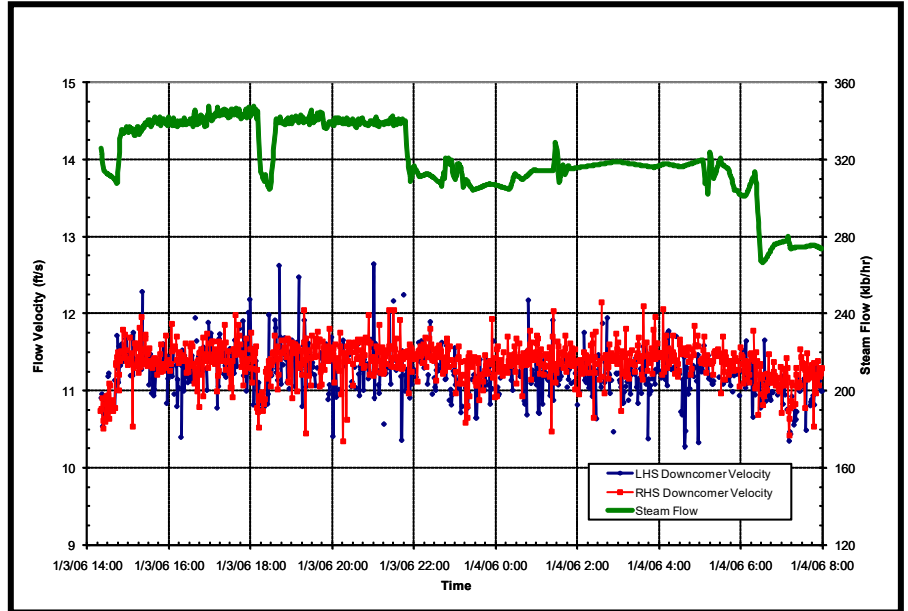
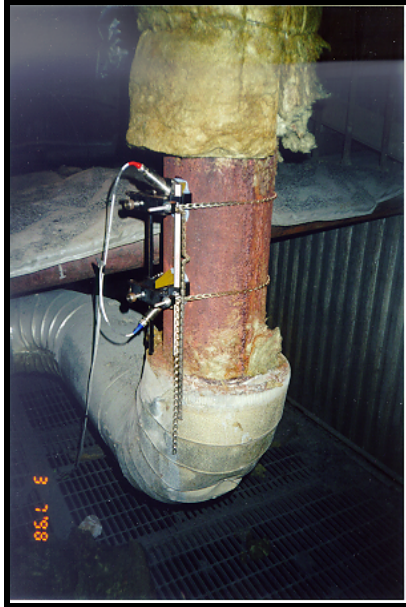


## PROJECT CAPABILITIES

### ULTRASONIC FLOW MONITORING (UFM) OF BOILER CIRCULATION



### Scope of Service

A valuable technique used by JANSEN during its analyses of circulation conditions is the application of Ultrasonic Flow Monitoring (UFM). UFM allows for direct water velocity measurements in selected downcomers and boiler furnace tubes without penetrating the pressure part boundary (as this is needed when using Pitot tubes). Therefore, UFM measurements require no boiler downtime.

UFM data provide invaluable input in the evaluation of boiler circulation conditions. The technique has been used successfully for making flow measurements on tubes and pipes with diameters from 2½ inch to 22 inch and water velocities from less than 0.1 ft/sec to over 14 ft/sec at temperatures up to 600°F.

For many applications, the UFM technique offers the following benefits and advantages:

- UFM instrumentation is clamped onto the outside of a tube rather than drilling and welding Pitot tubes.
- UFM instrumentation is mounted while the boiler is on-line.
- UFM instrumentation can be easily moved to different locations.
- UFM instrumentation makes a line-scan measurement across the pipe rather than a single point.
- UFM instrumentation can detect reversal of flow direction.
- UFM instrumentation can be calibrated mid-way during testing.
- UFM instrumentation can accurately measure flows as low as 0.1 ft/sec.

