Be Right™

Fiber Loss Challenges at Tissue Mills

Reducing Fiber Loss and Wastewater Discharge with TSS Sensors from Hach

Problem

A tissue mill in the southeastern United States was struggling with high rates of fiber loss, resulting in excessive wastewater generation, raw material waste, unscheduled maintenance and high sludge removal and haul-off expenses. High solids concentration, foam content and 'sticky' nature of fibers prevented other analytical approaches from providing reliable data due to sample line clogs and unreliable calibrations. Consequently, operators had limited understanding of fiber loss over time and no means to associate loss events to individual tissue machines.

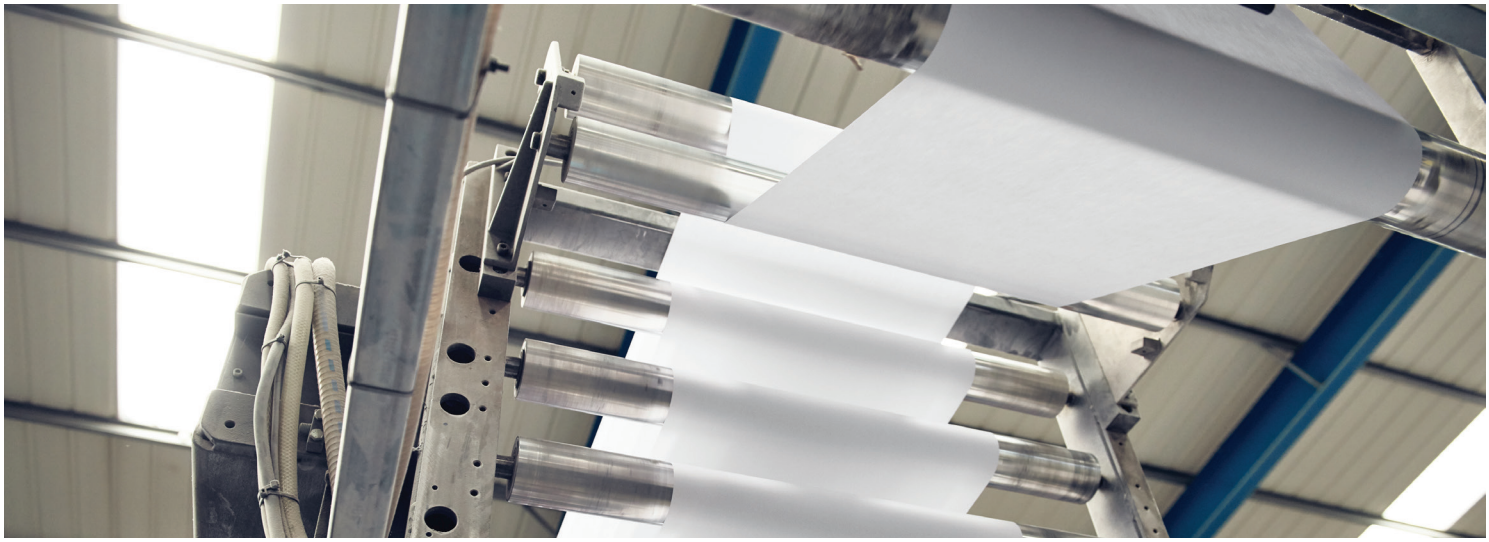
Solution

Six Hach® Total Suspended Solids (TSS) sc sensors with wiper were immersion-mounted in effluent collection streams for each tissue machine as well as in front of two collection screens inside a trench which carried effluent into a gravity sewer. Sensor wiper frequency was set at every four hours, with an instrument service agreement covering replacement of wear consumables including wipers and seals. Probe data was used to 'timestamp' fiber loss activity associated with each tissue machine such as spills, production changeovers, maintenance activities and shift changes.

Results

Flow to gravity drain decreased from 75 gallons per minute to 40 gallons per minute; about 660,000 gallons per year water savings.

Fiber loss decreased by 0.2%, or about 0.5 tons/day, reducing raw material production losses and waste haul-off expenses.



Background

Tissue paper manufacturing involves several stages. For tissue made from virgin wood pulp, logs must be debarked, chipped and cooked to break down lignins and remove impurities. The resulting pulp is washed, screened and bleached before it is prepared into a fibrous slurry for the papermaking stage. In this stage, the slurry is spread over a wire mesh to allow excess water to drain. The wet sheet is then fed through a series of rollers to remove residual water and add strength and smoothness before drying, cutting and converting to finished rolls. The drained water can carry pulp fibers, which are handled as waste or recovered. Rates and daily volume of pulp fiber loss are tracked as a key performance metrics, benchmarked across mills as an indicator of papermaking machine production losses and operational efficiency.

