Case Study (EnMS)

Company name	Man Truck and Bus, Pinetown					
Size of company (Based on the energy bill)	SMME (R 250k –R 750k)	X	Medium (R 750k –R 24 mil)		Large (Above 24 mil)	
Sector	Automotive industry					
Location	Pinetown, Durban					
Company contact	Name: Musa Simelane			Position: Project engineer		
	Email: musa.simelane@za.man-mn.com			Telephone: +27 31 - 792-9010		
Year joined project	2016					
Date of implementation	2016	Duration 1-Year		(months) 12		
Utility intervention	Assembly production plant					
Case study author	Bradley Mercuur					
Project manager	Lindani Ncwane					

1. BACKGROUND

1.1 Company profile

The MAN brand is world renowned for their efficiency, innovation and customer service. They pride themselves on their reliability to produce a long-lasting trust bond between themselves and their customers by producing high quality products.

MAN Truck & Bus (S.A.) (Pty) Ltd is a wholly-owned subsidiary of MAN Truck & Bus in Germany. The company is one of the leading manufacturers of their kind in medium, heavy and extra-heavy trucks, as well as commuter buses and luxury coaches.

The South African branch was formed in the early 1960's through Meyer and Hiller who served as agents to the AG business in South Africa. The headquarters for South Africa is in Isando and they have an assembly plant in Pinetown, a bus and coach manufacturing plant in Olifantsfontein and a central parts depot in Isando. They also run a commercial vehicle operation in Centurion and have a wide sales, service and parts operation across South Africa.

MAN also has a training academy located in Isando which offers technical courses to artisans, technicians and apprentices to ensure that their personnel is adequately skilled in line with leading technology and customer service.

A network of 14 full dealerships and 15 service and parts dealerships is strategically situated throughout Southern Africa, to provide complete support to MAN's widespread customer base.

1.2 Plant profile

The Pinetown branch is solely an assembly plant. It is also the only assembly plant within South Africa and is located in the Westmead industrial area of Pinetown where MAN CLA, VW and bus chassis are produced.

In 2014, the plant installed roofing that allows more natural light to penetrate the workshop floor. This was followed in December 2014 by a long-term investment in renewable energy, which saw the facility installing PV solar panels throughout the entire surface area of the roof space, to create a more sustainable supply of electricity to the plant and reduce their CO_2e emissions.

The plant also embarked on a lean manufacturing project, whereby adopting the six sigma principles have bettered operational effectiveness and efficiency within the workplace. This was achieved by eliminating waste, and streamlining their manufacturing processes.

Since embarking on the drive of continuous improvement, the plant made a commitment to become the first South African branch of MAN to attain the ISO 50001 certification.

1.3 Nature of the challenges

Faced with increasing electricity costs, it became apparent that MAN Pinetown's drive towards sustainability required more focus on energy efficiency. Being able to meet corporate energy reduction targets and objectives and contributing to the social objectives of the company added to the motivation for becoming more energy efficient in a structured manner. The Industrial Energy Efficiency (IEE) Project was able to provide support for the implementation of an ISO 50001 aligned energy management system (EnMS).

1.4 IEE capacity building programme

In 2015-2016, four MAN employees attended the two-day EnMS training session offered by the IEE Project. MAN Pinetown then subsequently enrolled one of the employees in the expert-level EnMS training programme. MAN Pinetown signed up as a demonstration plant for the IEE Project in August 2016 with the intent of becoming ISO 50001 certified by December 2017.

The concepts learned through the energy management training highlighted the importance of energy management within the organisation, and need to escalate these topics in operational meetings. The structured system assisted in communication across functional silos, while the systematic approach assisted in prioritising energy saving initiatives, financial appraisal of these and motivation for improving energy performance.

2. KEY ACHIEVEMENTS

Key findings table

Implementation period (yyyy-yyyy)	September 2016 to August 2017
Total number of project	6
Monetary savings in ZAR	34,114
Energy savings in kWh	29 941,42
Total investment made ZAR	323,453
Overall % of total consumption saved	5%
Total savings from no cost interventions	12 415.79 kWh
Payback time period in years	10
GHG emission reduction (ton CO_2e)[1]	30.5 tonnes
Number of females employed prior to implementation	28
Number of females employed after implementation	29

Figure one below shows the cumulative sum of the savings since the commencement of implementing the EnMS project. It is evident that for the first three months, during the management commitment and energy planning phases, no savings were realised until the third month of implementation.

