Industrial Energy Efficiency Project in South Africa

Case Study – EnMS

Company name	**Aveng Grinaker - LTA Boksburg East Asphalt Plant**
Sector	**Construction & Engineering**
Year joined IEE Project	**2014**
Year of interventions	**2014/2015**
Contact person	**Stefan Botha: Plant Manager (Aveng Asphalt)**
Key focus areas of intervention	• Reduction of baseload by stopping equipment that idles unnecessarily • Reduction of compressed air pressure from 9 to 8 bar • Switching off security lights that were left on during day light hours • Energy awareness training of all plant personnel

1. BACKGROUND

1.1 Company profile

Aveng Grinaker-LTA is a multi- disciplinary construction and engineering group, anchored in South Africa and focused on selected infrastructure, energy, rail and mining opportunities in Africa. The company offers a comprehensive range of standalone or integrated services that cover building, civil engineering, roads, earthworks, concrete, ground engineering, mechanical, piping, electrical and instrumentation contracting.

The Aveng group are committed to a strict environmental policy published in their sustainability report. The group aims to use energy, water and other natural resources and raw materials effectively, and prevent pollution by controlling its emissions, discharges and wastes, and disposing of or recycling materials in an environmentally friendly manner.

Plant profile

- The plant asphalt was built by the German manufacturer AMMANN and is only 4 years old.
- The plant is certified to ISO 9001 and is planning to certify to ISO 140001.
- Aggregate is transported from Afrisam Rooikraal quarry in road trucks to the plant and stockpiled in an area adjacent to the cold feed bins.
- A front end loader is used to fill the aggregate into the cold feed bins which is then dispensed onto a conveyor belt situated underneath the bins.
- The aggregate is then fed into a rotating drying drum.
- The drying drum burner uses R50 recycled oil which heats the aggregate to a temperature of about 160-165 degrees C.
- The hot aggregate is then transported to the top of a mixing tower via an enclosed bucket elevator which is then screened for separation and dispensed into 5 scales.
- In order to reduce dust levels, dust is extracted from the drying drum and is passed through a bag filter house via an extraction fan. The dust is recycled and used as a fine in the asphalt aggregate mix.

- Dust extraction is controlled by a swivel damper in the extraction duct. Should the hot gas temperature in the duct increase above 165 degrees C the damper opens and should the temperature of the hot gas go below 160 degrees C then the damper closes. The hot gas is then discharged into a stack.
- The extraction fan runs continuously and has a VSD control to increase or decrease the air volume.
- Four 50 000 litre vertical tanks containing bitumen are heated to about 170 degrees C. Heating is carried out using oil heat exchangers which are inside each bitumen tank. The oil is heated in a boiler which is fired by a burner using “white” diesel (“white” diesel an industrial diesel exempt from duties & taxes). The oil is heated inside the boiler; and is circulated through the heat exchangers.
- After screening and weighing the hot aggregate, the hot bitumen is pumped and combined with the aggregate in a mixer box which is then dispensed into hot mix storage skips; the asphalt is then weighed and directly loaded into awaiting road trucks for transportation to site.
- Compressed air is also used in the process for instrumentation as well as an air supply to the aggregate drying drum burner. Compressed air receivers are situated at the top and at ground level of the tower.

1.2 Nature of challenges

During the initial energy management assessment, it was realised that the management of energy requires commitment, planning, implementation and a sustained effort by everyone.

Raw data for Diesel, R50 (HFO) and Bottled Gas was not accurately recorded and the Head of Production undertook to keep records. It was decided that 12 months of data would be required before an analysis of the energy consumed can be carried out.

1.3 IEE capacity building programme

Three SHE personnel attended the 2 day advanced EnMS course and energy training was given to SEU operational personnel.

General energy awareness training was also given to all of the Aveng Asphalt Plant employees.

Energy awareness training is also included in the induction of all new employees, contractors and sub-contractors.

A maintenance technician attended the NCPC EnMS course on the 26th and 27th of October 2015.

On 30 April a behavioural change campaign was started firstly to inform all Aveng employees of the EnMS implementation program as well as the need to save energy. The maintenance and production SEU operators were also targeted by the Production Manager as well as the production and maintenance technicians to ensure that the plant is operated and maintained optimally in accordance to the OEM (AMMANN) operations manual.

