Application Brief

Pulp & Paper

Pulp & Paper Mill

There are more than 20,000 pulp and paper manufacturing facilities worldwide, with an estimated 700 facilities throughout the U.S. and 900 facilities in Europe. Trees used in papermaking are put through a debarker and a chipper, where they are reduced to approximately one-inch wood chips. The wood chips are pressure cooked in a digester and become pulp, which is refined, turned into slush, and screened. Screening drains away liquid, and the resulting pulp is pressed into paper.

Several steps within the pulp and papermaking process create emissions that must be monitored and reported:

- Bark is typically burned as fuel for a boiler.
- Chemicals (green liquor and white liquor) used in the digester to separate the cellulose fibers that become pulp result in emissions containing formaldehyde, methanol, acetaldehyde, and methyl ethyl ketone.
- High temperatures during the washing and screening processes generate exhaust gases.
- Any bleaching process includes chlorine or peroxide that must be vented.
- Fiber particles and chemicals are filtered out and recovered. The recovered material is called "black liquor" and is burned in a recovery boiler to provide additional power for the mill, generating exhaust gases.
- Wastewater generated during the pulp process is diverted to a wastewater treatment facility, where it is treated and recycled before being reused or released. (See the "Wastewater Application Note" for additional information.)

Creating paper pulp relies on a careful balance of low velocity air flows among the various processes. For example, the recovery boiler following the digester must be modulated to follow changes in the digester load. Other imbalances can:

- Create excessive amounts of pollutant gases
- Reduce chemical recovery efficiency
- Reduce the boiler's steam production
- Create extra soot to coat boiler tubes
- Cause excess corrosion problems for boiler components

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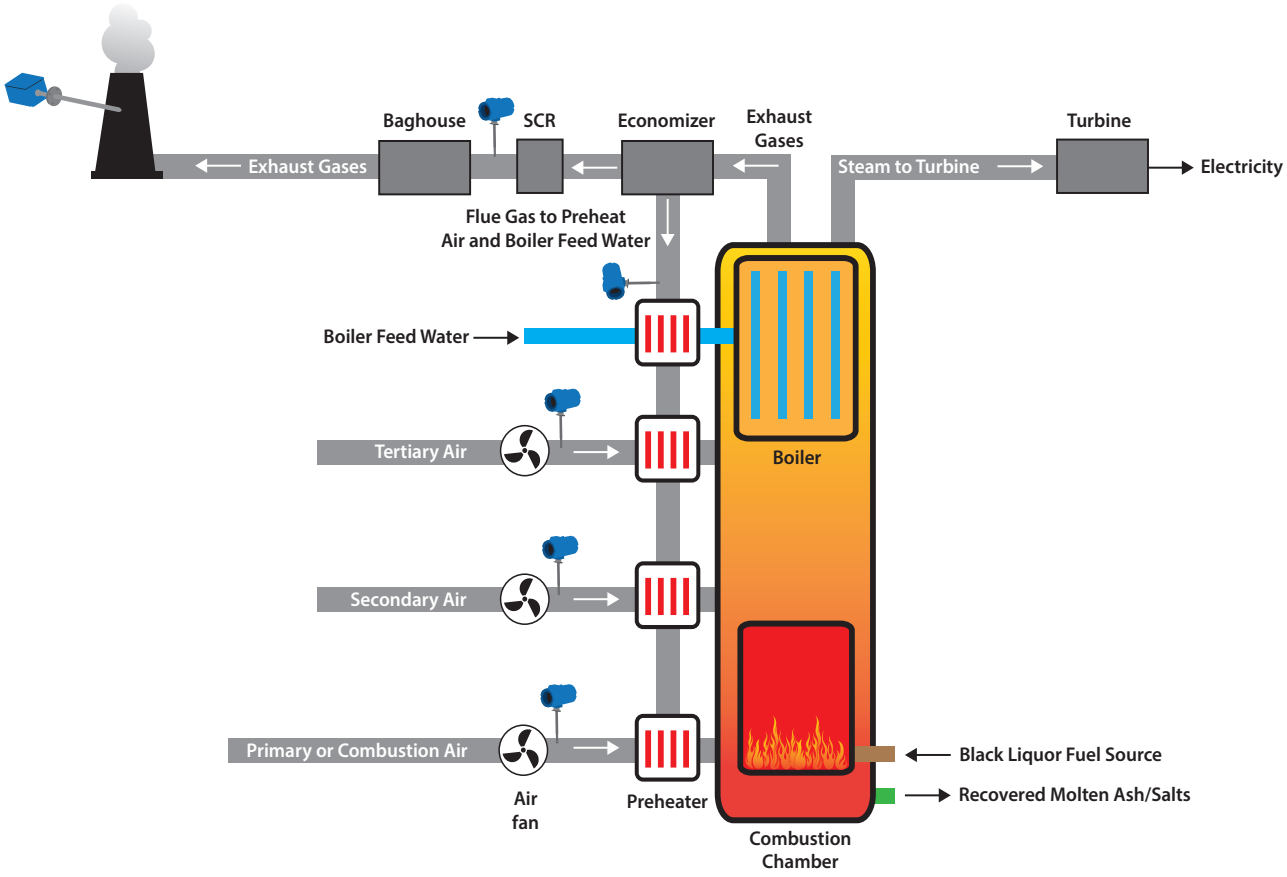

Refer to the Wasterwater application note for additional opportunities.

Simplified Recovery Boiler

A recovery boiler uses the chemical reaction of the black liquor to generate heat for the boiler. It has three air flow systems that must be accurately controlled to create stable air flows:

- The primary air flow system maximizes chemical recovery. Primary air optimizes bed size, shape, and temperature.
- A secondary air flow system is used to maintain complete combustion with dynamic mixing. The secondary air dehydrates the black liquor, and controls bed size, shape, and height.
- A tertiary air flow system is used to prevent the chemical reaction/processes from reaching the upper regions of the boiler and damaging the boiler tubes. This also generates an even temperature profile across the unit.
- The molten waste is recovered and dissolved in water to create the green liquor used in the separation process.

Specific installations have included flow meters used in the following environments:

- Measuring combustion air to a boiler
- Measuring primary/secondary/tertiary air to a recovery boiler
- Monitoring stack flue gas
- Measuring stack emissions
- Monitoring digester gases and aeration air
- Measuring inlet combustion air to gas turbine generator sets
- Controlling tight fuel-to-air tolerances, such as with natural gas
- Measuring turbine exhaust gases
- Measuring overfire and underfire air

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