SUSTAINABILITY FACTSHEET #08

Switching to alternative fuels to reduce greenhouse gas emissions

Fuel switching is often considered an essential step in achieving a low-carbon future. It replaces inefficient fuels with cleaner alternatives, such as substituting coal for natural gas or a suitable biofuel.

Combined with modern technology, fuel switching can be a relatively simple approach to reducing energy consumption and costs for end-users, while also curbing carbon emissions.

Technical Contributors

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This project is co-funded by the European Union

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THE VOICE OF THE CLAY BRICK INDUSTRY

CLAYBRICK for good

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THE CHALLENGE

The clay brick sector emits 2.6 million tonnes of $C0_2$ per year and the biggest contributor to this being the over reliance on the combustion of coal to meet the energy demands of the brick kilns (CBA, 2017). Fuel switching practices replace or reduce the over dependence on inefficient, carbon intensive fuels such as coal with cleaner alternatives such as natural gas and biomass as explained below. According to the International Finance Corporation (IFC) (2018), other benefits that companies may experience from the switch to less carbon intensive fuels are:

- Preferential support from national and internal regulations in terms of fiscal incentives due to the massive drive to reduce carbon emissions.
- Energy security and reliability
- Improvements in performance and lower long-term operational costs

SWITCH FROM COAL TO NATURAL GAS

Essentially, natural gas is less Green House Gas (GHG) intensive than coal. In addition, the flexibility in installation of natural gas infrastructure as well as its high caloric value is beneficial for manufacturing industries in their drive to improve green properties of their products, reduce waste and lower their long-term operation costs (IFC, 2018). These characteristics place it as an important fuel alternative to coal, even if its price per giga joule (GJ) is higher.

The scope for a fuel conversion from coal to natural gas may vary from plant to plant but it involves key activities such as the extension of existing natural gas pipelines, decommissioning of the gasifiers that were used to burn the coal, and the installation of a new combustion system that includes:

- Kiln burners and fire control systems
- Air, gas and electrical reticulation
- Thermocouples and compensating cables
- Kiln transformer and switchgear
- Instrumentational panel, among others

The process of installing the gas infrastructure requires a significant capital investment but the long-term environmental, economic and social benefits make it a viable alternative to coal alongside the existence of different types of gas infrastructure and expertise to aid a fuel switch.

From an already implemented fuel switch project from coal to natural gas by Corobrick in their Driefontein and Lowly brick factories (2007 and 2006, respectively), they reported some benefits which included;

- An improvement in energy efficiency due to the elimination of energy loses from the gasification process
- Estimated reduction in carbon emissions of up to 38,062 tonnes per year for the Drienfontein plant
- Potential earnings from carbon credit sales because they are registered under Clean Development Mechanisms (CDM) projects
- Healthier work environment due to the reduction in airborne particulate matter and Sulphur associated with the combustion of coal
- On a larger scale, reduction on the impacts and emissions associated with coal mining and transportation.

SWITCH FROM COAL TO BIOMASS

Biomass is considered a sustainable fuel alternative to coal because it produces less GHG emissions and reduces the quantities of bio waste in the environment. Sources of biomass are wood and agricultural products such as wood offcuts, ethanol and bio diesel, among others.

Figure 1: A commercial charcoal retort in Sweden. Source: Harris, 2017

However, to be environmentally viable and not lead to further deforestation, biomass for brick making needs to be sourced form waste such as sawdust or wood offcuts from sawmills as well as biowaste transformed into bio char.

According to the South African Saw Milling Industry (2012), there are 1,000,000- 1,500,000 tonnes of wood waste available in South Africa for energy production. Therefore manufacturers, especially those using clamp kilns, can tap into this energy potential.

In the clamp kilns, the switch does not require major changes to the production process, but minor modifications in the design of the kiln to minimise heat losses. It may also require that manufacturers produce their own charcoal in charcoal retorts (See Figure 1) or source it from other companies already producing the charcoal such as Allbrick (Pty) Ltd.

The switch to from coal to biomass in South Africa's clay brick sector was initiated by Allbrick Pty Ltd in their clamp kilns. Their source of biomass is wood waste from the local sawmills in George that was used as a raw material in charcoal production. The charcoal is placed in the lattice of the clamp kilns, the kilns are sealed and the charcoal is lit. The bricks bake for 2.5 weeks and then cool for 1 to 1.5 weeks. Some of the anticipated benefits from the switch were:

- An estimated reduction of 5,604 tonnes of CO_2 emissions per year
- Reduction in the amount of wood waste stockpiled at the mills and the associated methane emissions.
- Skills development in charcoal making

Conclusion

A fuel switch from carbon to alternative sources of fuel such as natural gas and biomass majorly targets the reduction in CO_2 emissions heavily discharged by the mining, distribution and combustion of coal. Also, the carbon credits earned when fuel switch projects are registered as CDMs in turn earn the manufacturers some revenue.

References

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For further information:
The Clay Brick Association of South Africa
Website: www.claybrick.org