



APPLICATION NOTE: In-Line Ultrasonic Meters Provide Continuous Measurement for Sample Stations

Boilers, cooling towers, and reverse osmosis (RO) systems are some of the most common systems that require monitoring and chemical treatment. While all three systems are found in many industries, pulp & paper, semiconductor, power generation and the pharmaceutical industries are some of the largest users of these systems.

Chemical treatment of boiler systems reduces scale, corrosion, and other mineral deposits. This enables the system to run more efficiently, keep heat transfer rates high and fuel costs down. Cooling tower water is treated for much of the same purpose with the addition of removing organic growth. And feedwater to RO membranes is pretreated with antiscalant as scaling can occur when particles accrue on the membrane and plug the membrane's pores. This pretreatment helps to maintain cleaner, more effective membranes, run at higher recovery rates and reduce operating costs.

To determine the proper amount of chemical to be injected into the water stream, samples of key parameters need to be taken. Instrumentation to measure ORP, pH, conductivity, temperature, pressure and flow are deployed to take these measurements. The sample systems are designed to provide real-time monitoring to provide an accurate representation of the water quality conditions. The sample flow rate is an important factor to ensure continuous, non-erratic samples are achieved. If the flow rate does not meet these criteria, chemical dosing control could be impacted.

Upon initial sample station commissioning, the sample flow rate is used to calibrate other inline instruments for continuous operation, set low and high alarm conditions, and optimize system response time based on size of system being sampled and the sample station's proximity to the feedwater source. Once the system is put in continuous operation, an accurate flow sample rate can be used to ensure these set perimeters are maintained. If the sample flow rate has increased, decreased, or stopped, this change can influence each system in different ways:

Boiler Systems: The chemical program for pH control and scale inhibition could be impacted, causing potential for scaling of the boiler to occur and reduce boiler efficiency.

Membrane Systems: The chemical program for antiscaling and chlorine removal could be impacted, causing potential for damage to the membranes or membrane fouling and reduce RO efficiency.

Cooling Tower Systems: The chemical program for pH control, scale inhibition and biofouling inhibitors could be impacted, causing potential for tower fill fouling and reduce cooling efficiency.

HIGHLIGHTS

Industry: Industrial
Service: Flow Rate/Total
Fluid: Water

Application

Measure sample flow rate to determine proper amount of chemical to be injected into water stream, and cooling water to condition sample stream

Problems

- Need to determine proper amount of chemical to be injected into sample station water stream
- Accurate sample flow rate needed to ensure continuous, non-erratic samples are achieved
- Proper amount of cooling water needed to condition sample stream and avoid instrumentation damage

Solutions

In-line Ultrasonic Flow Meters for continuous measurement of:

- The sample and cooling flow rates to avoid damage to instrumentation
- Chemical feed system for better injection control and reporting of overall chemical usage

Sample cooling flow is also important. The proper amount of cooling water is needed to condition the sample stream. If not adequately cooled, damage to instrumentation can occur or cause system failure. (See Diagram 1)

Historically, these systems have used mechanical flow meters that are prone to failure, not very accurate, and generally do not provide a digital output to the control system. This can result in many different problems:

- Over or under use of water
- Inaccurate analyzer readings resulting in over or under use of chemicals
- Damage of the cooling, membrane or boiler systems
- Damage to the sample station instrumentation due to improper cooling
- Dangerous conditions on systems from under treatment (overheating, over pressurized)
- Shorten life expectancy of the membrane, cooling or boiler system

Flow Technology's QCT and QLF in-line ultrasonic flow meters are providing continuous measurement for the sample and cooling flow rate. MODBUS communication is being utilized to retrieve multivariable from the meter to provide real-time feedback of flow rate, totalized flow, fluid velocity and temperature. The analog output is available as standard for retrofitting into older systems without MODBUS protocol.

The QLF in-line ultrasonic flow meter is also providing flow measurement of the chemical feed system, allowing for better control of injection and reporting of overall chemical usage. This provides more reliable and accurate data, and control over associating the feed rates to steam or feedwater flow or to pH or conductivity measurement.

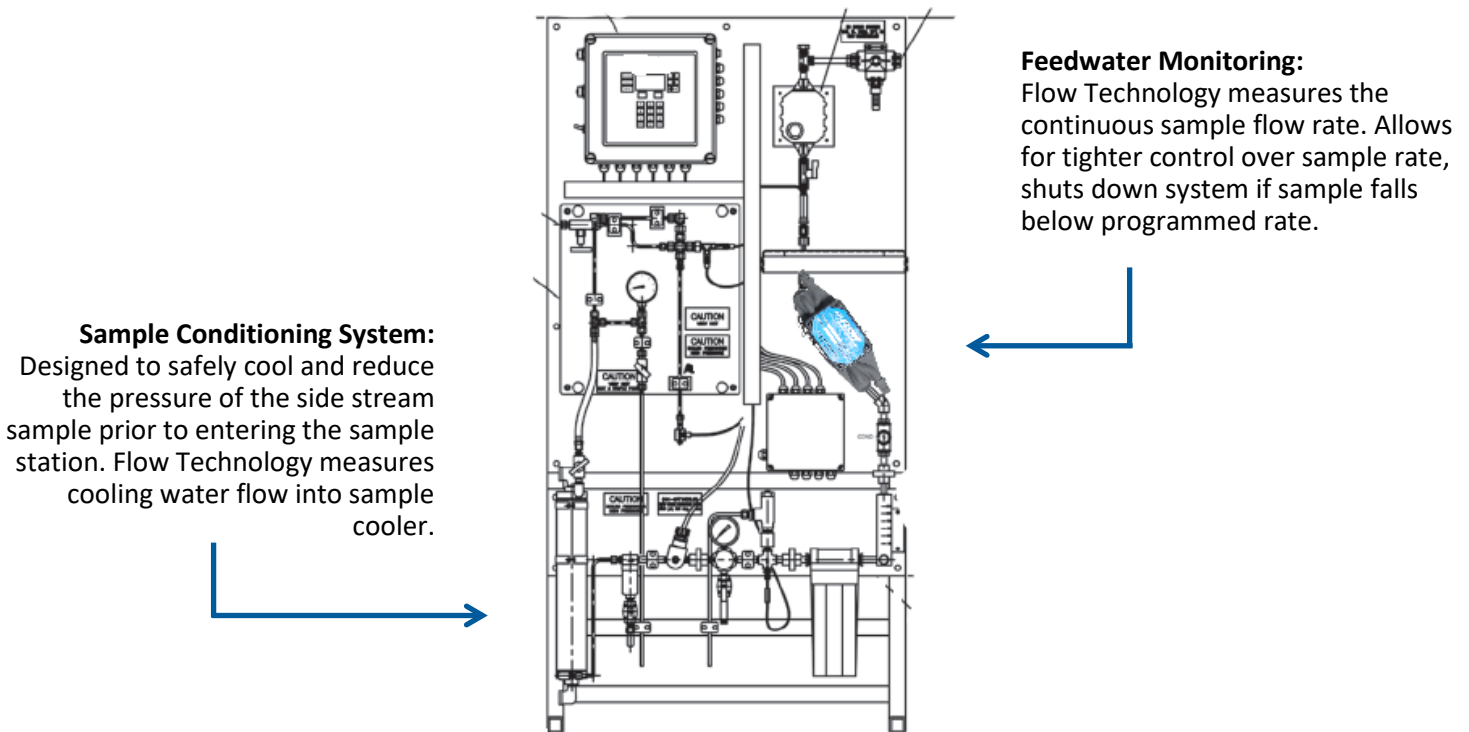


Diagram 1