



Clement Makhloa

FINDING OF ENERGY AUDIT

## PSEE Energy Review Report

### EdgeLine Engineering (PTY) LTD

No. 7 Port Road, Robertsham, Johannesburg  
Gauteng Province, South Africa

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#### 1 EXECUTIVE SUMMARY

The purpose of this energy review is to establish the energy intensity of EdgeLine Engineering (Pty) Ltd in order to identify opportunities for energy saving, propose viable options and the impacts on cost and carbon footprint. EdgeLine Engineering specialises in sheet metal fabrication, distribution kiosks, enclosures, motor control panels, distribution boards, cable management systems, electrical low voltage products, and spares. The energy review assessed the energy saving opportunities and their costs and benefits to the company and provided investment recommendations.

The specific objectives of the energy review that were fulfilled were:

- Review existing environmental policy, strategy and operational plans;
- Review of energy use and cost, expert data analysis and commentary;
- Conduct a site visit and assessment;
- Model cost and environmental impact of the existing systems;
- Outline cost-benefit analysis for recommendations especially those with less than 3 years payback; and
- To develop a draft energy policy for EdgeLine Engineering.

The tools used for the purpose of the audit included electronic dataloggers to measure power demand variation of various loads, a lux meter for light intensity in the work areas and digital thermometers for thermal processes. In addition we reviewed the monthly environment management reports, some of the past energy and water bills and extraction of energy costs from the financial ledger. The collection of historical energy data and on site measurements was made in February 2015. For validation and verification of the information, personal experience and expert opinion was sought from the various plant managers and supervisors at EdgeLine Engineering.

There are 5 main utilities in use at EdgeLine Engineering namely; electricity, compressed air, gas (consisting of natural gas, acetylene, hydrogen and LPG), liquid fuel and water. The compressor is new and is less than 1 year old. The compressed air is used at the Computer Numerical Control (CNC) and hydraulic machines. No leakages or opportunities for energy saving were noted

From the ledger we got costs of fuel combined with oil and we made an assumption that oil costs were 20% of the fuel costs. We also assumed that all the fuel was diesel and the current prices were applied. The ledger entry combines all costs of gases. We were only able to subtract the cost of natural gas as this was given from the monthly bill. The physical quantities of acetylene gas, hydrogen and LPG could not be established. For natural gas we got all historical data for 12 months but we had gaps with data for electricity (10 months only) and water (2 months only). To estimate the annual energy and water consumption we averaged the available months and multiplied by 12 months.

The share of annual energy consumption and cost from gas, fuel and electricity is shown in the pie chart below.

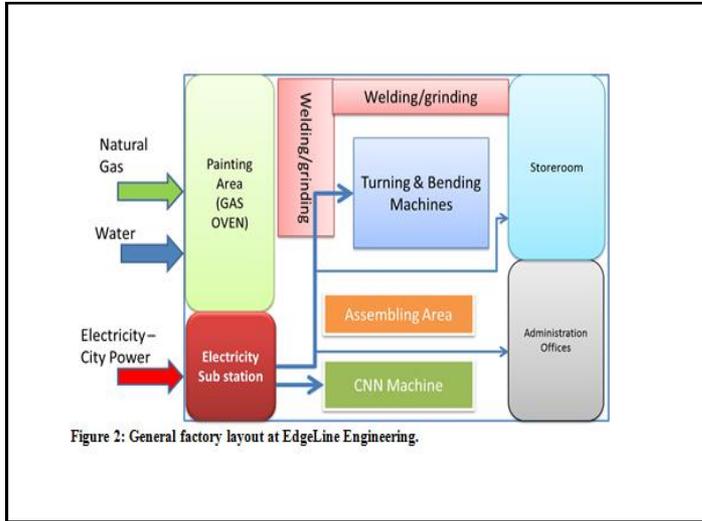


Figure 2: General factory layout at EdgeLine Engineering.

