

Real-Time Monitoring of Sugar Intrusion in Boiler Feedwater

Early Detection of Sugar Contamination in Condensate Systems of Sugar Mills

In sugar production plants, thermal energy is primarily transferred via steam generated during sugar juice concentration. This steam is reused across multiple process stages, and the resulting condensate is commonly recycled as boiler feedwater, particularly in evaporation and crystallization processes. During these stages, vapor generated from juice concentration is reused across multiple process steps to improve energy efficiency. As steam condenses, it forms high-purity water that is typically recycled as boiler feedwater.

However, contamination of this condensate can occur due to process leakages. Even minor contamination of condensate with sugar can negatively impact boiler performance and, over time, lead to operational instability or equipment damage. Therefore, continuous monitoring of boiler feedwater quality is essential for maintaining process reliability and equipment integrity.

In a typical sugar mill:

- Juice is concentrated in evaporators
- Steam is reused across multiple effects
- Condensate is collected and returned to the boiler

Under normal conditions, this condensate is clean. However, leaks from heat exchangers, evaporators, or crystallizers can introduce sugar into the system. As described in the provided document, contaminated condensate becomes unsuitable for reuse and may lead to operational risks if not detected early.

Sugar contamination in boiler feedwater presents several risks:

- Foaming and carryover in boilers
- Corrosion and fouling of boiler components
- Reduced heat transfer efficiency
- Unplanned shutdowns and maintenance

Even relatively small concentrations of sugar can cause significant damage. Excessive sugar levels may lead to severe operational issues and, in extreme cases, force plant shutdowns.

Early detection of sugar leakage is crucial for:

- Preventing contamination from reaching the boiler
- Minimizing downtime and maintenance costs
- Ensuring stable and safe plant operation

Reliable monitoring enables operators to react quickly, isolate the source of contamination, and protect critical equipment.

A common approach to identifying sugar ingress involves continuous monitoring of total dissolved substances (TDS) in the condensate. An increase in these values can indicate contamination and enable early detection.

When sugar enters the condensate:

- The concentration of dissolved solids increases
- This change can be detected using inline measurement technologies

A continuous monitoring allows detection of even trace amounts of sugar in boiler feedwater.

Solution from SCHMIDT + HAENSCH

Using the SCHMIDT + HAENSCH iPR HR² High-Resolution Inline Process Refractometer represents a state-of-the-art solution for applications requiring exceptional measurement accuracy directly in the process line. The world's most precise process refractometer is the best choice for any application where inline measurements need to be as precise as laboratory analysis. It is designed for monitoring very low concentrations, making it ideal for monitoring potential sucrose carryover in condensate tanks. By integrating the refractometer into critical points of the condensate and boiler feedwater system, plant operators gain immediate insight into water quality. In the event of contamination, alarms can be triggered and corrective actions initiated before sugar reaches the boiler, effectively preventing issues such as fouling, corrosion, and costly downtime.



iPR HR²
High-Resolution Inline
Process Refractometer

Product type	Product
Process Refractometer	iPR HR ² High-Resolution Inline Process Refractometer
Accessories	VARINLINE® housings (several ends and diameters)

Advantages

- Laboratory-level accuracy inline and detection of very low concentrations
- Real-time monitoring
- Robust and low-maintenance design
- No sampling required
- Flexible integration: compatible with common process control systems
- Improved process safety & prevents contaminated condensate from entering boilers
- Cost savings while reduces downtime, maintenance, and laboratory workload

Typical industries

- Sugar industry
- Food & beverage industry