There have been energy consumption improvements of 5% to the annual total energy consumption, against a baseline, established from September 16 to August 17, which was calculated using the regression analysis model. The target set was 5% saving on the overall energy consumption in 2017 which has been achieved.

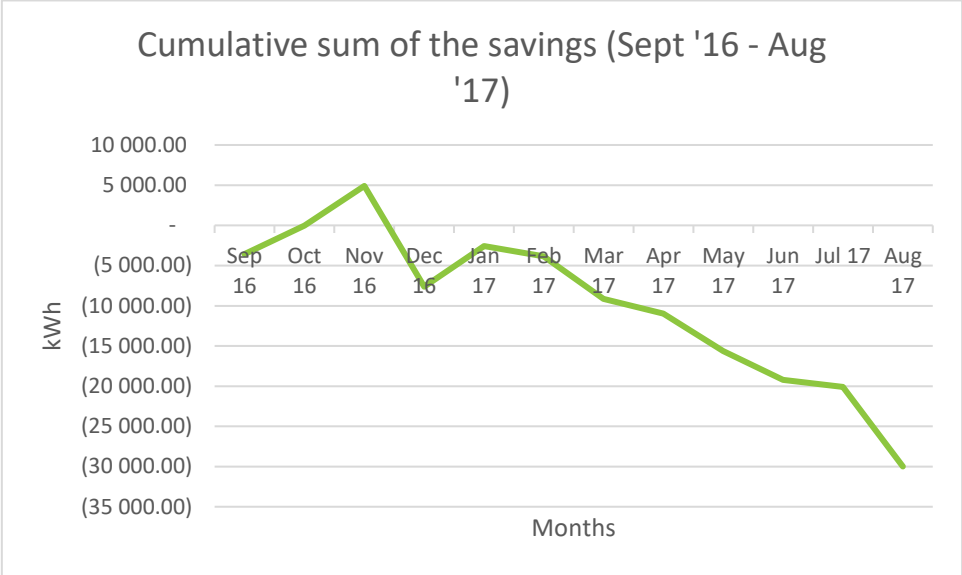

Figure 1. Cumulative sum of the savings (Sept '16-Aug'17)

The other main achievements through no cost interventions were the savings achieved on the air compressor, main spray booth, and IR Oven.

By implementing advanced operational control, the cumulative sum of the savings for the period from January 2117 to August 2017, for each significant energy user (SEU) against its total annual expected consumptions were 7%, 10% and 9% respectively.

Through continued communication to the employees about the achievements made, an increased level of individual energy efficiency participation across the plant has been evident.

3. IMPLEMENTATION OF AN ENERGY MANAGEMENT SYSTEM

The EnMS implementation methodology used was based upon Deming's cycle of plan-do-check-act. The six key concepts were established beginning with management commitment, roles and responsibilities, identifying significant energy users, deriving energy performance indicators, listing energy saving opportunities, drafting operational control parameters and finally, reviewing of the management system.

During the management commitment phase an energy policy was drafted and signed and an energy team was established with individual roles and responsibilities assigned.

Energy consumption and usage data was collated and analysed to establish patterns and trends and identify the SEUs of the site. From a list of eight SEUs, it was decided to focus on the infra-red oven (IR Oven) and the main air compressor. Environmental- (temperature, HDD, CDD, etc.) and operational (production and volumes) data was then collected in a quest to establish energy drivers for the consumption.

A list of energy savings opportunities (ESO's) were identified and documented. Objectives and targets were also established, and a list of action plans for reaching these targets were compiled. Once the critical operating parameters for the selected SEU's were defined, a measurement plan could be drafted. A technical audit was done on the IR Oven and an advanced process control parameters provided for the air compressors which yielded savings.

Communication and documentation strategies were prepared. Awareness raising sessions were held with all permanent and contract staff members in attendance. Furthermore, internal awareness structures (full circle communication) and notice boards were utilised to effectively ensure that the message of the organisation's commitment towards energy management was disseminated.

An internal audit was conducted to assess the current standing of the EnMS followed by a management review.

4. IMPLEMENTATION CHALLENGES

Availability of baseline data was a bottle neck in the EnMS implementation process. The measurement of energy was sometimes uncertain and engineering assumptions had to be made.

A third-party contractor had installed all the sub-meters and the historical data was held on a cloud server which did not have sufficient space available to retrieve data further than one year. After several meetings with the contractor, consensus was reached around adequate reporting structures for the plant as well as having the data readily available. After which, the quality of the data was investigated and further analytical iterations of analysis was performed to ensure accurate representation of the data.

