Industrial Energy Efficiency Project in South Africa

Case Study – EnMS

Company name	**Karob Plastics**		
Sector	**Chemical – Plastics**		
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Year joined NCPC Project	**2015**		
Year of interventions	**2015**	Duration (months)	**8 months**
Utility Intervention	**Behavioural and operational control** **EnMS implementation**		
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1. BACKGROUND

1.1 Company profile

Karob Plastics is an SME that manufactures High Density Polyethylene plastic containers by means of injection and blow moulding machines. Auxiliary equipment includes compressors, granulators, water chiller, conveyors, and packaging equipment aligned with the process of plastic drum manufacture.

20 and 25 litre containers are available in three different shapes: round, rectangular and square; and can be produced according to various specifications, tailored to suit customer's requirements. Karob Plastic's products are manufactured from High Density Polyethylene which offers the following characteristics: In addition 5 litre containers are manufactured in various weights and colours and are supplied with a 38 mm EXPE wadded ratchet cap.

- Excellent resistance to corrosive chemicals
- Lightweight and strong
- Easy handling and storage
- Suitable for either acid or alkaline liquids & various organic solvents
- Ideal for storage & transport of a wide selection of chemical foodstuffs
- Contamination free & hygienic
- Easy filling and decanting.
- Supplied with a 60mm tamper evident ratchet cap with santopreen seal.

Karob Plastics provide silk screen printing on the containers for customers who require their company information, contact details or directions for use on their packaging.

Karob Plastics holds ISO 9001 certification and integrated the principles of ISO 50001 into the existing management system.

Energy consumption and profile

The site is located in Roodepoort and the main energy source is electricity:

- Electricity bill approximately ZAR 3.5 million p.a
- Electricity usage approximately 3.0 MWh p.a

Diesel is also used for delivery vehicles, approximately 35,000 litres p.a, but external transport was excluded from the scope and boundaries of the EnMS:

The significant energy uses are:

- Injection moulding and the injection blow moulding machines
- Granulators
- Compressors (2xCompAir, L22 and 1x AllyCAT RS22, rotary screw compressors)
- Lighting

Introduction to the IEE Project

The first engagement with the IEEP was a SME Energy Assessment which was conducted during 2012.

1.2 Nature of challenges

During the 2012 IEE Energy Assessment total energy savings were identified amounting to 83 924 kWh per annum, but although some recommendations were implemented, for example the relocation of the compressors to a cooler position, there was no systematic approach to reducing energy consumption. Because of this the Karob Plastics top management decided to pursue the systematic ISO/SANS 50001 implementation approach and signed up with the IEE project for EnMS implementation.

2. KEY ACHIEVEMENTS

Key findings table -	
Implementation Period	2015
Total Number of projects	5
Monetary savings in ZAR	R 135 500 in 2015 financial year over 8 months (March – Oct 2015)
Energy savings in KWh	115 300 kWh in 2015 financial year over 8 months (March – Oct 2015)
Total investment made ZAR	0
Payback time period in years	0 (Immediate)
GHG Emission Reduction (ton CO2)[1]	110 ton CO2 in 2015 financial year over 8 months (March – Oct 2015)

3. IMPLEMENTATION OF AN ENERGY MANAGEMENT SYSTEM

The key lesson from this Karob Plastics EnMS implementation was that savings can be achieved through purely behavioural and operational controls. Secondly, it was confirmed that even though savings are identified during energy audits, it is a critical factor to have an EnMS in place to support the systematic implementation of the recommendations and the sustaining of such improvements. The approach taken was to integrate the ISO/SANS 50001 requirements into the existing certificated ISO 9001 Management System.

Of significant benefit to the implementation was the Powerstar electricity management system that Karob Plastics has been utilizing since before 2012, and the development of a sound regression baseline using both tons converted and cooling degree days as the drivers.

[1] SA Grid kWh to CO2 Conversion Factor set at 0.957 as per the 'Journal of Energy in South Africa' – Vol 22 No 4; November 2011.

4. IMPLEMENTATION CHALLENGES

The key challenge was quantifying savings in advance. This was because the improvement drives were heavily behaviour-based and operational optimization. Because of the significant savings achieved, it was possible to look at the site-wide electricity consumption and compare the 2015 consumption to the 2013/2014 baseline. However, going forward, if the savings are smaller it is acknowledged that SEU-Level metering would need to be considered to enhance savings measurement.

5. HIGHLIGHTS OF OPERATIONAL/ESO INTERVENTIONS

5.1 Summary of all interventions

As part of the development and first phase of implementation of the EnMS, Karob Plastics focussed on the very low hanging fruit and zero cost savings. Through involvement of the staff and improving operational control, significant savings were achieved as follows:

Verified Utility Savings (Using cumulative saving during 2015, based on the 2013/14 baseline multivariate regression)	Improvement Savings ZAR / Energy saving	Payback (years)	Period	GHG Emission Reduction (Kg CO2/ year)
115 300kWh – March 2015 to October 2015, inclusive	R 135 500 in 2015 financial year (March – Oct 2015)	0	March 2015 to October 2015 (8 months)	110 ton CO2 in the 2015 financial year (March – Oct 2015)

5.2 Details of highlights

Energy improvement initiatives included the following:

Granulators: For the granulators a campaign was conducted to emphasise the importance of ensuring that these large motor items of equipment only run when they are in use. In addition, from a shopfloor suggestion, the process of having one granulator operating per blow moulding machine was changed to using one granulator per colour instead of one granulator per blow moulding machine. This meant that at times one granulator can support two to three mould moulders.

Blow Moulder Efficiencies: As part of energy efficiency optimization, production planning placed emphasis on maximizing the use of newer more energy efficient moulders.

Water heating: Based on an analysis of the usage of hot water, the geysers were switched off.

Lighting and general energy saving awareness: Ensure that if something is not running it is switched off (including lights).

6. BENEFITS & LESSONS LEARNED

6.1 Sub-metering:

Although energy performance management can be done without sub-metering, there is no doubt that it will enhance controls and assist in the management and tracking of SEUs.

6.2 ISO/SANS 50001 Certification:

At the commencement of this EnMS implementation project, it was Karob Plastics' full intention to seek certification. However, the savings achieved through implementing the EnMS without certification and the cost of certification (quoted as ZAR 70000-80000 for Stage 1, 2 and fees for the first year of certification) has resulted in this being postponed for future consideration.

6.3 Regression Analysis

A success factor for this project was the development of a multivariate regression that accommodated for both the production tons of plastic converted a well as ambient temperature (cooling degree days) variables and gave an improved R-square for the baseline model. This enabled better predictions of expected consumption against which the savings were verified.

6.4 Electrical Data Management and Successful Ombudsman Appeal

As a result of improved data management, at the end of the EnMS project Karob Plastics successfully lodged an appeal with the City of Joburg Omdudsman Power regarding inaccurate billing and received a substantial refund.

Quotable quotes:-

The General Manage and owner of Karob Plastics said that his key expenses are raw materials, people and electricity. The ISO/SANS 9001 based QMS assists greatly in managing the first two, and now the ISO/SANS 50001 based EnMS is proving very effective in managing the third expense.

7. FUTURE PLANS

7.1 Investigate power quality in terms of maximum load unbalance

7.2 Procure electricity logger for sub metering to improve SEU-Level measurement and analysis

7.3 Extend the use of the Powerstar system for electricity performance management