

## Case Study

<b>Company name</b>	Unilever Indonsa Facility				
<b>Size of company</b> (Based on energy consumption bill)	<b>SMME</b> (R250 k – R750 k)		<b>Medium</b> (R750 k – R24 m)	<b>X</b>	<b>Large</b> (Above 24 m)
<b>Sector</b>	Agro-processing				
<b>Location</b>	Riverhorse Valley Business Estate, 77 Riverhorse road, Newlands East				
<b>Company contact</b>	<b>Name:</b> Suven Pillay			<b>Position:</b> Energy Practitioner	
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<b>Year joined project</b>	2014				
<b>Date of implementation</b>	2015 - 2018	<b>Duration</b>	48 months		
<b>Utility intervention</b>	Electricity				
<b>Case study author</b>	Njabulo Ndlovu				
<b>Project manager</b>	Njabulo Ndlovu				

## 1. BACKGROUND

### 1.1. Company profile

The Indonsa site, which began full production in the first quarter of 2012, is a world class site designed to be Unilever's first green manufacturing site. The site was originally designed to produce 65 000 tonnes of product per year, and has recently been expanded to a capacity of 100 000 tonnes per year.

Prior to 2012, Unilever's global enterprise had set a commendable sustainability target to reduce energy consumption by 50% whilst at the same time doubling production across global operations by the year 2015. This target was cascaded down through the different operating divisions and supported the motivation for the capital investment required to establish the Indonsa site. Once the plant was fully operational, it was found that there were additional improvements that could be made to further reduce the use of energy. In early 2014, the National Cleaner Production Centre South Africa (NCPC-SA) carried out a Resource Efficiency and Cleaner Production (RECP) assessment. The assessment revealed a 12% decrease in energy that was measured for a period where production increased by 26%.

Unilever has set a global sustainability target to make use of 100% renewable energy sources by 2030. This long-term target will drive the need to continually improve on energy efficiency which further supports the need for a systematic and sustainable management systems solution.

## 1.2. Plant profile

The 22 000 m<sup>2</sup> factory produces dry food products under the Knorr, Knorrox, Rajah and Robertson's brands. These brands are blended in a common manufacturing section and then sent to three separate packaging lines. The packaging lines are separated as soups, spices, and cubes. The Indonsa site employs 720 people who work on a three-shift basis, 24 hours per day per annum.



The key source of energy on site is electricity, the annual consumption of which is 18 million kWh. The chillers, which form part of the air conditioning system, are the site's significant energy user (SEU). Additional SEUs include the compressed air system, and the individual production lines, which most notably comprise of motors and heating elements on shrink wrap tunnels. A separate pilot plant for the soaps and the personal care divisions of Unilever is also on site and consumes between 5-10% of the total energy, depending on the required research activities.

## 1.3. Nature of the challenges

Some projects identified required capex, and some of the challenges experienced involved systematically implementing all the recommendations. This is due to the continuous improvement to the system required, as well as the lack of manpower to maintain all proposed savings opportunities.

## 1.4. IEE capacity building programme

### UNILEVER attendance of NCPC-SA training courses

Names	Position	Training attended
Brett VanRensburg	No longer with the company	Energy management system (EnMS) expert level EnMS user level (two-day)

There have been a number of direct engagements with the Industrial Energy Efficiency (IEE) capacity building programmes including the following:

- **EnMS expert level training 2014 - 2015:** Unilever Indonsa participated as a candidate plant with one engineer successfully completing the expert level training and qualifying as a UNIDO expert in EnMS.
- **EnMS two-day advanced level training 2015:** three employees from the Indonsa site were selected to attend this training in 2015.

As a result of the skills gained through these formalised programmes, a number of in-house training and capacity building initiatives were carried out in 2015:

- Maintenance and artisans trained on the benefits of correctly maintaining compressed air systems
- One-point lessons training on general energy awareness issues
- Energy policy incorporated into company induction for new staff, and annual refresher carried out for all 720 existing staff.