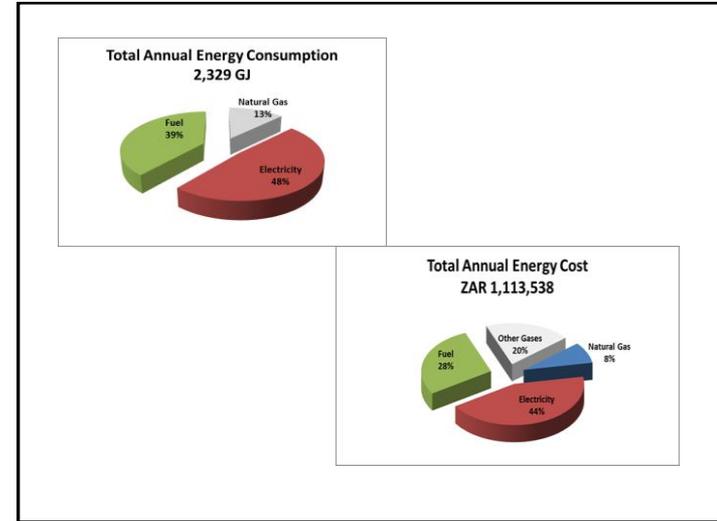
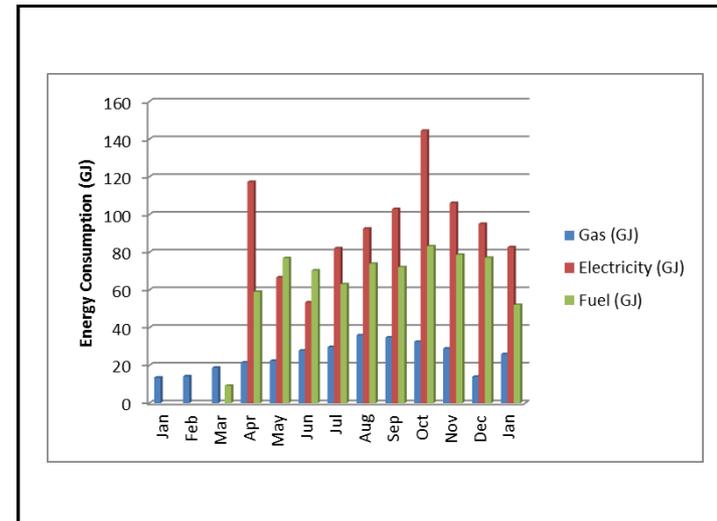


Table 1: Baseline intensities of the utilities assessed at EdgeLine Engineering.

Utility	Annual Consumption	Unit	Specific Intensity*	Unit	Cost intensity (ZAR/kg)	Annual CO <sub>2eq</sub> (tons)	Carbon Intensity
Electricity	314,435	kWh	1.310	kWh/kg	2.04	302	1.258
Natural Gas	296	GJ	1.232	MJ/kg	0.39	17	0.069
Fuel	902	GJ	3.758	MJ/kg	0.28	154	0.644
Water	6240	kL	26	L/kg	0.69	N/A	N/A
<b>Total (Gas, Fuel &amp; Electricity)</b>	<b>2329</b>	<b>GJ</b>	<b>9.706</b>	<b>MJ/kg</b>	<b>3.40</b>	<b>473</b>	<b>1.970</b>

\*Note: Specific intensity is calculated based on 20 tonnes of steel ordered per month.



## 1. ENERGY SAVING OPPORTUNITIES

### 6.1 Lighting in Storeroom

During the day the storeroom is continuously lit despite incoming natural light. There are total of 96 x 58 watt fluorescent lamps in a storeroom with an approximate area of 100 m<sup>2</sup>. Measured light levels with the light ON showed that the average light intensity in the storeroom was above 300 lux. For warehouses it is recommended to have 150 - 200 lux.

