

Successful Implementation – Energy Conservation Measure

Measure
Control of excess air in Fluidised Bed Combustion (FBC) Boilers
Equipment
Boilers
Industry / Sector
Pulp & Paper
Year of Implementation
1999
Cost Benefit Analysis
o Type of Measure: No investment
o Annual fuel Savings: 1400 Tonnes of coal
o Actual cost savings: Rs. 30.24 lakh
o Actual investment : Nil
o Payback: Immediate
Implementation Highlights
<ul style="list-style-type: none"> ☞ This measure was implemented by only controlling the flow of air into the boiler while maintaining the minimum velocity as this is a FBC boiler ☞ Numerous trials were carried out before arriving at the optimal operating point

Summary

Excess combustion air in the boiler carries away heat through the flue. A strict control on oxygen level, which is an indicator of excess air, improved the efficiency of the boiler by 1-2%.

Background

A paper manufacturing plant has 3 FBC boilers of 60 TPH of which 2 are in operation always. The boilers are coal fired. Steam generation of average 80-90 TPH at 60kgf caters to power & process requirement of the plant.

Boiler efficiency trials on the boilers were carried out by the energy auditor. Parameters like generation pattern, steam pressure, feed water temperature, Induced Draft & Forced Draft fan flow rates, flue gas temperatures, percentages of CO₂, O₂ & CO etc. were monitored.

The boiler operating efficiency was 78% to 79%. O₂ & CO₂ were around 13% & 7% respectively in the flue gases at 167°C.

The efficiency of the boilers was improved to 80% to 81% by controlling flow of air into the boiler such that O₂ levels were around 8.5% in the flue gases.

Principle

An optimum level of O₂ (air) is required in the boiler depending on type of boiler & type of fuel. If there is less than required quantity of air, combustion is poor. If the air quantity is more, the extra amount of air is just heated up and let out through the flue. O₂ levels are an indicator of the air flow into the boiler.

The O₂ levels have to be maintained at an optimum level by adjustment of damper openings, speed of fans, vane control etc. to ensure maximum operating efficiency of boilers at different operating loads.

Details of techno-economics:

Particulars	Actual energy savings
Improvement in boiler efficiency	1%
Savings in coal per month	120 tonnes
Annual Total energy savings, tonnes coal	1400
Annual Cost savings, Rs. lakh	30.24
Cost of implementation, Rs. lakh	Nil
Simple payback period, Year	Immediate

Implementation issues

- ☞ Plant operators were hesitant to lower the flow of air into the boiler. It was feared that by reducing flow the velocity of air would drastically reduce resulting in poor fluidization. The air velocity has been set at minimum level (18.5 m³ /sec) after trials.
- ☞ The online gas monitors were not functional and thus setting the operating points was a tedious exercise using fyrite kits.