**SUGAR IN CONDENSED WATER**

**Typical end products**
Pure water for the boiler system.

**Chemical curve: R.I. per Brix at Ref. Temp. of 20˚C**

![Chemical curve graph]

**Introduction**
Sugar mills often use the condensed water from the process as a distilled water feed which is safe for the boiler. However, condensates might get contaminated if juice leaks or overflows into the equipment making it unfit for use.

Detection of sugar shots in the boiler feed water is important for operating and maintaining the boiler system. Accurate and reliable measurements of overly high sugar levels permits acting promptly to avoid damage to the boiler system and extra incurred production costs.

**Application**
Steam from the boiler is used as a source of energy, for example, in the evaporators. It is common practice in the mills to utilize the vapor from one or several effects of the evaporators to the clarifiers or settling tanks. This leads to the condensation of the vapors resulting in a distilled water that can be used as feed to the boilers.

Feed water with excessive amount of sugar (above 200 ppm) can be extremely damaging for boilers causing a variety of problems including foaming, fouling, and corrosion.

**Instrumentation and installation**
Vaisala K-PATENTS® Process Refractometer PR-43 provides an accurate and real-time Total Dissolved Solids (TDS) measurement for early detection of sugar traces and leakages in the boiler system. The in-line measurement allows to take corrective actions before the contaminated condensates reach the boiler, thus preventing process upsets and damage to the equipment.

The refractometer is installed through a sample conditioning line before the boiler’s balance tank by a flow cell. Other refractometers can be installed in all condensate flows, for example from the evaporators, vacuum pans, clarifiers and settling tanks, allowing the earliest leakage point detection.

Sugar and Sweeteners | Side-streams Treatments
Our Conditioning System for sugar leakage detection in boiler feedwater also consists of a heat exchanger to reduce the temperature of the hot condensate to 20-30 °C with cooling water. The sampling system is simple and easy to install (Figure 1).

The refractometer provides Ethernet and 4-20 mA signals for real-time process control. This allows the creation of alarms and control of the drain’s shutter valve to avoid feeding contaminated condensates to the boiler and to ensure a safe operation.

Moreover, the refractometer can be specially calibrated to detect sugar contents down to a level of 0.02 Brix (200 pm). This way, lower levels of TDS caused by inorganics salts and other components that do not cause damages to the equipment are neglected, and only truly harmful sugar content is considered. This way false alarms can be eliminated.

Our solution for sugar leakages detection in boiler feedwater provides instant, accurate and reliable information of TDS allowing for sufficient time to react and eliminate any contaminated water from the system. This increases equipment life, reduces maintenance and operating costs and prevents production losses.

**Table:**

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<th>Instrumentation</th>
<th>Description</th>
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<tr>
<td>Process Refractometer PR-43-GC</td>
<td>A compact refractometer for smaller pipe sizes in general industrial applications. Available in 2 inch and 2.5 inch process connections and via reducing ferrule in 1.5 inch process connection. The refractometer is installed directly in a pipe elbow by an L coupling connection or in a straight pipe via a Wafer flow cell or a Pipe flow cell.</td>
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<tr>
<td>Sanitary Compact Refractometer PR-43-AC</td>
<td>For hygienic installations in small pipe line sizes of 2.5 inch and smaller. The PR-43-AC refractometer is installed in the pipe bend. It is angle mounted on the outer corner of the pipe bend directly, or by a flow cell using a 3A Sanitary clamp, I-clamp or Varinline® connection.</td>
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**User Interface:** Selectable multichannel Mf, compact CI or a web-based WI user interface options allow the user to select the most preferred way to access and use the refractometer measurement and diagnostics data.

**Measurement range:** Refractive Index (nD) 1.3200 – 1.5300, corresponding to 0-100 Brix.