Challenge

The mill had attempted several different fiber loss measurement strategies, including a recirculation loop system which pumped a continuous sample past a pipe-mounted transmitter. This approach was not reliable due to pump clogs and excessive foam formation contributing to inaccurate transmitter readings. Without a reliable measurement strategy mill staff were unable to trend fiber loss volume over time and had no means to connect losses to the four individual machines. Excessive fiber loss accumulation on the screens in front of the gravity drain, resulting in more frequent maintenance action to remove and dispose which involved haul away to landfill (a direct production loss).

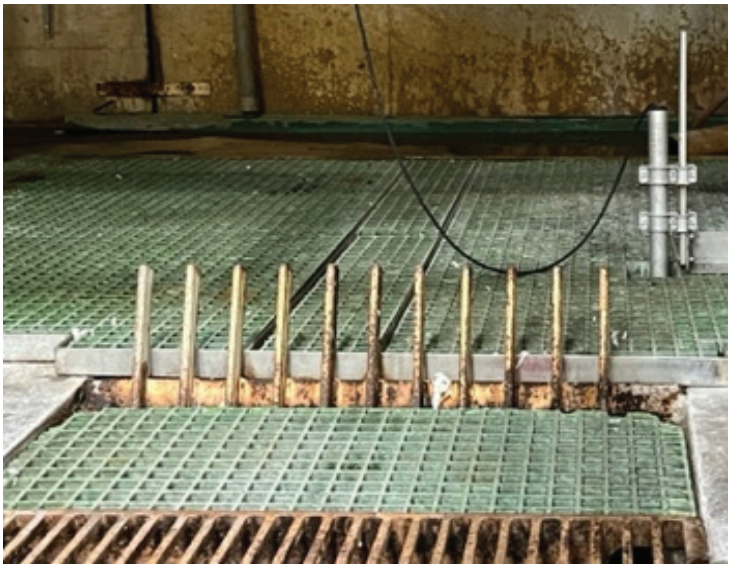


Figure 1. Photo illustrating trench leading to gravity sewer.

Setup

Six Hach TSS sc in situ probes with wiper were immersion-mounted at points in the effluent side of each tissue machine as well as directly upstream of the screens in front of the gravity drain. The previous challenges of foam presence and sample line clogs resulting in accurate readings were avoided due to TSS sc sensor differentiated design features which enable reliable measurements even in harsh environments. These include:

- Highly polished stainless steel with scratch resistant sapphire window designed to keep fibrous material from sticking to the surface.
- Double optical system with two pulsating infrared LEDs and four receivers. As transmitted light scatters, receivers pick up incident light at 90° and 120° angles effectively doubling instrument accuracy. This multiple-beam alternating light method, combined with beam focusing, facilitates accurate, independent color measurement of turbidity and suspended solids.
- Special software gives the system the ability to recognize gas bubbles or temperature swings for a more accurate suspended solids or turbidity measurement.

Each probe was connected to an SC200 controller via coaxial cable, which in turn transmitted TSS sc sensor readings to the mill's Distributed Control System (DCS) via analog 4-20 mA signal wire.

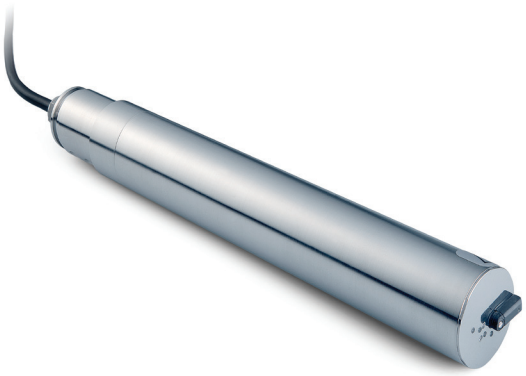


Figure 2. Hach TSS sc in situ probe with wiper

Conclusion

Results

Following sensor commissioning, the mill was able to implement optimization strategies for each tissue machine based on analysis of peaks in TSS measurements. The continuous measurement allowed traceability to specific machines and events such as spills, production changeovers, maintenance activities and shift changes. Following tissue machine optimization, the mill reduced effluent water flow to gravity drain from 75 GPM to 40 GPM, resulting in 660,000 gallons in discharge water savings per year. Additionally, fiber loss decreased by 0.2%, or about 0.5 tons/day, reducing raw material production losses and waste haul-off expenses. The Hach service program supporting seal and wiper replacement.

