Project Description

JANSEN Combustion and Boiler Technologies, Inc.

Bubbling Fluidized Bed Secondary Air Delivery System Upgrade
Catalyst Paper
Pt. Alberni, British Columbia, Canada

Project Scope

The No. 4 Boiler at Pt. Alberni is a Combustion Engineering (CE) unit that was originally placed into service in 1975. It was designed to burn bark and sludge on a traveling grate at a steaming rate of up to 300,000 lb/hr, at 625 psig and 750°F. After years of struggling to generate over 200,000 lb/hr of steam due to poor combustion conditions resulting from high moisture content fuel, the unit was converted to a bubbling fluidized bed (BFB) boiler by Kværner Pulping in 1997. The modified unit's new steaming rate when burning bark, sludge and tire derived fuel (TDF) was projected to be 340,000 lb/hr. The lower furnace and grate were removed and replaced with a BFB section that has a much larger cross-sectional area.

Experience showed that the unit's secondary air (SA) system was undersized. At high steaming rates, the SA system reached its maximum capacity of about 89,000 lb/hr and much combustion air was shifted to a tertiary air (TA) level high in the furnace. The resulting stretched combustion zone contributed to high carbon monoxide (CO) emissions, high carbon carryover, and high furnace exit gas temperatures. Also, during wet weather (winter) conditions, the unit had difficulty maintaining adequate bed temperatures to achieve stable and complete combustion. Poor furnace combustion in combination with elevated flue gas temperatures were also found to be contributors to dioxin formation in downstream ash deposits.

The mill's goals were to increase the capacity and effectiveness of the SA system in order to achieve the following results:

- Improved CO and char burnout in the furnace.
- Hotter flue gas conditions in the lower furnace to feed heat into the fluidized bed and allow higher moisture content fuel.
- Reduced furnace exit gas temperature, resulting in potential reduction in downstream dioxin formation.

Following an engineering evaluation and CFD modeling of the boiler, a new JANSEN SA system was designed and installed in November 2011 at the same time that the mill installed an enlarged replacement economizer.

Results

Follow-up testing in January 2012 (winter conditions) revealed the following performance improvements:

- Over 50% increase in SA flow delivery capacity.
- Over 33 % increase in total heat input to the boiler compared to typical pre-upgrade performance, and 6% increase compared to the original BFB upgrade design.
- 37% reduction in CO emissions and less observed char carryover compared to pre-upgrade conditions, even when firing at ~14% increase in load.

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