

Global Energy Management System Implementation: Case Study

South Africa

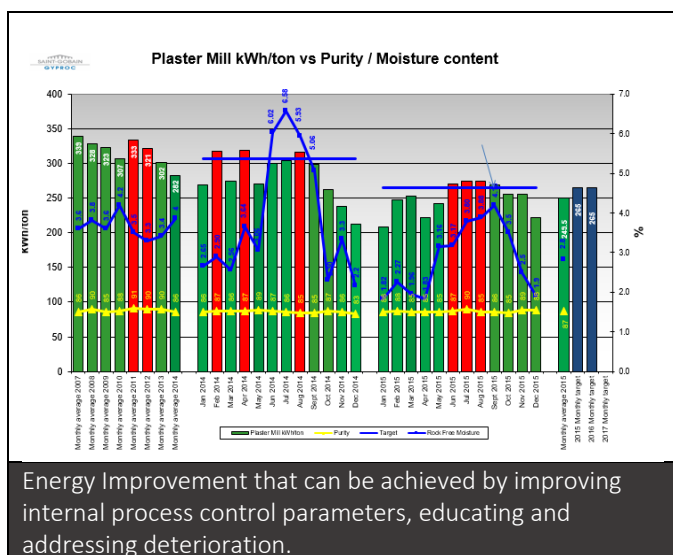
Saint-Gobain Construction Products Gyproc Cape Town Factory

26.4 % Reduction in Energy consumption on the EM 47 Claudius Peters Plaster Mill. - SEU

Behavioral change to conserving the energy resource attitude both in their personal and private lives.

Most important of all as a business, improving the bottom line cost to produce the product.

With any system there will be challenges, don't give up in our case it was in 2011 and 2012.



Case Study Snapshot

Industry	Manufacturing
Location	Cape Town
Energy Management System	ISO 50001
Product/Service	Interior Plasters & Plaster Board
Energy Performance Improvement (%)	11.5 %
Annual energy cost savings	R 1.9 Million in 2015

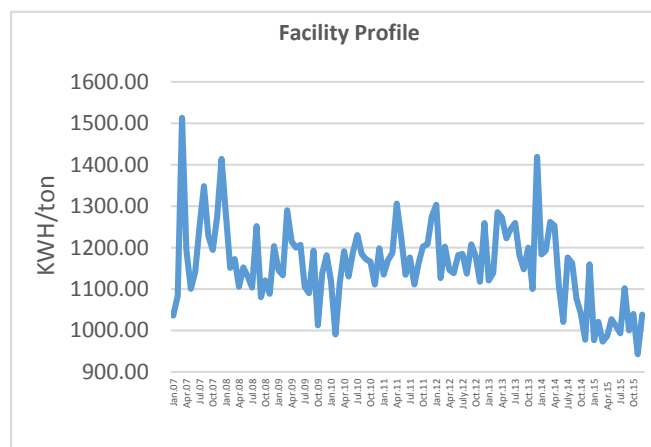
Business Benefits Achieved

The Business over the years achieved significant return on investment with regards to energy reduction activities within the plant with no large capital investment. It was achieved by looking at how we can do things differently with regards to process and equipment.

Carbon emissions reduction: 312 to 257 per ton of product produced and a cumulative financial benefit compared to base year 2007 of more than R 14 Million.

In 2015 compared to 2014 the direct hard savings achieved as a result of energy savings was R 1.9 Million.

Other benefits include improved upskilling of staff and improved maintenance of critical equipment. Through the general awareness training of the site personal, you could see the focus of people changing from energy being a kind for "free resource attitude" to one of conscious



Cost to implement	120000
Payback period	1 month

“Avoid increasing energy costs, implement ISO 50001. It will improve your bottom line”

—Azeem Mohamood

1. Training and awareness is critical for sustaining Energy Performance particularly in an environment where the human factor influences energy consumption! It creates more eyes focusing on the SEU's and a better understanding for maintaining the SEU's to consume as little energy as possible. Together with a platform for all employees to be able to report a non-conformance is vital for sustaining. ISO 50001 forces energy managers to take this into consideration.
2. ISO 50001 system allows business a holistic systematic approach to improving the energy cost of any business. It is a simple effective proven system.
3. The system allows you to set you own boundaries. Begin small, in our case we started in the Plaster Mill and later moved on to the board plant where we similarly improved the plant performance using existing equipment by 15.1 %.
4. ISO 50001 is a simple holistic approach that if the standard is followed correctly the implementer will achieve benefit to any business environment.

Business Case for Energy Management

Saint-Gobain is the world leader in sustainable habitat we have a corporate responsibility in protecting the environment and as official partner to COP21-CMP11 we are committed to improve our efficiency of our plants.



By Cape Town Factory Implementing ISO 50001 shows the local management commitment by the local plant to help the group achieve the set climate change goals.

The energy cost, is the largest of the plant expenses and with the rising cost of energy, ISO 50001 allows industry's to try to lessen the impact of the rising energy cost by becoming more efficient in the way that we consume that energy and improving that businesses profitability.

