Case Study

Company name	Richards Bay Coal Terminal (RBCT)					
Size of company (Based on energy consumption bill)	**SMME** (R250k – R750k)		**Medium** (R750k – R24 mil)	**X**	**Large** (Above 24 m)	
Sector	Logistics					
Location	Richards Bay, KwaZulu-Natal					
Company contact	**Name:** Shane Naidoo			Position: Business Improvement Manager		
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Year joined project	February 2018					
Date of implementation	2018 - 2019	**Duration**		12 months		
Utility intervention	Electricity, diesel					
Case study author	Siraj Williams					
Project manager	Milisha Pillay					

1. BACKGROUND

1.1. Company profile

The Richards Bay Coal Terminal (RBCT) is the second largest coal export terminal in the world, volume wise. Opened in 1976 with an original capacity of 12 million tonnes per annum, it has grown into an advanced 24 hour operation with a design capacity of 91 million tonnes per annum.

Positioned at one of the world's deep sea ports, RBCT can handle large ships and large volumes. It has gained a reputation for operating efficiently and reliably. RBCT shares a strong cooperative relationship with South Africa's national utility, Transnet, which provides the railway services linking the coal mines to the port, and the shipping co-ordination of over 900 ships per annum.

Link to the company website is as follows: https://rbct.co.za

1.2. Plant profile

The 276 hectare site has recently been expanded and currently boasts a quay 2.2 kilometres long, with six berths and four ship loaders, of which two were recently upgraded at the end of 2017. Two new stacker reclaimers were also upgraded in May and July of 2018, thereby extending the capacity of the stockyard to 6.2 million tonnes.

The plant employs 470 personnel operating in four shifts 24 hours a day. The main energy sources are electricity and diesel, with a total annual consumption reaching 146 GWh in 2017.

1.3. Nature of the challenges

RBCT has an energy committee called '*Yongamandla*' which was established in 2010. The main purpose of the committee is to formulate strategies, implement systems and monitor RBCT's energy performance. When RBCT was approached by the National Cleaner Production Centre South Africa (NCPC-SA) promoting the implementation of an energy managements system (EnMS), it was readily welcomed.

Critical to RBCT success of their energy management programme was the development of a sustainable and systematic methodology to improve and manage energy performance. The EnMS programme offered by NCPC-SA was a solid foundation from which to develop and implement their own energy management programme.

The company has set a target of 5% improvement in energy performance by 2020 using 2014 as a baseline.

1.4. IEE capacity building programme

RBCT attendance of NCPC-SA training courses

Names	Position	Training attended
Shane Naidoo	Business Improvement Manager	Energy management system (EnMS) expert level EnMS user level (two-day)
Tshianeo Nethonando	Process Engineer	Energy management 101

One of the key learnings from the training was that it allowed RBCT to review their existing performance metrics. Using annualised reporting and the potential of multivariate performance models based on relevant drivers were especially welcomed, as it provided an alternative to existing metrics, which did not appear to provide the required guidance and focus.

The second key learning was that sustainable performance improvement could only be achieved through systematic management of energy.

RBCT is also intending to attend the motor systems optimisation (MSO) suite of training courses offered by the NCPC-SA early in 2019.

2. KEY ACHIEVEMENTS

Key findings table

Implementation period (yyyy-yyyy)	January 2018 – December 2018
Total number of projects	3
Monetary savings in ZAR/year	1 166 691
Energy savings in GJ/year	3955.48 GJ
Total investment made ZAR[1]	514 900
Overall % of total consumption saved	0.8% (of 494 614 GJ per year)
Total savings from no cost interventions ZAR/year	655 590
Payback time period in years	0.44 (based on all three projects)
GHG emission reduction (tonne CO_2e)[2]	765.13 tonnes per year
Number of females employed prior to implementation	137
Number of females employed after implementation	138

There has been a major mind shift towards a more detailed understanding of energy consumption at RBCT. Top management has supported the investment in sub-metering to gain a better understanding of consumption patterns.

Major capital upgrades were completed at the end of 2017 (two ship loaders) and also during 2018 (two stacker reclaimers). There has since been a large focus on ensuring smooth commissioning and production. However, due to limited sub-metering, RBCT was unable to accurately adjust baselines and are in the process of establishing new baselines for the new production capacity.

