

Micro Motion® Coriolis Meters Improve Efficiency, Savings in Black Liquor Recovery

RESULTS

- Better throughput and lower recovery costs
- Better compliance with environmental regulations
- Accuracy unaffected by changes in temperature and viscosity
- Lowered maintenance costs



APPLICATION

Alkaline pulp mills produce large quantities of black liquor — a complex mixture of organic compounds and inorganic salts — as a byproduct of the wood digestion process. The black liquor is put through a recovery process, which reclaims valuable chemicals from the spent liquor and combusts the organic materials to produce steam energy for use in the mill. Measurement and control of the percent solids and heating value of the black liquor is critical to the economy of the recovery process.

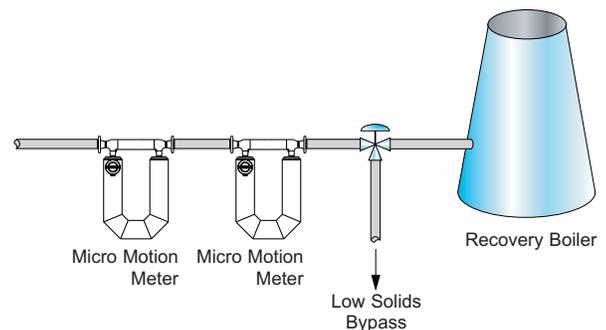
Percent solids is derived from measuring density and temperature. An accurate percent solids measurement allows operators to better control the solids delivered to recovery boilers.

The average heating value is determined through the continuous on-line measurement of mass flow. Knowing the liquor's heating value is important for the steady-state operation of a recovery boiler. Heating value has a large impact on steam generation rate, and on the maximum pulp production rate the boiler can support.

CHALLENGES

The recovery of black liquor is often a bottleneck in a pulping mill, particularly as pulp mills implement extended delignification or oxygen delignification to minimize environmental impact. Much of the holdup is caused by the inaccuracy and high maintenance requirements of traditional measurement technologies.

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The historical way to measure the density of black liquor is with a refractometer. Refractometers require regular recalibration and cleaning due to drift associated with, among other things, build-up of material on the lens. As this material build-up accrues, the accuracy of the refractometer suffers, and finally the line must be stopped so that the lens can be cleaned.

Flow rates have been typically measured with velocity-based magnetic flow meters. Because such meters measure volume, their accuracy decreases as the temperature of the black liquor varies away from reference temperature. Furthermore, the volumetric measurement must be converted into a mass flow value in order to determine heating value, mass combusted and boiler efficiency.

SOLUTION

Micro Motion® Coriolis flow meters provide robust, reliable and highly accurate measurement of three independent variables: mass flow, density, and temperature. Based on the density and temperature measurements, Micro Motion Coriolis meters can be used to measure the percent solids of black liquor. The relationship between the density, temperature, and percent solids of black liquor has been well established with laboratory tests and mathematical modeling across various wood species and pulping conditions. This data provides a curve that can be used for the accurate, reliable measurement of percent solids in black liquor.

By tracking percent solids through evaporators, concentrators, and into the firing line, the efficiency of the recovery process can be optimized. Calculations show that increasing solids levels by 2% for a recovery boiler firing 300 GPM of black liquor will yield \$160,000 in annual savings.

Because Micro Motion Coriolis meters measure mass flow directly, fewer calculations are necessary to determine the average heating value, resulting in more accurate process data and greater recovery efficiency. The mass flow accuracy of the meter remains constant through changes in liquor viscosity and temperature.

By design, Micro Motion sensors have no moving parts or obstructions. The fluid comes into contact with only the tube surface, as in conventional pipe flow. The flow itself, or occasional CIP flushing, removes any build-up of material that may occur on the flow tubes and associated process piping. This dramatically reduces metering maintenance costs.

SUMMARY

Realizing liquor recovery savings is a function of accurate and reliable measurement and control. Micro Motion meters measure mass flow and density directly, allowing for accurate online calculation of percent solids and average heating value, regardless of changes in viscosity or temperature. And the lack of intrusive parts means Micro Motion meters can operate virtually maintenance-free in the process line.

The improved solids and heating value data can help mills dramatically reduce the expense of liquor recovery while simultaneously meeting environmental goals.