2. KEY ACHIEVEMENTS

Key findings table -

Implementation Period (yyyy-yyyy)	**2014/2015**
Total Number of projects	**4**
Monetary savings in ZAR	**R 109 424 .00**
Energy savings in KWh	**99 795 kWh (Elect) (9.94%)**
Total investment made ZAR	**Small investment made**

Payback time period in years	**Immediate**
GHG Emission Reduction (ton CO2)[1]	**60.69 (ton CO2 for Elect)***

* (CO2 Conversion Factor for electricity set at 1.015kg CO2 emitted per kWh)

The Aveng Asphalt plant consumed 583 218 kWh in 2014 (an average of 48 602 kWh/month) at a cost of R956 449 for the year (an average of R79 704/month)

The plant is only 4 years old and was built to the latest technology standard. Operations are completely automated and are SCADA and PLC controlled.

After carrying out 4 technical audits, low cost opportunities were identified which were immediately implemented.

These were:-

- Reduction of baseload by stopping equipment that idles unnecessarily
- Reduction of compressed air pressure from 9 to 8 bar
- Switching off security lights that were left on during day light hours
- Energy awareness training of all plant personnel

Other projects that were identified entailed high capital costs which were not appropriate to implement in the current economic climate even with their short payback periods.

In June 2015 Aveng were ISO9001 certified and it is intended that after ISO 14001 certification, ISO 50 001 certification will be accomplished. The high cost of ISO 50001 certification is a barrier at this point, however ISO 50001 has been adopted by the Aveng Asphalt.

3. IMPLEMENTATION OF AN ENERGY MANAGEMENT SYSTEM

A fully documented system audit was carried out outlining recommendations for improvement.
A management review was also conducted where the electricity 2014 baseline and baseload was approved.
An energy performance indicator (EnPI) with a correlation (RSQ of 0.77) was confirmed and approved.

4. IMPLEMENTATION CHALLENGES

The Aveng Asphalt plant is only 4 years old and is fully automated built to high quality and environmental standards.

Because of the nature of the process the plant has a very high base load up to 70% of the average monthly consumption.

The client dictates not only tonnages but date and time of delivery, since asphalt can easily solidify if these conditions are not met.

5. HIGHLIGHTS OF OPERATIONAL/ESO INTERVENTIONS

5.1 Summary of all interventions

System	Intervention	Capital Cost ZAR	Savings ZAR	Payback Yrs	Energy saving

1. Reduction of Baseload	Reduction of baseload by stopping equipment that idles unnecessarily, This was implemented over a period of 2 weeks over the April / May 2015 Public holiday periods.	-	R 0	-	No saving could be calculated since the base load in 2015 was higher than the base load in 2014
2. Behavioural Change	EnMS training attended by the energy team members. Companywide energy awareness training attended by all employees. SEU operator optimisation training by Production Manager and Technicians	R5 000	R 74 158	-	45 542
3.Compressed Air	Reduction of compressed air pressure from 9 to 8 bar. New compressor purchased (same compressor as old compressor) but repositioned away from dust.	-	R 5534	-	3024
4. Lighting	Switching off security lights that were left on during day light hours	-	R 11 336	-	7008

5.2 Details of highlights

The Aveng Asphalt Plant team showed great interest and enthusiasm during the implementation of the Energy Management System.

6. FUTURE PLANS

R50 which is a heavy fuel oil, White diesel (industrial diesel), bottle gas and Diesel are excluded for now, since the data available is unreliable. Although these energy sources are small in comparison to electricity, accurate data has to be first collected for a period of 12 months and then managed accordingly.

Diesel is one of the energy sources that have been excluded since only small quantities are used on site the rest being sold to external transporters.

The EnMS system will now be taken over by the SHE site representative who has attended the 2 day EnMS training and was a member of the team that implemented the project.

7. LESSONS LEARNED

Although the plant uses the latest technology to produce asphalt, there are major opportunities to further reduce the high baseload and save energy in the process.

Enquiries

For more information about the training workshops and participation opportunities:
www.iee-sa.co.za • Tel.: 012 841 2768 (Pretoria) 021 658 3983 (Cape Town) or 031 242 2365 (Durban)

For more information about partnership opportunities: www.unido.org • Tel.: 012 394 1567 (Pretoria)