RBCT embarked on a campaign to replace all their high mast lighting with LED equivalents in 2017. The programme continued in 2018 with a further 11 mast lights replaced. The replacement programme is expected to conclude in 2021.

RBCT had also purchased a Smart Trac system for their moving machinery. This allowed them to track movements of vehicles, trucks, locomotives and dozers. The system also allowed them to reduce idle times for locomotives, thereby by reducing diesel consumption.

[1] Based on a rate of R0.84/kWh and R13.00/litre for diesel
[2] 1.0425 tCO_2/MWh, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, chapter 2, Table 2.2

3. IMPLEMENTATION OF AN ENERGY MANAGEMENT SYSTEM

Although energy reduction has been an area of focus for some years, its implementation has been ad-hoc. The EnMS has allowed RBCT to formalise the process and become systematic with implementing improvement projects. Top management has provided support and commitment by signing the energy policy, appointing personnel into the energy portfolio, and providing resources to invest in metering and measurements for the identified sub-systems.

RBCT management has also supported the establishment of a broad-based energy team, named *Yogamandla,* with representatives from all departments, including management. Energy awareness campaigns were started and integrated with other corporate affairs communications strategies. These included posting notices on boards and entrances, handing out energy pamphlets to personnel and other general awareness drives.

RBCT has used the EnMS to identify and quantify previously unqualified significant energy uses (SEUs) through the completion of energy reviews. This has required further analysis and review of existing available data, where the need for sub-metering was identified. This is in the process of being bought and installed, and will enable RBCT to develop baselines and energy performance metrics for each of its major energy use areas.

From an operational perspective, RBCT has identified production optimisation as an area of no and low-cost opportunities. As such, they have developed procedures for certain tasks to encourage optimal productive practices and reduce inefficiencies. These include tasks for unloading of trains, stacking, reclaiming, and silo management. Operational procedures are included in the training rolled out to new employees on the RBCT energy policy.

RBCT has also used the EnMS as a driver towards seeking ISO 9 001 and 50 001 readiness. Although no target dates have been set, RBCT has committed to conform to international standards. They are also reviewing existing objectives and targets to further drive continual improvement.

4. IMPLEMENTATION CHALLENGES

RBCT is a large complex site with hundreds of conveyors and other large machinery making the quantification of companywide energy consumption challenging. The company has invested substantially in sub-metering. Data from tipplers, stacker reclaimers, and ship loaders are currently recorded at batch level.

Identification of high usage conveyor sub-systems and motors have proven more of a challenge. RBCT has contracted consultants to assist with the identification of key conveyors to be monitored. A programme to install sub-meters on these identified conveyor sub-systems has been started. It is envisaged that this data will be available for analysis in 2019.

In 2016, RBCT invested in the Smart Trac asset management system that uses the latest geographical positioning technology to monitor vehicle movements. This technology was installed on all vehicles including locomotives, dozers and other trucks. The system enabled RBCT to achieve further savings on diesel consumption in 2018, after an initial 15% saving in 2017 for its fleet of locomotives.

Diesel savings could only be computed based on energy models derived in 2018. Challenges related to IT technology used to track diesel vehicles (locomotives and dozers) prevented usage statistics for individual vehicles to be collected. The technology vendor is in the process of moving to a new platform, which has been proposed as the way to correct the issue.

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) GJ	GHG emission reduction (tonnes CO_2e/year)
Lighting	Electricity	High mast lighting changed to LED (11 units in 2018)	2018	514 900	511 101	1.0	2190.43	634.34
Kettles		Hydroboils controlled by 24-hour timers						
Loco-motives	Diesel[3]	Reducing running idle times	2018	nil	655 590	immediate	1 765.05	130.79
TOTAL				**514 900**	**1 166 691**	**0.44**	**3955.48**	**765.13**