## 2. KEY ACHIEVEMENTS

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### Key findings table

<b>Implementation period (yyyy-yyyy)</b>	2015 - 2018
<b>Total number of projects</b>	8
<b>Monetary savings in ZAR</b>	R1 652 538
<b>Energy savings in kWh</b>	1 967 307
<b>Total investment made ZAR<sup>1</sup></b>	Could not be determined as the company did not have the figures for this
<b>Overall % of total consumption saved</b>	26%
<b>Total savings from no cost interventions</b>	0
<b>Payback time period in years</b>	Could not be established as the investment costs were unknown
<b>GHG<sup>2</sup></b>	2 050 917.55
<b>Number of females employed prior to implementation</b>	0
<b>Number of females employed after implementation</b>	0

## 3. IMPLEMENTATION OF AN ENERGY MANAGEMENT SYSTEM

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Unilever is on a continuous improvement journey through the use of world class manufacturing (WCM) methodologies. The approach is based on the principal that there are foundational pillars that an organisation needs to establish to ensure efficient operations and success. The pillars cover the full breadth of operations with a core focus on the development and engagement of people. A key pillar is the environmental one, and embedded within this structure is the need to establish a formalised system to eliminate the waste of energy and continually improve energy performance. The implementation of a formalised EnMS in accordance with ISO50001 is therefore directly aligned with the organisation's WCM drive.

Unilever has also recognised that the implementation of a systematic approach such as EnMS cannot be carried out in isolation but needs to be integrated with all energy improvement initiatives at each of their facilities. The Indonsa site nominated a representative from their WCM team to attend the UNIDO expert level training in EnMS, and also made their facility available to host two other expert candidates that required practical training during the year.

The EnMS outcomes of the UNIDO expert level training programme coincided with the implementation of initiatives identified through the RECP assessment that took place on site during the 1st quarter of 2014. As a result of these two initiatives implemented in parallel, it is not possible to clearly and accurately quantify the unique benefits that can be attributed to each of the interventions.

In this case study, energy savings were calculated by comparing total metered electrical energy consumption and production volumes between 2015 and 2018. Below is a journey of how Unilever Indonsa has progressed in improving their base load, while gaining control of their operations and energy consumption.

24-months						
Year	Period	Variable	R <sup>2</sup>	P - value	Intercept	Standard error
2014	Jan – Dec 2014	CDD	0.699	0.0006	1 098 457.83	59 062.91
2015	Jan – Dec 2015	CDD & production	0.540	0.0325 & 0.007	907 533 .29	74 596.54
2016	Jan – Dec 2016	CDD & production	0.841	0.0002 & 0.00003	724 928 .61	45 292.18
2017	Jan – Dec 2017	CDD & production	0.914	0.00007 & 0.00001	810 118 .85	28 761.97

The 2017 data was used as a new baseline regression model for the whole facility. This was also done as there was a static change in the variables, where production output was increased by 26%. The few projects that were implemented include: the heating, ventilation, and air conditioning (HVAC) system, as well as optimising the control and set point adjustment of chillers from the BMS system, and implementing metering site wide.

To date, the following key system outcomes have been achieved:

- **Energy policy:** Indonsa is the first Unilever site in Africa to develop an energy policy that has been signed off by senior management. The policy is in the process of being developed pictorially so that the key messages can be easily communicated throughout the facility.
- **People:** An internal energy team has been established with representation from multiple departments and functions. Crucial to the success of the system has been the effective engagement and communication with staff across all levels. An example of this is the inclusion of energy awareness in the latest site induction programme that all staff have completed.
- **Energy planning:** A detailed understanding of energy sources, SEU's, energy baseline, and energy performance indicators (EnPI's) has been gained.

#### 4. IMPLEMENTATION CHALLENGES

- **High staff turnover:** While implementing EnMS over the 24-months, the Indonsa site experienced high staff turnover, especially in the HSEQ Department, which acted as the custodian of the management systems. This emphasised the potential risk of initiatives reliant on key individuals. To mitigate this, additional staff have been identified for further training. This includes the plan for a future Energy Manager to attend the next round of the UNIDO expert level training.
- **Justification of energy efficiency projects in a new facility:** The Indonsa site is a new facility and still operates during a period of high depreciation of assets. This directly impacts the total cost for manufacturing products. In order to maintain a low-cost basis and remain competitive, it has become

difficult to motivate for large capital expenditure that will increase the depreciation cost and adversely affect the cost of production. Although the capital expenditure for certain identified energy efficiency projects has been approved, there have been long delays in securing the finance which has delayed implementation.

