

# Project Description



*Combustion System Upgrade of the No. 3 Power Boiler  
Domtar Industries Inc.,  
Rothschild, Wisconsin*

## Project Scope

Domtar Industries Inc. (Domtar) operates a grate fuel-fired boiler at its paper mill in Rothschild, Wisconsin (No. 3 Power Boiler). The boiler was originally supplied in 1957 by Union Iron Works to fire coal on a spreader stoker to generate 90,000 lb/hr of steam. In 1975, the unit was converted to burn waste wood on a traveling grate. The grate fuel currently fired in the boiler is a mix of purchased wood wastes, mill generated waste wood (called wood room fuel), and screen pellets (compressed and pelletized wood knots).



Historically, the boiler had not been able to reliably achieve carbon monoxide (CO) emissions compliance at increased steaming rates. CO emissions during normal boiler operation could be maintained below the permit limit only at significantly lower steaming rates in the 55,000 lb/hr range. Limited steam generation from the No. 3 Power Boiler would require a significant amount of fuel oil firing in another boiler to meet the total mill steam demand. Domtar's goal was to improve the performance of the boiler so that higher steam generation rates could be realized while maintaining CO emissions compliance; increasing the No. 3 Power Boiler's steam generation rate would allow the mill to realize significant cost savings by lowering the fuel oil firing rates in the other boiler.

Domtar contracted JANSEN to evaluate the operation of the boiler, to evaluate the feasibility of meeting its goals, and to develop design concepts to overcome boiler limitations. The project was initiated by an engineering site visit where boiler operating data was collected and evaluated to develop a baseline of boiler operation. Computational Fluid Dynamics (CFD) modeling was implemented to evaluate combustion conditions within the furnace. The results showed that poor CO emissions performance resulted from insufficient forced draft (FD) fan capacity, and inadequate penetration and mixing of the existing overfire air (OFA) system. Modeling also showed increased CO emissions to result from non-uniform fuel delivery profiles generated by the original fuel distributors. Modeling of the furnace with a higher capacity FD fan supplying adequate amounts of combustion air to the unit, a modern side wall interlaced OFA system, and the installation of modern fuel distributors showed significant improvements in CO burnout at increased steam generation rates.

## Results

The combustion system upgrade on the No. 3 Power Boiler was implemented in two discrete steps. During the first step in 2008, the existing fuel distributors were replaced with modern fuel distributors. The second step implemented in 2011, included the upgrade of the FD fan and the OFA system. Subsequent testing has shown that the unit can be operated at steaming rates that are more than 20% higher than those prior to the upgrade, with CO levels that have been lowered by more than 40%. In addition, compliance with nitrogen oxides (NO<sub>x</sub>) emissions has also been maintained and oil firing in the other boiler was significantly reduced. In all, Domtar is very pleased with the boiler's improved performance.