5.2. Details of highlights

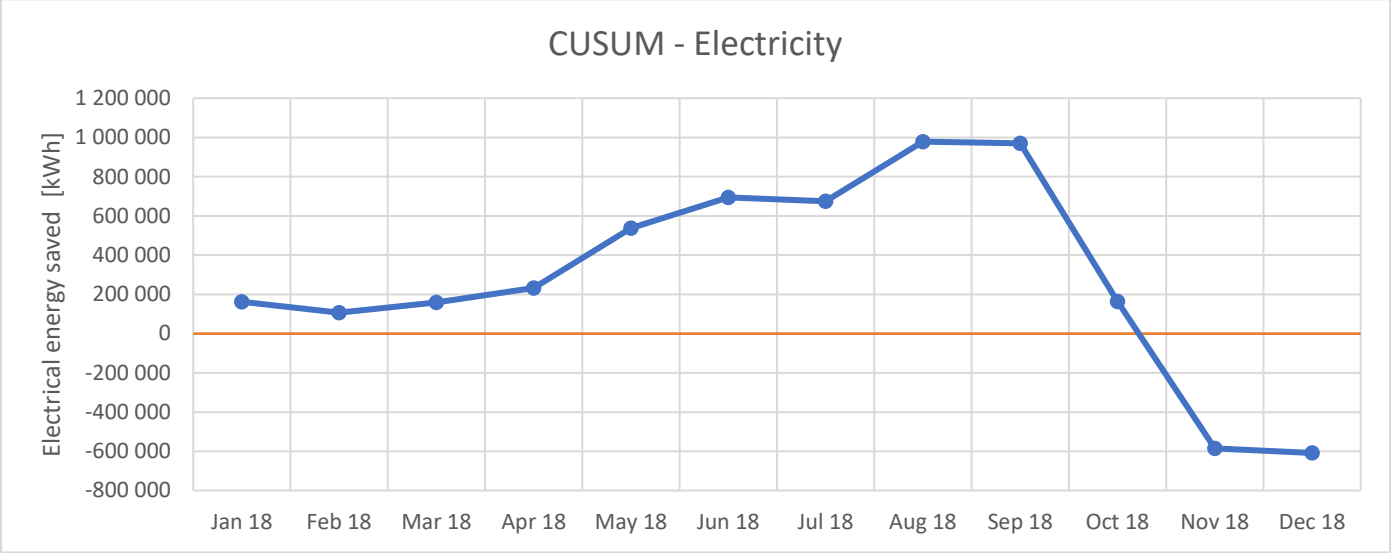
Traditional discharge lamps were used in high mast lighting. One of the early projects identified an opportunity for these lamps to be replaced with LED equivalent. Operating an average of 12 hours a day throughout the year, the energy savings were simple to calculate for the static load. The replacement programme was started in 2017. In 2018, a further 11 lighting masts were converted. The lamp replacement programme will continue until 2021. The replacement has not only resulted in an energy reduction, but has also increased the lighting levels in the operational areas, thereby improving visibility and safety at the site.

RBCT identified optimisation of diesel consumption as a no or low-cost opportunity. With the Smart Trac system installed on all vehicles, idling times for vehicles were estimated at 27% in 2016. Through awareness campaigns, training and updating of procedures to include optimal operating practices, the company has decreased the base load consumption for diesel.