**Selected References (see next page)**

## Selected References

### UFM of Boiler Circulation

Alabama River Cellulose - Perdue Hill, AL  
 APRIL Group - Rizhao, China (2 units)  
 AV Nackawic - Nackawic, NB  
 Bahia Specialty Cellulose SA - Camaçari, BA, Brazil  
 Boise - Jackson, AL  
 Boise - International Falls, MN  
 Boise Paper - Wallula, WA (2 units)  
 Bukoza - Hencovce, Slovakia  
 Canadian Kraft Paper Industries - The Pas, MB  
 Cariboo Pulp & Paper - Quesnel, BC  
 Carter Holt Harvey Pulp & Paper Ltd. - Tokoroa, NZ  
 Cascade Pacific Pulp - Halsey, OR  
 Catalyst Paper - Biron, WI  
 Champion International - Quinnesec, MI  
 Confidential Client - North America  
 Covanta Energy - Hartford, CT  
 Domtar Corporation - Ashdown, AR  
 Domtar Corporation - Bennettsville, SC  
 Domtar Corporation - Nekoosa, WI  
 Donohue Inc. - St.-Félicien, QC  
 Finch Paper LLC - Glens Falls, NY  
 Fraser Papers Inc. - Park Falls, WI  
 Georgia-Pacific - Camas, WA  
 Georgia-Pacific - New Augusta, MS  
 Georgia-Pacific - Wauna, OR  
 Glatfelter - Chillicothe, OH  
 Graphic Packaging Inc. - Macon, GA  
 Graphic Packaging Inc. - West Monroe, LA  
 Grupo Cassa - Izalco, El Salvador  
 Howe Sound Pulp & Paper - Port Mellon, BC  
 International Paper Company - Courtland, AL  
 International Paper Company - Luíz Antônio, Brazil  
 International Paper Company - Mansfield, LA (2 units)  
 International Paper Company - Pine Bluff, AR  
 International Paper Company - Pine Hill, AL (3 units)  
 International Paper Company - Pineville, LA  
 International Paper Company - Riegelwood, NC  
 International Paper Company - Svetogorsk, Russia (2 units)  
 KapStone Paper - Roanoke Rapids, NC  
 Louisiana Pacific - Samoa, CA  
 Mead Paper - Chillicothe, OH  
 Mead Paper - Escanaba, MI  
 MeadWestvaco - Phenix City, AL (2 units)  
 Minnesota Power - Duluth, MN  
 Minnesota Power - Grand Rapids, MN  
 Mondi Group - Richards Bay, South Africa  
 Mondi Group - Ružomberok, Slovakia (2 units)  
 Mondi Group - Syktyvkar, Russia  
 Montenay Onyx - Burnaby, BC  
 New Ulm Public Utilities - New Ulm, MN  
 Northwood Pulp & Timber Ltd. - Prince George, BC  
 Plainwell Paper - Anderson, CA  
 Pope & Talbot - Halsey, OR  
 Rayonier Inc. - Jesup, GA  
 Rayonier Inc. - Fernandina Beach, FL  
 ReEnergy Holdings - Lyonsdale, NY  
 Rentech Energy Midwest Corporation - East Dubuque, IL  
 RockTenn - Demopolis, AL  
 Sappi - Ngodwana, South Africa  
 Sappi North America - Muskegon, MI  
 Sappi North America - Skowhegan, ME  
 Simpson Tacoma Kraft - Tacoma, WA  
 SP Newsprint - Newberg, OR  
 Stora Enso North America - Wisconsin Rapids, WI  
 Twin Rivers Paper - Edmundston, NB  
 Weldwood of Canada - Hinton, AT  
 WestRock - Phenix City AL (2 units)  
 Westvaco - Covington, VA  
 Westvaco - Wickliffe, KY  
 Weyerhaeuser Corporation - Longview, WA  
 Weyerhaeuser Corporation - Oglethorpe, GA  
 Weyerhaeuser Corporation - Port Wentworth, GA