I decided to align our energy management system with ISO 50001 to improve the sustaining of results. The system gives a clear logical manner in which to manage and sustain energy use for any environment that consumes energy.

The National Cleaner Production Center assists and provides training for business willing to reduce energy consumption. As well as United Nations Industrial Development Organization has very good training programs for company's willing to improve the efficiency of equipment. Training available for companies are pumps, fans, and steam systems optimization training.

The prior approach to energy management was not as holistic as ISO 50001. The system forces you to look at entire elements around a SEU to ensure sustainability for that SEU. Analyzing all factors from measurement, training and operational control, etc. The system encourages sustaining of all elements, so many times we think of sustaining around a machine we neglect items like purchasing etc. Depending on the process, ISO 50001 helps you to consider the inputs to the process that also impact the energy consumption an SEU.

Keys to Success

- Start small, identify the significant energy users and set your boundaries around the targeted SEU.
- Begin with measurement of the SEU, if you don't know where you are you won't know what you can achieve. Holistically look at all aspects of the measuring system from calibration to the human factor in calibration and how that data is reflected in the final report. In so many instances a company comes out and calibrates the meter, the meter is only one aspect of the entire measuring system so always consider from metering to final report.
- Don't neglect training and awareness. The maintenance and operational staff are critical in sustaining and maintaining the efficiency of the equipment. This is critical for sustaining! People appreciate being upskilled and will contribute more. Provide an easy feedback process for all employees to report abnormalities from the sweeper cleaning the SEU to the manager. The sweeper walks by the SEU on a daily basis he knows the sound of that SEU

and if he is trained around abnormalities in the area, the SEU will be better sustained particularly in air ingress environments.

- Don't think of beginning with investment, great savings can be achieved by looking at the existing processes you have and analyzing it for best efficacy. I would say at least 10% can be achieved by looking at operational control and process on the existing equipment and how we maintain it.
- In many installations the designers of the systems included safety factors that are not in the best interest of energy efficiency. For example in our case there is a 3 stage dryer with EOS and heat exchanger and 2 dampers on the pre zone section of the dryer was not set up to consider energy efficiency.
- When setting KPI's for the SEU's look at the regression analysis to ensure the ENPI is accurate and conforms.
- Consider the raw material inputs, this can affect the SEU considerably.
- Management commitment and team commitment is essential, management of change is critical. In many industries each department is focused on its own objectives and targets. Energy consumption is affected by all departments. The engineering department will install the cheapest most reliable component and not necessarily the most energy efficient component. Quality department will change the raw material or a portion of the process, safety department will install new equipment for monitoring. Energy efficiency can quickly spiral out of control if the collaboration from all departments within a business is not achieved.



PICTURED ABOVE: Receiving the ISO 50001 certificate at the Energy Indaba NCPC conference. (From left to right) Faith

Mkhacwa (NCPC), Azeem Mohamood (Saint-Gobain Gyproc), Pieter Hassbroek (SABS), Claudia Giacovelli (UNIDO)

EnMS Development and Implementation

The following benefits were achieved in 2015:

EM 47 Plaster Mill improvement 282 – 249.5 KWh/ton

Board Plant Improvement 719 – 649 KWh/ton

Resulting in R 1.9 Million Rand and no serious capital expenditure was required. It was as a result of addressing maintenance issues to increase humidity and analyzing our process controls to further improve energy efficiency.

For the two plants the total Kg CO₂/ton of product was reduced from 289.7 to 256 Kg CO₂/ton of product.

For a successful energy management system, management commitment is essential, I cannot stress how important this is for all departments and all staff to be engaged in energy conservation. Sustaining of the energy management system will not be achieved without the collaboration from all departments. Our team consisted of:

- Maintenance planner and site Energy Manager
- Control and instrumentation engineer.
- Quality engineer.
- SHEQ manager.
- Lab engineer.

When setting up your energy management team consider involving the senior operator that operates the machine/process as well as the mechanical or electrical person that maintains the significant energy user of that process.

The quality involvement is because as a quality engineer we always tend to work to the higher specification limits for a safety factor. Consider a drying installation the operator operates the machines to achieve the dryer side of the specification which then adversely affects energy consumption, when if we operate on the opposite's side of the limits it would improve energy consumption. Every little bit counts when you manufacturing tons of a product.

A good step to start is to analyze energy data, identify the significant energy uses and establish the driver influence on the significant energy user. Use regression analysis to assist in

determining the relevant variables. Then establish the baseline on the targeted SEU's. Identify opportunities for improvement and from there develop targets and action plans. Don't forget about the easy win and quick to implement items, do them first it will give management confidence in the system and all who views it, be proactive simple things like a purchasing procedures for lighting, drives and motors.

Most importantly review projects implemented for sustainability, track it for 3 months after installation and review at the annual internal audit for sustainability. Also do don't neglect new staff engagements, awareness is key for sustaining.

