



COROMANDEL CEMENTS LIMITED

Modification of Furnace Grate Bars and Coal Particle Size

SUMMARY OF THE OPTION

Coromandel Cements Ltd, a small cement producer in India, implemented options to improve the combustion efficiency of its coal-fired furnace that supplies hot air to dry coal in the coal mill. It was observed that large lumps of coal were burnt on the furnace grate bars that were 50 mm apart from each other. This resulted in coal particles falling through the grate into the ash pit before they were completely burnt, and therefore lower temperatures of the hot air sent to the coal mill (making the drying of coal in the coal mill less effective). Options to resolve this included reducing the size of coal lumps fed into the furnace, reducing the distance between the furnace grate bars to 25 mm, and training of operators on coal feeding and combustion management of the furnace. Annual coal savings were 50 tons worth US\$ 2326 with an immediate payback period because no financial investment was necessary. Greenhouse gas emission reductions were 77 tons of CO₂ per year.

KEY WORDS

India, Cement, Furnaces & refractories, Coal mill, Hot air furnace

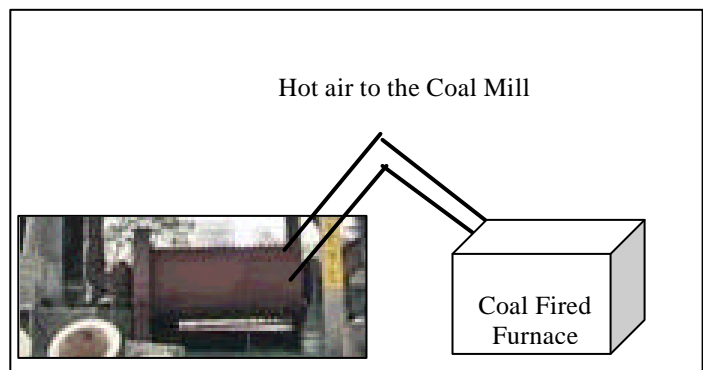
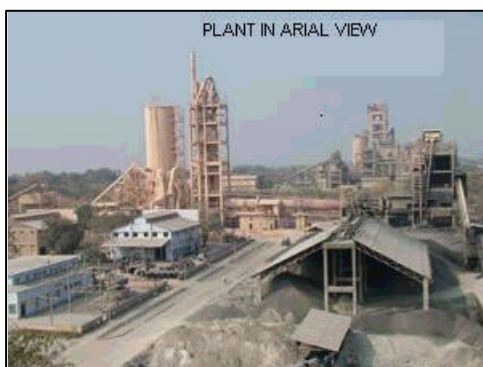
OBSERVATIONS

Coal is burnt in a furnace to provide hot air to the coal mill to dry coal prior to grinding (the drier the coal, the more efficient the grinding process). Three observations were made:

- A large amount of unburnt / semi-burnt coal particles in the ash pit at the bottom of the furnace
- A large amount of coal particles dropping through the grate bars into the ash pit
- The temperature of the hot air sent to the coal mill was measured to be 200 °C which is relatively low

Upon investigation this had two causes:

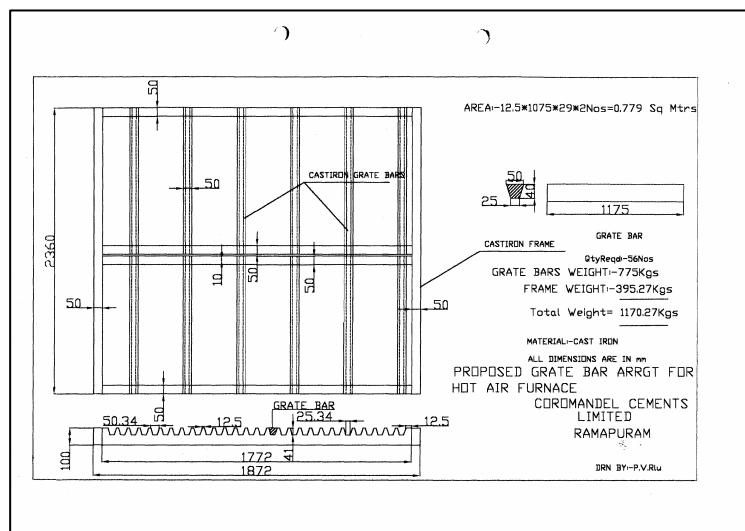
- Large coal lumps were fed into the furnace, resulting in high amounts of excess air because the coal could not be burnt effectively and therefore insufficiently hot air was sent to the coal mill
- The distance between the grate bars was large: 50 mm, resulting in coal particles falling through the grate into the ash pit below before the coal was burnt completely



OPTIONS

Three options were implemented:

- The coal size fed into the furnace was reduced
- The space between the grate bars in the furnace was reduced to 25 mm (see picture below)
- Operators were trained in proper coal feeding and combustion practices



RESULTS

Through the implementation of the three options, the overall combustion efficiency was improved resulting in an increase of the furnace outlet temperature (i.e. the temperature of the outgoing flue gases) from an average of 200 °C to 240 °C. This resulted in improved drying of coal in the coal mill (or less coal was needed in the furnace to achieve the same drying result). The financial, environmental and other results are as follows:

Financial benefits

- Investment: none
- Annual cost savings: Rs.1.0 lakh (US\$ 2326, @ Rs.43/US\$) (50 tons coal /year * Rs.2000/T Coal)
- Payback period: Immediate

Environmental benefits

- Annual coal savings: 50 tons, which was calculated as follows:
 - Clinker production: 450 TPD
 - Thermal Energy Reduction: 1.5 kCal/kg of clinker (Based on Coal drop test)
 - Daily energy savings: 675,000 kCal/day (= 450TPD X1.5 Kcal/kg Clinker)
 - Equivalent daily coal savings: 0.15 Tons/day (= 675,000 kCal/day/4500 kCal/kg)
- Annual GHG emission reduction: 77 tons CO₂ (= 50 tons/day X 1.53 T CO₂/T Coal) [1]

Other benefits

- Better operating conditions at the furnace locale
- Better reliability of coal mill output
- Better heat release in the kiln due to moisture reduction in coal.

[1] – General emission factor for coal, sourced from UNEP GHG Indicator: www.uneptie.org/energy/tools/ghgin/

FOR MORE INFORMATION

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