

# Project Description



## No. 3 Power Boiler Overfire Air Delivery System Upgrade Rayonier Inc., - Jesup, GA

### Project Scope

The No. 3 Power Boiler was supplied by Babcock and Wilcox in the early 1970s and designed to generate 206,000 lb/hr of steam at 750°F and 650 psig from firing waste wood alone (on an air cooled traveling grate) and up to 400,000 lb/hr with additional co-firing of fuel oil or natural gas. The unit was limited in achieving higher waste wood firing rates due to high ash and char carryover and piling of fuel on the grate. The fly ash removal systems were being overloaded and experienced frequent pluggage, requiring downtime. The unit periodically fired costly auxiliary fuels to meet steam demand.

The old overfire air (OFA) system consisted of multiple rows of small OFA ports located on the front and rear walls. Computational Fluid Dynamics Modeling of the boiler furnace illustrated the inadequacy of this system in terms of capacity and jet penetration to achieve high burnout of the in-flight char and ash particles when operating at higher waste wood firing rates. Subsequent modeling of the furnace with improved OFA delivery showed significant improvements in grate fuel burning and boiler operation.

In order to improve the unit's combustion performance and reliably increase waste wood firing rates, the mill implemented upgrades to the boiler scrubber system and fuel delivery systems, and installed a feedwater heater and a new instrumentation and control system. In addition, JANSEN provided an upgrade to the OFA system, with the goals of:

- Sustaining a minimum steam generation rate of 233,000 lb/hr from waste wood firing alone.
- Reducing/eliminating auxiliary fuel oil and/or natural gas firing.
- Maintaining adequate combustion conditions and limiting fly ash and char carryover when firing increased grate fuels.
- Maintaining flue gas Carbon Monoxide (CO) and Nitrogen Oxides (NO<sub>x</sub>) emissions below permit levels.

The new OFA system was installed in March of 2006. 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. The existing forced draft fan was retained to supply combustion air to the new OFA nozzles without requiring a fan upgrade or an additional high pressure fan. A separate ambient air fuel distributor air fan was installed to supply high pressure air to the wind-swept wood distributors.

### Results

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

- Steam generation rates of up to 300,000 lb/hr were achieved from waste wood firing alone.
- Fuel oil and natural gas co-firing has been greatly reduced.
- Carryover of ash and char have been maintained to acceptable levels without compromising the performance, operation and integrity of the pollution control equipment.
- CO and NO<sub>x</sub> emission compliance has been achieved at the increased waste wood firing rates.