The energy saving opportunity is to de-lamp the storeroom. By removing 60 of the lights can lead to significant energy savings. Energy saved by removing the 60 lamps is equivalent to 8,640 kWh per year. The total annual cost saving is ZAR 16,392 which is a combined lamp and energy saving. The cost of de-lamping has been estimated at R500. This gives a payback period of 0.03 years.

### 6.2 Security Lights

The four sodium halide lamps providing security lighting to the premises were observed to be on during the day. The energy saving option is to switch these off during the day or alternatively connecting them to a daylight switch. The energy saved by switching them off for a period of 12 hours is equivalent to 2,190 kWh at a cost of ZAR 3,395. Investing in a daylight switching and installing it will cost about ZAR 100 and this give a payback period of 0.03 years.

### 6.5 Replacement of all lights with energy efficient LEDs

This opportunity looks at replacing all the lamps and fixtures and install more energy efficient LEDs. It is estimated that the energy saving measure will lead to energy saving of 6,000 kWh per year. The investment cost required will be ZAR 66,000. The payback period will be 7.06 years.

### 6.6 Water Recycling

Currently all the waste water is flushed through the municipality sewer lines. The opportunity presented is to recycle some of the waste water and use it in the factory. The estimated annual water saving will be 3,120 kL of water per year. The equivalent annual cost saving will be ZAR 82,900. It is estimated that the recycling unit will cost ZAR 250,000 giving a simple payback period of 3.02 years.

### 6.7 Training

The proposed awareness training is at three levels. The first is an awareness targeted at executive management and this is proposed to be done in half a day. The second training is targeted at supervisor level where they are taken through the energy management concepts, energy saving techniques and technologies in areas relevant to EdgeLine Engineering. The third training will be for the general and shop floor workers on energy awareness and how they contribute to saving through behaviour change. It is estimated that the training will result in 5% energy savings across all utilities. The training will cost an approximately ZAR 50,000 and energy saving equivalent to ZAR 50,440 will be realised. The simple payback period is less than 1 year.

### 6.3 Lighting in Powder Coating Room

This case is similar to the above situation where the fluorescent lamps (58 watts) are ON during the day despite opportunities for natural light to be used. The roof needs to be fitted with translucent roof sheets. Given security concerns it is further recommended to reinforce where the sheets will be installed with metal barriers. During winter there might be times when natural light will be insufficient. To cater for this it is estimated that during the two months the factory will require additional lighting. Thus the total energy saved by installing the translucent roof sheets including the metal barriers will lead to an annual energy saving equivalent to 13,680 kWh. The cost saving will be ZAR 21,200. The investment cost is estimated at ZAR 2,500 for the sheets and metal barrier giving a payback period of 0.12 years.