With every new implementation, there is a degree of uncertainty, and the same applied with regards to EnMS investment at MAN Truck and Bus. This barrier was overcome by involving all key personnel who then acted as change agents so that they carried the message of better efficiency and performance improvements.

Time management was often the biggest barrier faced as the energy manager often had other pressing issues to attend to which sometimes clashed with the energy team meetings.

5. HIGHLIGHTS OF OPERATIONAL/ESO INTERVENTIONS

5.1 Summary of all interventions

Energy uses/users	energy sources	Intervention	Utility saving Period	Investment (ZAR)	Savings (ZAR/YTD)	Payback (Yrs.)	Utility saving (Units) kWh	GHG emission reduction (tonnes CO_2e/year)
Lighting	Electricity	Admin offices lighting motion sensors installation	2	54 000	20 828	10	18 287	19
Lighting	Electricity	Outdoor lighting replacement with LED's	3	269 453				
Geyser	Electricity	Geyser switching	1	0				
Compressor	Electricity	Training and controls optimisation	0	0	3697	0	3243	3
Main spray booth	Electricity	Process control optimisation	0	0	3495	0	3066	3
IR Oven	Electricity	IR Oven process control optimisation	0	0	6094	0	5345	5.5
TOTAL					**34 114**	**10**	**29 941,42**	**30.5**

5.2 Details of highlights

One of the project highlights was the replacement of the outdoor lighting with LED's for the perimeter (spotlight) lighting as well as motion sensors installed in all admin offices. These changes have increased the awareness around energy performance through the conversations it has sparked amongst employees.

The promotion of energy awareness across all levels of the workforce at the plant through communication channels such as the "full circle" notice boards or additional energy efficient work instructions has proven to be effective. After technical training was given on the air compressor, the percentage savings increased from 8% to 18% of its total SEU annual consumption by the next month, and 15% the following month.

During the implementation phase, the energy team noticed an increase in energy consumption by the IR Oven, due to unforeseen issues. These issues were promptly resolved with some process control improvements made to the unit. In the months since the intervention, from June and July

2017, the cumulative percentage savings achieved were 39% and 67% respectively of the actual consumption for its SEU, against the expected consumption, using the regression analysis model.

Furthermore, the plant wants to utilise majority of their PV solar generated power. The utilisation is slightly offset from the optimum usage of the PV power generated. Thus, the requirement to buy power from the municipality and similarly sell back to the grid during the unaligned periods. Some suggestions were to provide battery backup for the times PV is not being generated and then use the battery to power certain main sections of the plant.

Alternatively, to shift the production and process tasks times to best fit the PV generated curve to take advantage of the PV solar power generated. These options have been considered and are now in the inception planning phase with implementation marked for the end of 2018.

6. BENEFITS AND LESSONS LEARNED

6.1 Benefits

- Involvement from all employees will be one of the major initiatives for the following year. The aim is to focus more on employee contribution and give more responsibilities and ownership of the system to the employees of the business.

- The plant has taken the initiative to enter energy efficiency competitions to further drive awareness within their sector, showcasing the achievements made through the EnMS.

- Improved ability to accurately measure performance of the SEUs and then translate the information into forming a comprehensive business case for future improvements projects.

- The staff has gained some assurance that the business will continually strive to improve in being the leading business driver for a sustainable future within its sector.

- Furthermore, MAN AG, has supported the Pinetown, South African branch and specified that all MAN branches within South Africa should follow Pinetown's path and embark on achieving ISO 50001 certification.

6.2 Lessons

- The formation of a steering committee for energy management was successful in giving direction to the energy team, resolving technical issues and giving insight into corporate targets and objectives.

- Management commitment is one of the necessary pillars for success and with strong commitment from top management, the necessary resources was allocated to the system.

- Having an energy team that is focused and passionate about improving the energy performance of the organisation was vital to the "health" status of the system. The energy team was given a name from the inception of the project and this added to the enthusiasm and motivation of the team throughout the implementation.

- Assigning roles and responsibilities, setting goals and achieving them through working together as a team is the key to success.

7. FUTURE PLANS

Plans for optimising the solar PV system with battery backup is one which MAN Truck and BUS Germany (AG) has committed to assisting the Pinetown facility with. The inception meetings were held and planning of the intervention is underway. If successfully installed in 2018, the facility will store energy in a battery backup bank through peak shaving and load levelling.

MAN Truck and Bus (Pinetown) plans to pursue ISO 50001 certification by December of 2017 and have committed to communicating the importance of the energy management to its customers and suppliers.