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OFFICE OF INDUSTRIAL TECHNOLOGIES
ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY

Benefits

- Almost 14,000 million British thermal units (MMBtu) in annual energy savings
- $31,000 annual savings in fuel costs
- Decreased energy losses resulting from boiler blowdown
- 6-month simple payback period

Applications

Typical blowdown flows range from 3 to 15 percent of a boiler's steam generating capacity. Any boiler with continuous surface blowdown exceeding 5 percent of the steam generation rate is a good candidate for blowdown waste heat recovery.

Boiler Blowdown Heat Recovery Project Reduces Steam System Energy Losses at Augusta Newsprint

Summary

The boiler blowdown process involves the periodic or continuous removal of water from a boiler to remove accumulated dissolved solids and/or sludges. During the process, water is discharged from the boiler to avoid the negative impacts of dissolved solids or impurities on boiler efficiency and maintenance. However, boiler blowdown wastes energy because the blown down liquid is at about the same temperature as the steam produced. Much of this heat can be recovered by routing the blown down liquid through a heat exchanger that preheats the boiler's makeup water. A boiler blowdown heat recovery project at Augusta Newsprint Company's Augusta, Georgia, mill will save almost $31,000 annually in fuel costs.

Plant Overview

The Augusta Newsprint mill is part of a joint partnership between Abitibi Consolidated and the Woodbridge Company, Ltd. The mill produces up to 440,000 metric tons of standard newsprint each year from southern pine and recycled newspaper and magazines. The mill has 2 paper machines and employs 380 workers.

Abitibi-Consolidated is a global leader in newsprint and uncoated groundwood papers with ownership interests in 27 paper mills in Canada, the United States, the United Kingdom, and Asia (including its 50 percent interest in Pan Asia Paper Company). The company also has ownership interest in 22 sawmills, 2 remanufacturing facilities, and a market pulp mill. Abitibi-Consolidated employs approximately 18,000 people and supplies products in nearly 100 countries.

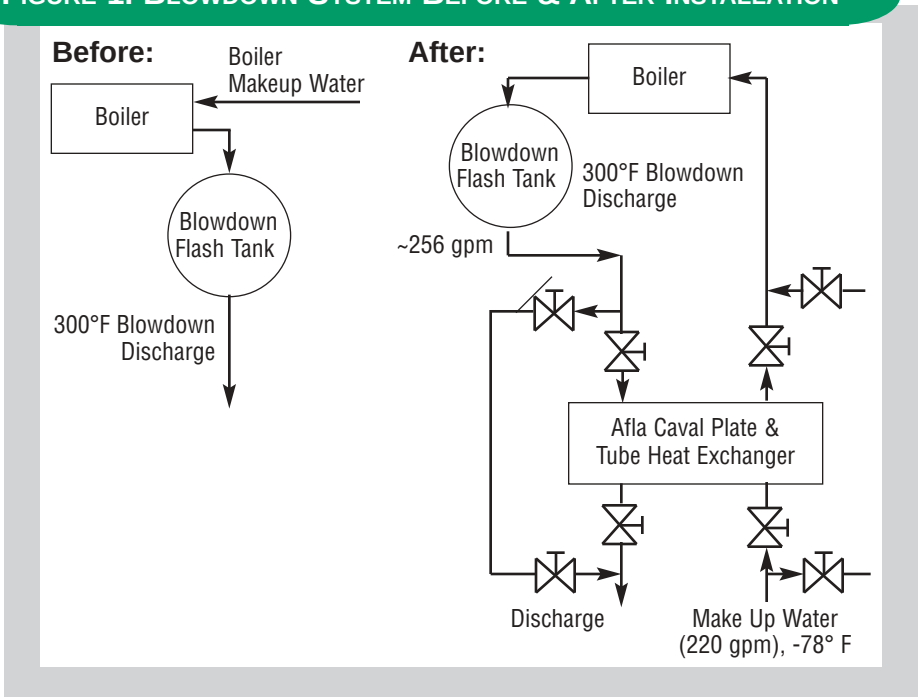
Project Overview

Blowdown is essential for continued operation of any steam boiler. However, blowdown represents an energy loss to the steam system. Although the blowdown rate at Augusta Newsprint is typical of most boilers, recovering the heat resident in the blowdown stream can save energy. Currently, the continuous boiler blowdown is routed to a flash tank where the pressure is reduced from 300 pounds per square inch gauge (psig) to approximately 55 psig. Flash steam produced in the pressure reduction process is piped into the deaerator to offset deaeration steam demand. This operation is currently saving the mill about $10,000 per year in fuel costs. Additional energy can be recovered from the contaminated condensate exiting the flash vessel. The condensate dissipates energy that could be utilized to preheat makeup water. Figure 1 shows a schematic of the boiler blowdown system before and after heat exchanger installation.

Project Implementation

As water evaporates within a boiler, dissolved solids in the water are left at the bottom of the boiler, resulting in buildup of sludge and scale. This buildup is alleviated by

Figure 1. Blowdown System Before & After Installation



discharging some boiler water through a valve at the bottom of the boiler. High concentrations of solids can also lead to foaming near the top of the boiler and result in water hammer, which may damage piping, steam traps, and process equipment. Skimming or surface blowdown removes the dissolved solids near the surface of the liquid and is usually a continuous process. This flow is routed through a heat exchanger. The amount of blowdown necessary depends on boiler operating pressure, amount of makeup water, impurity levels in the make up water, and the dissolved solids concentrations that a given boiler can tolerate.

Augusta mill personnel modified the existing boiler blowdown system to recover the energy from the continuous blowdown stream from the boiler blowdown flash tank. Modifications included installing a plate-and-tube heat exchanger and associated piping (Figure 1). The 300° F water from the flash tank drain was routed to the "hot side" of the heat exchanger to preheat boiler feedwater passing through the other side of the heat exchanger.

Results

At the Augusta mill, preheating the boiler feedwater by 17° F will save almost $31,000 in annual fuel costs. These calculations are based on a normal feedwater flow of 220 gallons per minute, a temperature differential of 17° F, and a fuel cost of $2.33 per 1,000 pounds of steam. The total cost of the project is $15,000; the simple payback period is about 6 months. Nearly 14,000 million British thermal units in annual energy savings are expected.

Industry of the Future—Forest Products and Agenda 2020

*In November 1994, DOE's Secretary of Energy and the Chairman of the American Forest and Paper Association signed a compact, establishing a research partnership involving the forest products industry and DOE. A key feature of this partnership was a strategic technology plan-**Agenda 2020: A Technology Vision and Research Agenda for America's Forest, Wood, and Paper Industry**. Agenda 2020 includes goals for the research partnership and a plan to address the industry's needs in six critical areas:*

- *Energy performance*
- *Environmental performance*
- *Capital effectiveness*
- *Recycling*
- *Sensors and controls*
- *Sustainable forestry*

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BestPractices is part of the Office of Industrial Technologies' (OIT's) Industries of the Future strategy, which helps the country's most energy-intensive industries improve their competitiveness. BestPractices brings together the best-available and emerging technologies and practices to help companies begin improving energy efficiency, environmental performance, and productivity right now.

BestPractices emphasizes plant systems, where significant efficiency improvements and savings can be achieved. Industry gains easy access to near-term and long-term solutions for improving the performance of motor, steam, compressed air, and process heating systems. In addition, the Industrial Assessment Centers provide comprehensive industrial energy evaluations to small- and medium-size manufacturers.

Project Partners

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