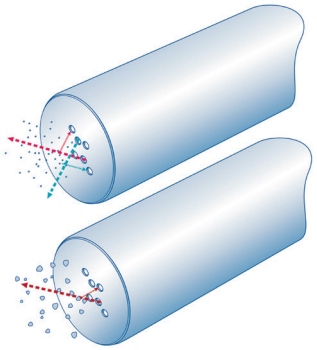


Figure 3. Double optical system in gas bubble environment.

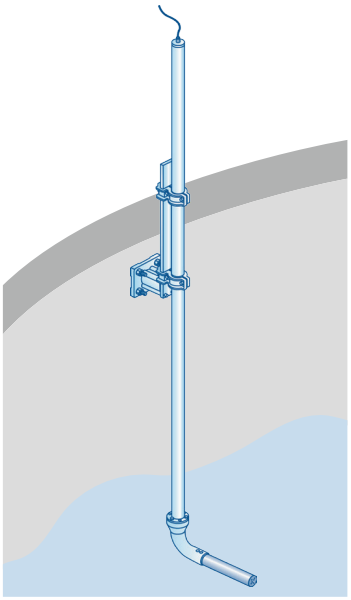


Figure 4. Immersion mounting hardware.

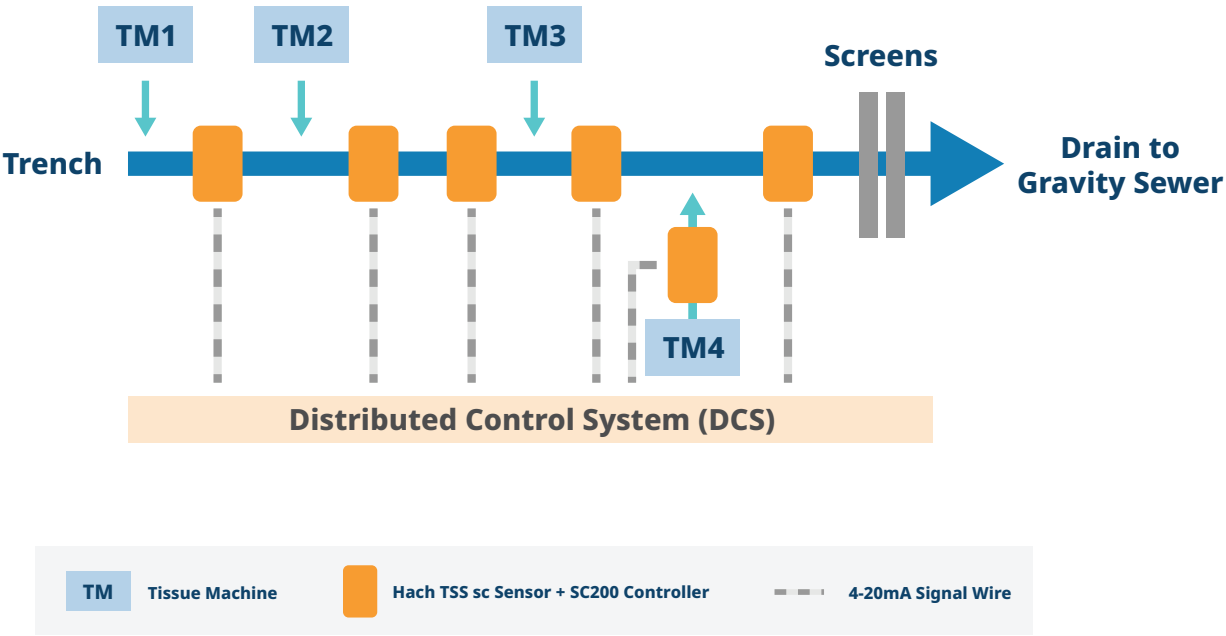


Figure 5. Installation diagram

Perspectives

Fiber loss is a key performance indicator of operational efficiency for paper mills. Additionally, water discharge volume restrictions and surcharges for volume in excess of permitted allowances significantly impact mill profitability. Projects to reduce water discharge volume and improve operational efficiency at the mill level can be benchmarked and leveraged enterprise-wide as part of a corporate sustainability strategy.

World Headquarters: Loveland, Colorado USA | hach.com

United States **800-227-4224** fax: 970-669-2932 email: orders@hach.com
Outside United States **970-669-3050** fax: 970-461-3939 email: int@hach.com

DOC043.53.30773.Aug23