

Project Description



No. 1 Power Boiler Overfire Air Delivery System Upgrade

Large Paper Company

Location: North America (US Southeast)

Project Scope

The No. 1 Power Boiler, supplied by Babcock and Wilcox in 1960, was originally designed to burn a combination of waste wood, natural gas, and fuel oil for a Maximum Continuous Rating (MCR) of 400,000 lb/hr of steam at 875 psig and 900°F. The ability to fire pulverized coal was added in 1980. The unit typically operated at a constant waste wood firing rate and utilized pulverized coal to meet steam demand. Prior to this project the boiler generated an annual average steaming rate of 313,000 lb/hr with 40% of the heat input from biomass.



The old overfire air (OFA) system consisted of several small circular ports arranged in multiple levels on the rear wall and front walls. Due to fundamental design limitations, there was insufficient flow and penetration of the OFA into the furnace, leading to higher CO emissions and increased carryover of unburned char and ash if waste wood firing was increased. The unit was typically operated with an indicated waste wood firing rate of around 25 tons per hour. During an in-depth evaluation of the boiler, it was estimated that with improved combustion air delivery and uniform fuel feed, the boiler's grate and furnace had the capability to sustain a waste wood firing rate exceeding 44 tons per hour. However, the existing fuel delivery and conveying system was deemed to not have sufficient capacity to deliver 44 tons per hour of waste wood.

The mill had a desire to improve the combustion performance of the No. 1 Power by upgrading the OFA system and fuel delivery. The goals of the upgrade project were:

- Reliably increase waste wood firing to at least 28 tons per hour.
- Reduce the reliance on burning auxiliary pulverized coal to maintain the steam demand.
- Maintain optimized boiler operation at the current lower waste wood delivery capacity limits.
- Design the combustion air system with sufficient flow capacity to achieve 44 tons per hour waste wood firing rate.

The new OFA system was installed in April of 2008. Four custom designed dual-range Jansen High Energy Combustion Air Nozzles™ were placed on each side wall, arranged in an interlaced pattern. A new higher capacity OFA Booster fan was installed to supply combustion air to the new OFA nozzles. The dual range design of the OFA nozzles allows the OFA flow to be optimized for both the current waste wood firing rates (limited by the current fuel delivery system capacity) as well as for future conditions of firing 44 tons per hour of waste wood (following future capacity upgrades to the fuel delivery system).

Results

Operation with the new OFA system resulted in the following demonstrated performance improvements:

- Achieved increase in waste wood firing rate by 24%.
- Reduced amount for pulverized coal co-firing to maintain the steam demand.
- Optimized OFA operation at the current lower waste wood firing rates with sufficient OFA flow capacity to achieve waste wood firing rates of 44 tons per hour.