case study

ENERGY MANAGEMENT SYSTEMS (EnMS)

Aveng Grinaker – LTA Boksburg East Asphalt Plant

Construction and engineering – EnMS Expert level candidate plant 2014

BACKGROUND

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

Its four-year-old asphalt plant is ISO 9001 certified and certification to ISO 140001 is on the way. In terms of process, aggregate is transported from the 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 fed into a rotating drying drum, the burner of which uses R50 recycled oil that heats the aggregate to a temperature of about 160-165 °C. The hot aggregate is transported to the top of a mixing tower via an enclosed bucket elevator which is screened for separation and dispensed into five scales. 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 in the asphalt aggregate mix.

Dust extraction is controlled by a swivel damper in the extraction duct. The damper opens when the hot gas temperature in the duct rises to 165 °C, and closes when temperature decreases to less than 160 °C. The hot gas is then discharged into a stack. The extraction fan runs continuously and has a variable speed drive control to increase or decrease the air volume.

Four 50 000 litre vertical tanks containing bitumen are heated to about 170 °C. Heating is carried out using oil heat exchangers which are inside each bitumen tank. The oil is heated in a boiler that is fired by a burner using ‘white’ diesel – an industrial diesel exempt from duties and 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 weighed and directly loaded into road trucks for transportation to site.

KEY FINDINGS

Over the period 2014-2015, four projects were undertaken, resulting in a total energy saving of 59 795 kWh, valued at R 109 424, and with a very small investment, the payback period of which was immediate. A reduction of 60.69 tonnes CO_2 (electricity) was achieved.

IEE Project capacity building programme

Three safety, health and environment personnel and a maintenance technician attended the two-day advanced EnMS course. Energy training was given to Significant Energy User (SEU) operational personnel.

Aveng Asphalt Plant employees, new inductees, contractors and sub-contractors received general energy awareness training. A behavioural change campaign was implemented to inform all Aveng employees of the EnMS implementation programme and the need to save energy. The maintenance and production SEU operators as well as the production and maintenance technicians were also targeted to ensure that the plant is operated and maintained optimally in accordance with the operations manual of AMMANN, the original equipment manufacturer.

IMPLEMENTATION OF AN ENERGY MANAGEMENT SYSTEM

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

IMPLEMENTATION CHALLENGES

The plant has a very high base load – up to 70% of the average monthly consumption. Tonnages, date and time of delivery must be carefully managed as asphalt easily solidifies if the right conditions aren't met.

SUMMARY OF INTERVENTIONS

System	Intervention	Capital Cost ZAR	Savings ZAR	Energy saving
Reduction of baseload	Reduction of baseload by stopping equipment that idles unnecessarily.	-	R 0	No saving calculated: base load in 2015 higher than that of 2014
Behavioural change	EnMS, operator optimisation and energy awareness training	R5 000	R 74 158	45 542
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
Lighting	Switching off security lights that were left on during day light hours	-	R 11 336	7008

LESSONS LEARNED

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