

TECHNICAL NOTE #35

Energy Efficient Technologies – VSD Fan Optimisation

An EECB-facilitated Energy Systems Optimisation (ESO) Assessment at Algoa Brick identified VSD fan optimisation as an opportunity for energy reduction.

The audit report evaluated 9 of ±50 fans at Algoa Brick for the fitment of VSD's. The 37kW exhaust fan at Plant 2 was nominated for the technology upgrade because it had the highest potential saving (127 000 kWh per annum), as well as the potential for replication at other brick manufacturers.

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ENERGY EFFICIENCY TECHNOLOGY DEMONSTRATION

VSD FAN OPTIMISATION AT ALGOA BRICK PLANT 2

BACKGROUND

Algoa Brick (hereinafter referred to as Algoa) is a privately owned brick manufacturer operating from a site near Swartkops, Port Elizabeth. It manufactures a range of clay bricks focussed on non-facing plaster products (NFP) which it produces from raw materials mined on site.

Algoa's Swartkops facility consists of two separate plants employing a total of approximately 150 people depending on demand. Although Algoa Brick has implemented an energy management system aimed at managing and reducing its energy costs, both of its plants are old and there is significant potential to improve their energy efficiency with judicious capital investment.

ABOUT THIS ENERGY EFFICIENCY MEASURE

The EECB facilitated a targeted Energy Systems Optimisation (ESO) Assessment at Algoa Brick as part of the National Cleaner Production Centre (NCPC) programme. The audit report evaluated 9 of the approximately 50 fans in operation at Algoa Brick for the fitment of VSD's (Variable Speed Drives).

Of the potential estimated savings of 565,000 kWh / annum due to the fitment of VSD's, the 37kW exhaust fan at Plant 2 was listed as having the highest potential saving of approximately 127 000 kWh per annum. For this reason and the potential for replication of the project at other brick manufacturers, the EECB undertook to co-fund the fitment of a Variable Speed Drive onto Algoa Brick's Plant 2 exhaust fan.

KEY ACHIEVEMENTS

Implementation period	April 2016 – November 2016
Estimated annual saving	R109,205
Estimated annual energy saving	120,695 kWh
Total project cost (including M & V and report)	R92,610
Payback period	0.85 years or approximately 10 months
Estimated annual GHG reduction (t CO₂)¹	118.3t

¹ Eskom Annual Report 2013: 1 kWh = 0.98 kg CO₂

IMPLEMENTATION

The baseline electrical consumption was measured via a PowerStar electrical meter installed in advance of the existing star-delta starter. Secondly, the installation of the VSD was intended to obviate the need for damper control and modulation of the fan. For this reason, the actual influence of the fan on the kiln needed to be measured by means of a draught monitoring system.

The main challenge of installing the VSD was ensuring that the kiln was not stalled for a significant period. This was overcome by careful planning and coordination which resulted in fan downtime of less than 1 hour. After the installation was completed, the same PowerStar metering arrangement was used to measure power consumption.

RESULTS

At first, the kiln draught was set to maintain a relatively high draught value. This resulted in an average daily electrical consumption of only about 6.8% lower than the baseline. Notwithstanding, it became clear from the varying speed of the VSD that another factor – air leakage – was influencing kiln draught rather than only the speed of the exhaust fan.

Unfortunately, air leaks can come from a number of sources such as the intercar seals on kiln cars, poor kiln car decks, kiln inner door leaks and also leaks into the flues and ducting. Dealing with these air leaks necessitated work on a number of fronts including repairs to intercar seals and kiln car decks (ongoing as there are 90 kiln cars), replacement of the kiln inner door and also changing the kiln pushing regime. Additionally, the exhaust fan and sections of corroded ducting were replaced.

Following these further interventions, the draught setting on the kiln was “walked downwards” whilst maintaining acceptable kiln performance. Further measurement of power consumption now shows a daily average consumption by the Plant 2 exhaust fan of approximately 64.5% lower than the baseline. This equates to an annual energy saving of approximately 120 695 kWh per annum worth approximately R109 205 per annum at AB’s weighted average electricity cost. The project cost R92 610 (including M & V and reporting) giving a simple payback period of 0.85 years or a little over 10 months.

CAPITAL / FINANCE CONSIDERATIONS

Readers interested in undertaking similar projects are encouraged to refer to the “Clay brick Sector Energy Efficiency Finance Guide” available from the Clay Brick Association (CBA) of South Africa. The difficulty in funding many energy efficiency projects is that it is often not straightforward to predict the potential savings accurately but similar projects delivered elsewhere can provide a useful guide.



The 12L tax incentive (refer to the “Clay brick Sector Energy Efficiency Finance Guide” for more detail) cannot be regarded as a potential source of funding as monies are returned via a reduction in tax well after the expense occurs (likely to be >1 year later).

Notwithstanding, if the business can find means to fund the project initially, the 12L tax incentive can be a useful revenue stream after the fact if the project proves to be successful. In this case, a successful 12L application would see the annual estimated saving of 120,695 kWh allow for a reduction in taxable income of R114 660 (R0.95/kWh). Applying company tax of 28%, the potential benefit would be R32 105 which would need to be considered against the potential cost of a 12L application and the timeframe.

LESSONS LEARNED

- Although the energy efficiency issue can appear simple on paper, there is often more to the problem than immediately meets the eye
- A focus on resolving an energy efficiency problem can have unexpected positive impacts
- In order to make the most gains out of an EE project, it may be necessary to incur expenditure on surrounding issues that are not strictly part of the project
- Air leaks can have a significant effect on the power consumption of kiln exhaust fans
- Regular kiln car maintenance (or the lack thereof) can have serious detrimental effects that are not initially clear
- Good project management and measurement / metering is crucial to establish the effectiveness of the intervention
- Good project management and measurement / metering could set the project up for a potential 12L claim should the savings prove significant and the cost of the 12L process is not too high.

For further information:

Energy Efficient Clay Brick Project
The Clay Brick Association of South Africa
Website: www.claybrick.org/eeeb