

2001 **Title:**           **The Use of Ultrasonic Flow Monitoring for Analyzing Recovery Boiler Circulation**

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**ABSTRACT:**

Recovery boilers are used to dispose of black liquor while recovering pulping chemicals and producing steam. Due to the presence of a molten salt pool on the hearth of the furnace, a tube leak in the boiler can lead to a smelt-water explosion. Poor circulation of water in boiler tubes can lead to tube overheating and failure. As liquor firing (and heat input rates) increase, adequate circulation is more critical.

In the design of a recovery boiler, circulation rates are calculated. Calculations can also be used to project the effect of new operating conditions on circulation or to investigate suspected circulation problems. However, at times, a direct measurement of flow is desired due to extenuating factors that are difficult to predict, or include, in a circulation model. Pitot tubes have often been used for measuring flows in boiler circuits, but they have limitations. We have developed an alternative technique for determining flows in recovery boiler circuits called Ultrasonic Flow Monitoring (UFM). UFM overcomes many of the problems associated with Pitot tubes, and we have used this technique to evaluate circulation in over a dozen recovery boilers.

In one boiler, UFM was used to determine the effect of the steaming rate on circulation. UFM has been used to monitor the side-to-side differences in the wall circuits of a boiler and to show the effect of heat input on the flow rates in the circuits. In another boiler, the flows to the various wall circuits were measured by installing UFM probes on the supply tubes. UFM was used to measure the flow in wall tubes to determine the average flows and to evaluate the stability. In the last example, very low flows were measured in the generating bank of a single drum unit.