

Project Description



No. 8 Power Boiler Overfire Air System Upgrade Nippon Paper Group - Port Angeles, Washington

Project Scope

The No. 8 Power Boiler was supplied by Combustion Engineering in the late 1950s and is a VU-40S unit originally designed to fire fuel oil. It was modified in 1976 to allow it to burn waste wood. The unit was designed to generate 120,000 lb/hr of steam at 550 °F and 225 psig from co-firing waste wood (fired on an air cooled traveling grate) and fuel oil. Prior to the upgrade project, the unit typically operated at steaming rates close to 90,000 lb/hr while firing a combination of waste wood and sludge. Grate combustion conditions were particularly poor in the winter season when the moisture content of the fuel would increase to 60%. The failure to maximize grate fuel firing rates (especially during the winter season) required the co-firing of costly fuel oil and the operation of a second oil-fired package boiler to meet the mill steam demand.



The old overfire air (OFA) system consisted of air ports on the boiler side walls that introduced OFA into the unit in a tangential pattern. A fundamental design limitation that caused insufficient OFA flow capacity and less than optimal mixing of the OFA with the in-flight fuel particles was identified by JANSEN during an in-depth evaluation of the boiler's operation.

To improve the combustion performance of the unit, the mill implemented an upgrade by JANSEN to the combustion air delivery system. The goals of the upgrade were to:

- Sustain a steam generation rate of 115,000 lb/hr from grate fuels alone.
- Reduce/eliminate auxiliary fuel oil firing.
- Maintain adequate combustion conditions and limit fly ash and char carryover when firing increased grate fuels.
- Maintain flue gas Carbon Monoxide (CO) and Nitrogen Oxides (NO_x) emissions below permit levels.

The combustion air system upgrade, implemented in summer of 2003, included the installation of a new OFA system. Four custom designed Jansen High Energy Combustion Air Nozzles™ were placed on each side wall, arranged in an interlaced pattern. The low pressure drop design of the JANSEN nozzles allowed increased OFA flow capacity and penetration. A new OFA booster fan was installed to supply combustion air to the new OFA nozzles.

Results

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

- Steam generation rates up to 115,000 lb/hr were reliably achieved from grate fuels firing alone.
- Annual mill-wide fuel oil firing was all but eliminated.
- Carryover of ash and char has been maintained to acceptable levels without compromising the performance, operation and integrity of the pollution control equipment.
- CO and NO_x emission compliance has been achieved at the increased grate fuel firing rates.