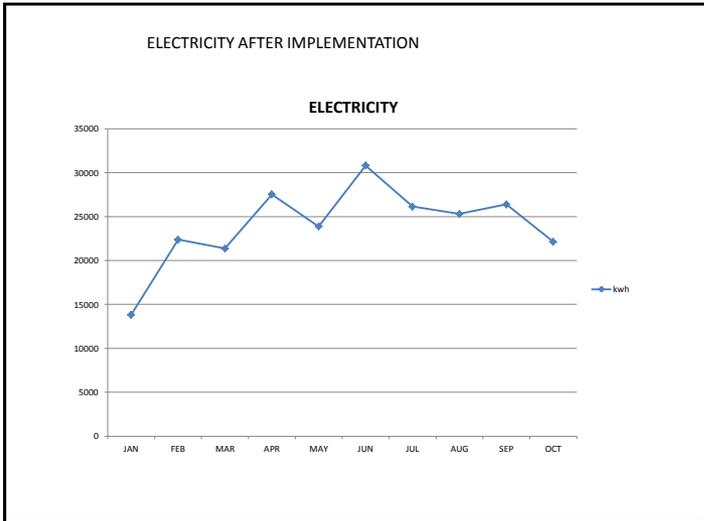
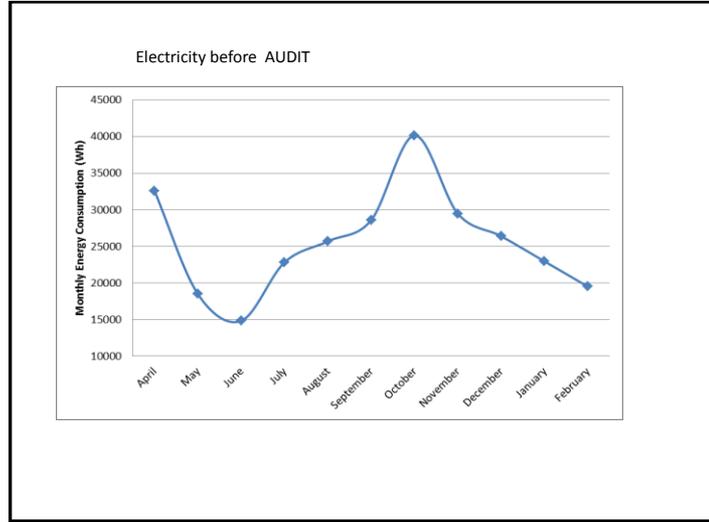
### 6.4 Electrical Geyser

The 200 litre electrical geyser connected to the main office can be replaced by a solar powered geyser leading to some cost savings. It is estimated that replacing the electrical geyser with a solar powered one will lead to an annual energy saving of 3,285 kWh which is equivalent to ZAR 5,120. Investing in a solar geyser will require an investment of ZAR 25,000. The payback period for this investment will be 4.88 years.

Table 2: Total energy and cost savings, investment costs and GHG emissions

Low Cost Investment Opportunities							
Energy saving opportunity	Annual Energy Saved (kWh)	Cost of Saving, ZAR	GHG Emissions (kg/CO <sub>2</sub> )	GHG Emissions Deviation from Baseline (%)	Investment Cost, ZAR	Payback (Years)	Priority
Switching off of security lights during the day	2,190	3,414	2,102	0.7%	100	0.03	1
De-lamping of the storeroom	8,640	13,470	8,294	3%	500	0.04	2
Use of natural light in powder coating room	13,691	21,345	13,143	4%	2,500	0.12	3
Install CO <sub>2</sub> sensor on Air Fans	2,520	3,929	2,419	0.8%	2,000	0.51	4
Conduct energy awareness training*	32,354	50,441	31,060	10%	50,000	0.99	5

High Cost Investment Opportunities							
Energy saving opportunity	Annual Energy Saved (kWh)	Annual Cost of Saving, ZAR	GHG Emissions (kg/CO2)	GHG Emissions Deviation from Baseline (%)	Investment Cost, ZAR	Payback (Years)	Priority
Installation of motor tracking system and training of drivers	325	25051	312	0.1%	50,000	2.00	1
Replacement of electricity geyser in the administration into solar	3,285	5,121	3154	1%	25,000	4.88	2
Change of lamps into high energy efficiency LED lights in the factory	6,000	9,354	5760	2%	50,000	5.35	3
<b>Power savings, total (kWh)</b>	<b>9,610</b>	<b>9,354</b>	<b>9225</b>	<b>3%</b>	<b>50,000</b>	<b>5.35</b>	<b>n/a</b>



- WHAT WAS IMPLEMENTED BY EDGELINE MEET THE TARGET**
- **Training employees of energy management**
    - Switching off lights after work, switching off machine when going to lunch.
    - Limiting lights in store
    - And the use of natural light when applicable
  - **Controls**
    - Geyser timer
    - Change to LED lights (this we decide to change when the lights burn out)
  - **Water controls**
    - Training for employees
    - Introduced a water switch outside that cuts out water supply of the entire factory after shift.