2019 **Title:** **Combustion System Upgrade on CKPI's Biomass-Fired Boiler**

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ABSTRACT:

Canadian Kraft Paper Industries Ltd (CKPI) operates the No. 2 Power Boiler at its mill in The Pas, Manitoba, Canada. The boiler was designed to generate up to 275,000 lb/hr of steam on Bunker C oil firing or a combination of oil and biomass fuel. The unit was originally equipped with a stationary pinhole grate that sloped downward from front to rear, with a steeper drop over the front half. This design caused most of the biomass combustion to occur at the bottom of the steeply sloped grate portion, resulting in limited steam generation from biomass, frequent oil co-firing, high carbon monoxide (CO) emissions, and high carryover of biomass fuel particles into the upper furnace.

In 2017, the mill contracted Jansen Combustion and Boiler Technologies, Inc. (JANSEN) to design and supply major elements for a combustion system upgrade. The mill's goals included increasing steam generation from biomass, reducing oil co-firing, and decreasing excess air and char carryover. The project began with a boiler evaluation that characterized the deficiencies of the existing boiler, defined necessary pressure part modifications to support a new continuous ash discharge grate, and determined upgrades to optimize fuel and combustion air delivery.

The boiler upgrades were installed between July and September 2018. JANSEN's scope of supply included design and supply of modifications to the combustion air system, fuel delivery equipment, and ash handling equipment, as well as boiler pressure part modifications to accommodate a new Detroit® RotoStoker VCG grate supplied by Detroit Stoker Company. Boiler tuning during start-up in September and again in November showed greatly improved combustion conditions without the need for oil co-firing. Improved combustion led to reductions in fly ash collection of 60% to 80%. Average reductions in CO were approximately 50% while operating at higher biomass firing rates, based on spot check field measurements before and after the upgrade.

This paper describes the process that led to a successful upgrade project, including data collection and analyses, Computational Fluid Dynamics (CFD) modeling, equipment design, supply and installation of the modifications, operator training, start-up assistance, and post-start-up tuning.