

Project Description



No. 9 Power Boiler OFA Delivery System Upgrade
SAPPI Fine Paper North America
Cloquet, Minnesota

Project Scope

The No. 9 Power Boiler at SAPPI's mill in Cloquet, Minnesota, is a Combustion Engineering (CE) VU-40 unit that was placed into service in 1980. It was originally designed to burn bark on a traveling grate in combination with fossil fuels at steaming rates of up to 300,000 lb/hr, at 650 psig and 750°F. SAPPI wished to increase bark and sludge burning in the unit to generate up to 250,000 lb/hr of steam from grate fuels alone, while still reaching 300,000 lb/hr when co-firing natural gas. The mill's goals included:

- Reduce fly ash carryover.
- Lower unburned carbon in the ash.
- Increase boiler efficiency.
- Improve CO emissions to meet upcoming Boiler MACT limits.



Following an engineering evaluation (including circulation study for generating up to 350,000 lb/hr of steam) and CFD modeling of the boiler, a new JANSEN overfire air (OFA) system was designed and installed in October 2011. At the same time, new fuel distributors were installed to improve the uniformity of fuel distribution over the grate.

Results

Initial testing following start-up in late 2011 resulted in recurring problems with fuel piling and elevated CO emissions. With JANSEN's assistance, it was determined that changes to the undergrate air (UGA) zone damper settings during the boiler outage had caused non-uniform UGA distribution through the grate, resulting in poor grate combustion in some areas. Once the UGA zone dampers were adjusted to a more closed position, the UGA distribution improved and the boiler was able to meet all of its performance guarantees. Over an eight-hour test period, the CO emissions were 28% below the guarantee level, while firing at an extremely high grate heat input rate and an overall steam generation rate of 300,000 lb/hr.