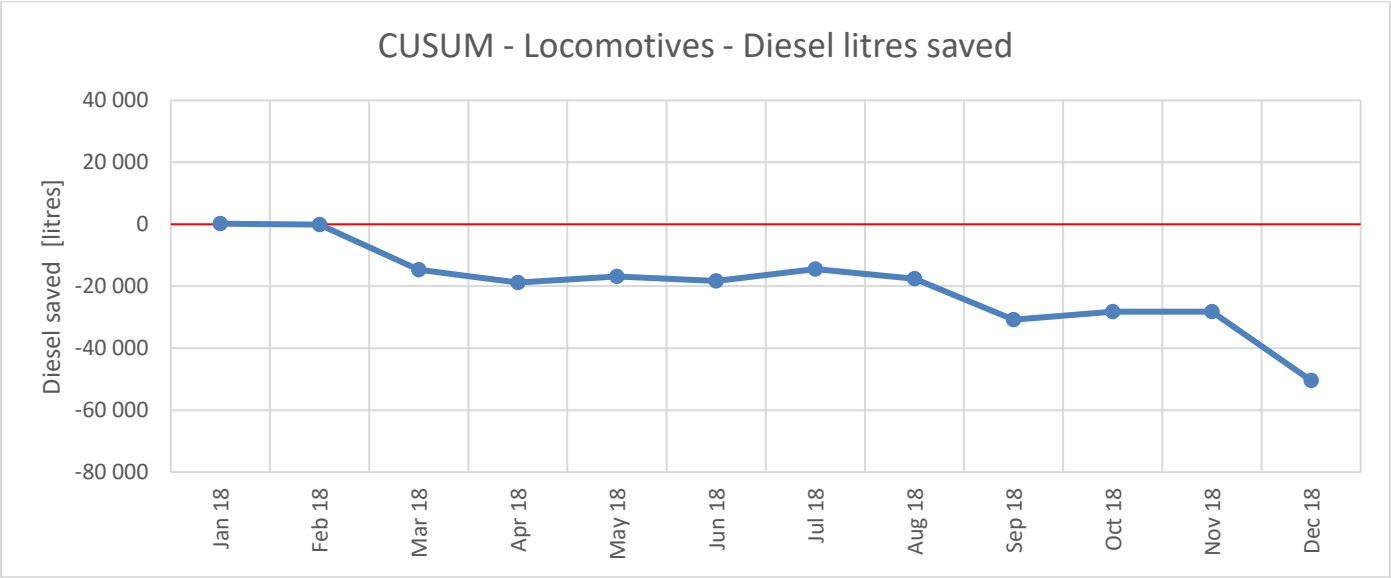
New energy performance indicators were developed for each energy source. These use historical data to provide a reference point or baseline. Improvements made during the subsequent periods are then compared to this baseline to track performance. At this stage, RBCT has developed a single energy performance indicator for electricity, two for diesel, and an additional two for locomotives and dozers.

[3] Calculations using ZAR13.00/litre of diesel and 35MJ/litre of diesel

For the period from January 2018 to December 2018, RBCT managed to realise an electrical saving of 608 454 kWh or 2190 GJ. This represents a saving of approximately 0.5% of annual site electrical consumption. Major savings were achieved in October and November. This coincided with the final commissioning of the new ship loaders and stacker reclaimers, and the decommissioning of the older units.



In 2018, RBCT realised a saving of 50 430 litres of diesel for the locomotives, which is approximately 4% of annual locomotive diesel consumption. Savings for dozers could not be verified for the 2018 year because of technical problems with the data acquisition platform and the inability to establish a credible baseline because of insufficient data.



6. BENEFITS AND LESSONS LEARNED

6.1. Benefits

- The RBCT energy team has gained a better understanding of their own operations by implementing the EnMS. Because of the complexity of operations, RBCT has realised that a more in-depth analysis of energy consumption patterns is required to make major improvements in energy performance.
- Some energy savings were achieved in 2018 despite the increase in capacity and machinery upgrades. The energy team therefore projects that more substantial savings can be achieved once the sub-metering projects have been completed.
- Personnel at all levels of the organisation have become more aware and involved in energy optimisation at the plant.

- Whilst investigating the LED lights, the solution provided increased the lux levels on the ground by 30% and was able to reduce energy consumption by over 50%. The increased lux levels have also reduced incidences of fatigue amongst operational personnel.
- Optimisation and implementation of a structured approach to energy management has raised the profile of RBCT as a world leading coal terminal.

6.2. Lessons

- RBCT has learned that energy management requires an in-depth knowledge of plant operations.
- They have also learned that accurate measurement of key parameters is essential to not only develop viable improvement projects, but also to develop applicable metrics and performance indicators.
- They also realised that performance improvements are possible without major capital equipment changes. However, an investment in measurement instruments and data acquisition is required.
- They also recognise that good change management methodologies supported by a structured management framework are essential to continual improvement and sustainable profitability.
- They also learned that this structured approach requires a long-term view where, for example, capital machinery purchases should be viewed in terms of life cycle costs rather than purchase price.
- Quotable quote or message:
  - RBCT strives for efficiency, enabling the company to do more with less.
  - There is always more you can do, if you look at the details.

7. FUTURE PLANS

RBCT has been encouraged by the improvements made thus far and are planning for the following:

- Analysis and optimisation of conveyor subsystems once the sub-metering installation project is completed.
- Review of other existing data streams to improve the accuracy of energy performance and prediction models, of both electricity and diesel.

In the long term:

- RBCT intends achieving certification for the ISO 9001 and ISO 50001 standards.
- RBCT intends to explore supplementing the baseload of the terminal through renewable energy (PV/solar panels).