For companies that want to implement it took me 6 months to implement a management system and I would say with resources available one year to having full system delivering sustainable results.

As I mentioned before training awareness is key. At our plant we use world class manufacturing techniques. We have tools for example one point lessons, standard maintenance procedures we also have various ways for an employees to give feedback on issues that arise for example a simple tag, or the safety, health, environmental and quality forms that were developed for all employees to report any SHEQ issue. A method that I found best with artisans is to show them the influence they have in a positive manner and having a positive discussion on things we can do differently. You will find people are willing to contribute when we are all learning new things. Take the time with the operator operating the process explaining to him or her the detail you know, you will be surprised by the benefit to the energy management system that can be achieved by that discussion.

Before any of these systems can be implemented, awareness training firstly needs to be carried out. Employees need to be shown what to focus on and what to be aware of before any reporting can be done.

One particular awareness training session that was held on EHS was particularly effective because the link to global warming and the effects of our process on the environment was made very effectively. Also the awareness related to our SEU's was clearly made and link between maintenance and the influence of the operators was understood by the audience.

When tracking the results of the energy management system always verify it with the actual energy bills or accountant to ensure sustainable results. Meters, PLC, Sequel Servers and plant SCADA display systems for the plant can go out of calibration and require correct scaling and monitoring. (SCADA

- Supervisory control and data acquisition is a system for remote monitoring and control).

In our drying plants we identified humidity as key to energy efficiency both in the calcination and board Plant and began sealing up and adjusting dampers in order to increase the humidity. Using wet bulb and dry bulb measurements, the board plant humidity was increased from 220 g/kg – 380 g/kg per zone and the plaster mill was similarly raised from 200 to 320 g/kg together with the change in process quality phase analysis parameters. We reduced the excess air in the mill by retuning the burner and addressing deterioration on seals. The result in the plaster mill was a reduction in process temperature of 162°C to 154°C. We used sap maintenance for time based maintenance and quality inspections on the particular sections of the plant where we experience air ingress issues. Also we addressed maintenance related energy consumption losses through standard maintenance procedures and awareness training for inspecting particular components. Type of seals was also changed to make it easier for the mechanical person conducting the routine maintenance inspection. In both plants humidity is now a routine inspection and we are now looking into Vaisala humidity meters for constant measurement and to alarm at set values for notification. Additional sustaining countermeasures was to tighten up on the process temperature variation alarm and displaying a control plan for the entire plant on the floor that shows critical setting values to achieve best energy and quality. Displaying this control plan on the floor means anyone looking at the plant information screen can see deviations. On the burners for the plant, we issued the burner contractor with optimal combustion settings for our process between the modulation points that our burner runs at. All process improvements should be documented fully in operational control for a history and for it to be reviewed and audited by anyone at any time, this document can assist in sustaining of all countermeasures and training of new employees. When we carry out energy projects a snap shot over a particular period is taken before the project is carried out and after the project is implemented on the same process conditions. For our heating processes, evaluation of temperature and burner fuel rating as well as modulation settings are evaluated. When we are looking into electrical improvements we use a power meter for a before and after evaluation on success of the project. We implemented a tracking sheet for each project that is carried out, on this sheet we track the results, cost benefit ratios, problem identification, root-cause and countermeasures installed. Results should be tracked for a minimum of three months to ensure sustainability after the project is completed. This sheet can then be shared

with employees and our sister plant to communicate the success achieved by the energy management system.

On our routine internal audits of our energy management system we create an audit plan to audit certain sections of our energy management system at certain stages and it's always conducted with more than one employee for an objective view.

On our management review we cover the following topics.

- Energy policy review & amendments
- Review energy performance and related EnPI's
- Results of evaluation of compliance with legal & other internal business requirements.
- Follow up actions from previous management reviews
- EMS internal audit findings and countermeasures implemented.
- Status of corrective and preventative actions
- Recommendations for further energy initiatives
- Forecasted energy performance for the next period,

maintenance consumables. Track that cost benefit analyses as this will help you justify future projects. That simple sealant used could save thousands.



“The holistic approach required to implement SANS ISO 50001 enhanced the safety and quality within the plant. As Chair (SABS) of TC242, it was fascinating to experience the implementation within our business.”

—Lisa Reynolds – Sustainable Development Executive & Chair of TC242

Lessons Learned

- Begin small set your boundaries.
- Assess the energy data, accounts and metering systems from meter to final report.
- Develop a metering plan and include it in your operational control.
- Understand the energy metrics and the driver influences.
- Baseline and benchmark the SEU.
- Carry out awareness training
- Create a platform for all employees to effectively communicate non conformances
Spend the time training it is so beneficial.
- Document the costs of implementing in detail regardless of how simple the cost is. It will assist in implementing of future projects and motivating for future projects. Consider a seal that is not replaced on a dust collector, this impacts energy and is addressed in the normal maintenance program with

To all who are willing to implement ISO 50001, all the best with your systems and it will definitely improve your business profitability!

Through the Energy Management Working Group (EMWG), government official's 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.





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