presence is key. During all kick-offs and major audits, at least one member of the company management team is present. All plant officials are also expected to attend to show solidarity.
- Team effort is necessary in the ISO 50001. Before the Quality and Environmental teams were called, the core energy team had a hard time jumpstarting the process. The involvement of the rank-and-file employees also helped in strengthening the foundation of the system. If the general public felt that their ideas were being implemented, they participated more in the activities.
- Best practice sharing reduces the amount of work to be done significantly. Between the two sites, the initiatives were very different. After sharing insights, both plants picked very good ideas from either side. They ended up not only using one another's practices but also developing a light camaraderie.
- External consultants are helpful but it is crucial that they not only have technical expertise but also have the ability to adapt their system and procedures for the local implementation.
- Setting and following-up initiatives are normal within the first few months. If someone develops a certain kinship or ownership towards an initiative that he is heading, he tends to push and work for it on his own without need for reminders. Moreover it takes a significant effort to keep the motivation up after the first few months.
- Suggestions email facilitates receiving comments

and ideas from anyone and everyone. Given the highly technical background of the community, we found that the richest resource for ideas was our experienced workforce.

- The EnMS was launched as a mindset rather than a system implementation. Various programs were designed to inculcate energy-saving behaviors in the long-term.

*“We hope to inspire other industry players in the region for energy efficiency to become a standard practice”*

— Denise Flordeliza, Energy Manager

- The company focused on simple initiatives which required less capital but with huge benefits. This program is designed to prioritize small-investment projects before proceeding to develop capital-intensive ones.
- As a result, return for the project was excellent but more importantly, based on the system outputs important energy related investments are projected in 2017 to increase further CEMEX's operational efficiency.

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](http://www.cleanenergyministerial.org/energymanagement).

