



ITC LIMITED

Reduction of Unburnt Coal and Coal fines in Boiler by Installing Fines Separation Mechanism and Low Speed Crusher

SUMMARY OF THE OPTION

M/s ITC Limited–Paperboards and Specialty Paper Division (ITC–PSPD), Bhadrachalam unit commenced its commercial production in October 1979. It is the largest and one of the best performing integrated pulp and paper plants in India with a design manufacturing capacity of 200,000 tons per annum (TPA) of paper and paper boards and was actually producing around 238,000 – 240,000 TPA. Notwithstanding, the unit, plans for an immediate expansion with the addition of another Paper Machine, thus taking the manufacturing capacity upto 285,000 TPA. The products range from Printing and writing paper of various grades, Poster paper, Uncoated paper board and Coated paper board. The annual electricity consumption is of the order of 242 million kWh and the thermal energy consumption totals 914913 million kCals/annum. The energy cost accounts for 5.12% of the manufacturing cost. The specific electricity consumption is 971 kWh/Ton and the specific thermal energy average is 3.87 million kCal/Ton.

The improvement options aimed at reducing coal fines and thereby, reduction in unburnts in boiler ash. This option involved the replacement of the high speed ring granulator/ impactor crusher by a pair of low speed roll crushers (primary and secondary) in series as well as a change in grade of coal to that containing less fines. This option was implemented in FBC 5, which has resulted in an increased bed temperature from 890 to 940 °C and reduced unburnt coal in ash of the order of 10 percent i.e. (from 18 – 20 percent to 8 – 10 percent).

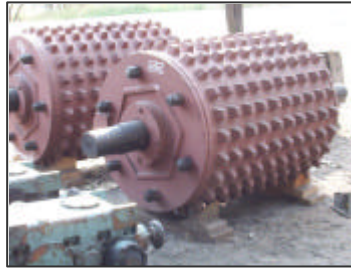
KEY WORDS

India, Pulp and Paper, Boilers and thermic fluid heaters, FBC boiler, Coal, Unburnt

OBSERVATIONS

A battery of Fluidized Bed Combustion (FBC) boilers, in addition to the recovery boiler together cater to the steam requirement of the processing sections as well as the Captive Power Generation plant. The unburnts in ash, from the boilers, was of the order of 18-20 percent which is much higher than the normal range i.e. 6-8 percent, for these types of boilers. The primary reason for the high percentage of unburnts in ash was identified to be the unduly high degree of fines in the coal received as well as that generated in the secondary high speed crusher. It was observed that fines (less than 1.0 mm size) accounted for nearly 35 - 40 percent of the coal being fed to the boiler. These types of boilers work best when coal fired is of a homogenous size of 6-8 mm. Fines percent (less than 1mm) in coal being fed to the boiler was very high 35 – 40 percent.

- As received coal itself consists of high degree of fines, about 25 percent.
- Balance fines (i.e. 10 – 15 percent) generated in the high speed crusher impactor.
- The primary crusher was a high speed Impactor cum Ring granular of 120 TPH capacity.
- Unburnts in ash of FBC boiler-5 was ranging between 18 – 20 percent
- The roller crushers were operated at a hydraulic pressure of 100 kg/cm² with a low speed of around 30 rpm.
- Primary roll crusher output size was -30 mm and the secondary roll crusher output size was -10 mm.



Primary Low Speed Crusher Rolls



Sec'y Low Speed Cru

OPTIONS

The improvement options involved,

- Replacement of the high speed ring granulator/ impactor crusher by a pair of low speed roll crushers (primary and secondary) in series
- Fines Separation Mechanism for Screening of Coal as received from the coal yard
- Making arrangements to feed the separated fine from the screens fro under the bed of the boiler and as well as change in grade of coal containing less fines. This option was implemented in FBC 5.

RESULTS

Financial benefits

- Investment: US\$ 149,989
- Annual cost savings: (Rs. 1500/ton of coal X 2713 TPY Coal): Rs. 40.7 lakhs (US\$ 94,640)
- Payback period: 19 months

Environmental benefits

- Annual coal savings: 2713 tons
- Annual GHG emission reduction: 4159 tons CO₂ (= 2713 TPY X 1.53 Tons CO₂/Ton of Coal) [1]

[1] – Sourced from UNEP GHG Calculator – General value

Coal savings were calculated as follows:

- Ash in coal
 - Steam generated: 575240 TPY
 - Evaporation Ratio: 5.36
 - Coal Consumption: 107420 TPY
 - Ash in Coal: 29.6% or 31796 tons per year (TPY)
- Unburnts in Ash
 - Before percent: 18 percent
 - After percent: 10 percent
 - Reduction: 8 percent (2544 TPY)
- Coal savings:
 - GCV of Coal (kCal/kg): 4800
 - GCV of unburnts in ash (kCal/kg): 80 percent of coal GCV): 3840
 - Boiler efficiency: 75 percent
 - Annual thermal energy loss reduction: 9768 Million kcal(= (2544 TPY X 1000 X 3840 kCal/kg unburnt)
 - Equivalent annual coal savings : 2713 TPY (= 9768 X 10⁶ kcal)/(4800 kCal/kg coal X 0.75)



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Other benefits

- Low level of noise pollution due to operation of low speed crushers
- Ash can be used for brick making or in cement industry as an admixture

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