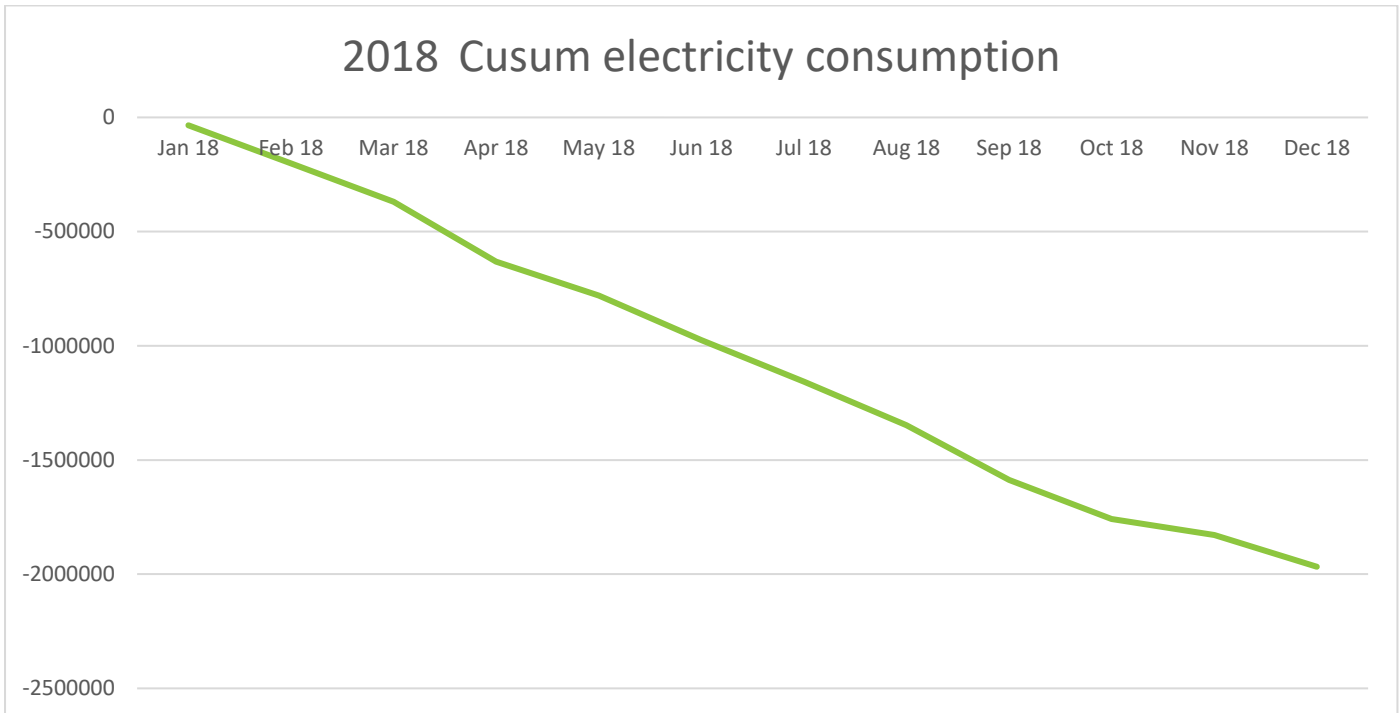
## 5. HIGHLIGHTS OF OPERATIONAL/ESO INTERVENTIONS

### 5.1. Summary of all interventions

Energy uses/users	Energy sources	Intervention	Utility saving period	Investment (ZAR)	Savings (ZAR/year)	Payback (Yrs)	Utility saving (Units) kwh	GHG emission reduction (tonnes CO <sub>2</sub> e/year)
HVAC system	Electricity	Optimised control	2017	Unknown the plant did not have the data available	1 652 538		1 967 307	2 050 917.55
Chillers		Set point adjustment of chillers from BMS system	2015					
Metering & monitoring		Implementation of site wide metering and also on the compressor as it is the main SEU	2017					
Lighting		Lighting Improvements, changing to LED	2015					
Hot water system		65% more heat energy recovered from chillers	2017					
Power factor correction		Installed power factor correction mechanism	2017					
<b>TOTAL</b>					<b>1 652 538</b>		<b>1 967 307</b>	<b>2 050 917.55</b>

Graph 1: Overall plant electricity reduction for the year 2018 using the 2017 baseline. CUMSUM highlighted 1 967 307 kWh cumulative energy reductions for the 2018 year.

## 2018 Cusum electricity consumption



### 5.2. Details of highlights

#### 1. EnMS behavioral interventions

There was improvement in employee behaviours on the correct use of high-speed doors which are required to prevent unnecessary heating of the production area.

#### 2. Improved control and automation

Improved automation of lighting control based on the use of occupancy and lux level sensors, as well as automation of shrink wrap tunnel control to isolate system and minimise unnecessary heating during periods of no production, and automation of high-speed doors separating cooler production areas from hotter environments

#### 3. Lighting improvements, changing to LED

Over 2000 light bulbs were replaced with higher efficiency LED and CFL options. The project managed internally and estimated saving calculated at 240 000 kWh pa (251 tCO<sup>2</sup>) based on a conservative estimated saving of 20 W per fitting.

