ENERGY SYSTEMS OPTIMISATION (ESO)

GLEDHOW SUGAR COMPANY

Training host plant implementing energy efficiency measures

September 2013

BACKGROUND

Gledhow Sugar Company (GSC) is an independent sugar manufacturer with one factory in KwaDukuza (Stanger) on the KwaZulu-Natal North Coast, where 1.5 million tons of sugar cane is processed annually into roughly 160,000 tons of refined white sugar, 200,000 tons of fibre for paper production and 50,000 tons of molasses. The company directly employs 400 staff and indirectly supports the livelihoods of at least 3,000 farm employees and hauliers supplying sugar cane to GSC and hauling finished goods to market.

Engineering Manager Barry Parkin was one of the IEE Project's very first expert level steam system optimisation candidates, and GSC signed up as a training host plant with the IEE Project in 2011, ensuring implementation of Energy Efficiency measures at the factory. GSC has implemented a series of ESO as well as energy management systems interventions since 2011.

THE ISSUE AND MAIN FINDINGS

Although GSC generates its own steam and thus sufficient electricity for internal use by burning coal and bagasse during the 30-40 week harvesting period, electrical power is imported from the local municipality during the off-season.

Throughout the year, GSC uses large quantities of coal, which has to replace the fuel energy value lost by the sale of bagasse fibre out of season, while the amount of coal used is proportional to the amount of fibre sold for paper manufacture.

A challenge to implementation was the fact that, because the factory runs 24/7 for nine months of the year, GSC realistically has only a 3-month window in which to implement systematic changes.

Key findings:
An investment of ZAR 210,000 in 2012 realised a saving of ZAR 500,000 with a payback of 6 months. The results inspired GSC to invest a sizeable ZAR 2,250,000 into 4 more energy-saving projects during 2013.

A spin-off of the project is that improved energy efficiency may enable GSC to bid for renewable energy cogeneration in the Department of Energy's Renewable Energy Independent Power Producer (REIPP) Procurement Programme.

ENERGY CONSERVATION OPPORTUNITIES IDENTIFIED

A 2011 IEE Project baseline study, to establish the existing energy and mass balance across the factory, identified and evaluated numerous opportunities for the optimisation of GCS's steam system – to improve the energy efficiency in the factory, reduce the amount of coal used and increase profitability.

IEE Project capacity building programme

After attending IEE Project courses in energy management, motors, as well as steam, compressed air and fan system optimisation, GSC's engineering manager, mechanical and electrical engineers and electrical technician could establish energy goals, actively champion energy optimisation technologies and initiate energy optimisation projects, with the tools and understanding to ensure success.

IMPLEMENTED SAVINGS MEASURES

2012

- Staff energy awareness and training programme
- A detailed survey of the steam distribution network, followed by improvements to thermal insulation
- Improvements to boiler controls – notably oxygen trim controllers and improved fuel spreading to improve boiler efficiencies
- Implementation of a steam trap and steam leak maintenance programme to reduce leaks

2013

- Soot blowers and automated boiler blow down systems were installed on the coal-fired boiler to improve boiler efficiency.

> ***"To make an impact in an energy optimisation project, you have to be bold enough to take the initiative and become the champion of the changes you want to achieve."***
>
> *Barry Parkin, Engineering Manager, Gledhow Sugar Company*

PROCESS CHALLENGES AND LESSONS LEARNED

- Lead times between planning and approval of energy optimisation projects that require higher capital investments and implementation of these projects presented a challenge, due to the capital budgeting cycle and the operational cycle of the business, meaning maintenance and projects can only be undertaken during the 3-month shutdown period. **A realistic lead time, from investigation of an opportunity to successful implementation of a solution, is two years.**

- Once a system or component is being investigated, new and verifiable insights into its functional design emerge. **New insights into how systems can be optimised inspired both engineers and factory floor employees to work together towards innovative solutions.**

- The IEE Project Steam System Optimisation training materials presented concise and workable solutions to assist the engineers in optimising their steam system. **By obtaining expert training and mentorship in optimisation opportunities, the hard lessons were learnt in the classroom rather than by making expensive mistakes on the factory floor.**

- Implementation of energy savings opportunities at first resembles unrewarded work, requiring dedication and enthusiasm for positive outcomes. **An impactful energy optimisation project requires bold initiative from engineers, who need to become visionary change agents.**

THE FUTURE

The economic viability of further optimisation of the steam system rests in part on the developments associated with the REIPP programme, where a favourable electricity tariff will justify significant investment in optimising the energy efficiency of GSC's factory and the construction of a new electricity-generating "Power Island".

Should the renewable energy option not be viable, energy efficiency optimisation projects will be limited to those justified by the coal or electricity savings achievable. Some projects currently under investigation include:

- Installing feed water economisers on two of the bagasse-fired boilers so that they can carry a larger share of the load;
- Installing oxygen trim controllers on the remaining two boilers; and
- Blow down heat recovery.

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