#### 4. Hot water system

Tanks were reconfigured to operate in parallel. 65% more heat energy recovered from the chillers. A calculated saving based on the estimated hot water usage over the 2014 calendar year was found to be 417 370 kWh pa (436 tCO<sup>2</sup>).

#### 5. HVAC system

Changes were made to the control system of the HVAC unit stationed in the administration area. Ambient temperature setting increased by minimum of 2C which allows air-conditioning to be switched off between June and August.

## 6. Power factor correction per local substation

The power factor was improved to maximise the current-carrying capacity, improve voltage to equipment, reduce power losses, and lower electric bills. Power factor correction capacitors act as reactive current generators. They help offset the non-working power used by inductive loads.

## 7. Installation of dedicated electrical meters per compressor

The installation of the electrical meters allows for monitoring of the operation cost as well as performance of the compressors.

## 8. Optimised control and set point adjustment of chillers from the BMS system

## 9. Implementation of site wide metering, monitoring and targeting system

# 6. BENEFITS AND LESSONS LEARNED

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## 6.1. Benefits

- Apart from the financial benefits, a key benefit of Indonsa embarking on the EnMS implementation programme has been the positive response and engagement from staff on energy efficiency.
- An improved understanding of the cost of energy and the impact it has on the total cost of production has been gained. This has driven positive behavioural changes within the production departments.
- A critical key to the success of efforts on site thus far has been linked to the intentional focus on employee engagement. The use of unique engagement tools has provided excellent platforms to heighten awareness and promote energy efficient behaviors. An example of this was the use of coloured shoe laces to spread the energy agenda on a one-on-one personal level. This initiative began with the core energy team members changing their safety shoes laces to bright colours. When someone in the facility asked about the coloured shoe laces, team members would explain that they represented their commitment to energy efficiency. Following from this, they would share a simple message on energy awareness and opportunities where behaviour can have a positive impact. On completion of this engagement, coloured shoe laces would be passed out so that the new 'energy ambassador' could in turn share the same message to their colleagues. Over the course of three months, the entire production staff was wearing the coloured shoe laces.

## 6.2. Lessons

- The internal cost (in terms of resource requirements) of implementing and maintaining a functioning EnMS was not fully appreciated at the onset of this initiative. As a result, the responsibility and accountability for performing system related tasks have fallen to a few key individuals. The risk associated with this approach recently materialised when these key individuals changed job functions

within the organisation and there was limited capacity for continuity of the EnMS. As a result, the internal energy team, although established, is not fully functional within the organisational structure at Indonsa.

- A systems approach is therefore needed to safeguard against all responsibilities placed on one or a few individuals. There is a balance to be met as the management and accountability for the system still needs to reside within the organisation in the form of individuals who can motivate and champion the process.
- The Indonsa site has 70 electrical sub meters in place measuring usage right down to a distribution board level. Although such a monitoring system is commendable, the scale of the system poses unique challenges in that there is an excessive amount of data to process and analyse before it can become useful information. As a result, it has been difficult to fully understand the electrical usage that is driven by production. In this scenario of an overload of information, the ability to identify SEU's and concentrate efforts in these areas has been negatively impacted. Moving forward, a need has arisen to consolidate data at a higher level in an attempt to understand usage linked to key energy systems and main production lines.
- Although some key elements of EnMS implementation have been incorporated into various levels of the organisation, one of the challenges that remain is to implement the formalised management system aspects of the management system. Activities such as reviewing and implementing operation controls, procurement and design policies have not been adequately addressed. These aspects also need to be integrated with existing systems which create a great opportunity for synergy, but equally, an additional level of complexity.
- The alignment of EnMS to an existing management system infrastructure can prevent duplication of effort.

## 7. FUTURE PLANS

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Moving forward, Unilever Indonsa has recognised that the key to continued success is the investment in people. For this reason, the plan to develop skills and capacity of their staff is prioritised. This site also poses an interesting scenario whereby the opportunities for reducing consumption by investing in more energy efficient equipment have been somewhat exhausted. The opportunities that are now available create a different level of complexity as they fall within the broader areas of behavioural and organisational systems improvements. The need to continue with the full implementation of an EnMS in accordance with ISO 50001 is therefore justified and necessary.

With the recently defined high level renewable energy target that Unilever is working towards (100% renewable by 2030), it is expected that future technical initiatives in energy will also focus largely on generation opportunities for example solar PV. Considering the high renewable target, there is a prevalent need to drive continuous improvement in energy efficiency to reduce the size and cost of future renewable installations.