

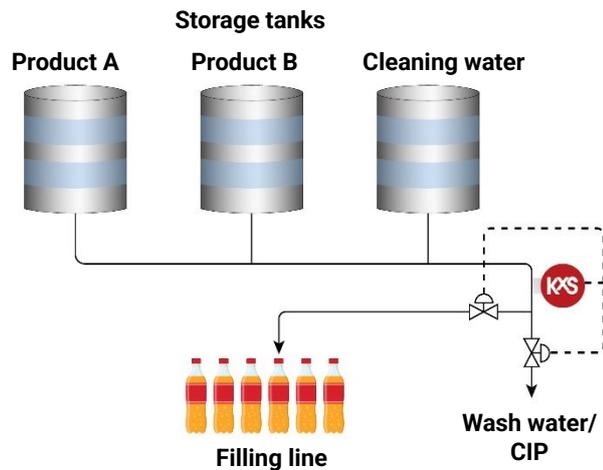


**Beverage and beer filling process**

Product and CIP interface detection and H<sub>2</sub>O<sub>2</sub> sterilization of packaging surfaces

**Benefits of R.I. measurement**

- By integrating KxS DCM-20 Inline Refractometers into beverage filling processes, manufacturers significantly enhance operational efficiency, product quality, and process safety, ensuring seamless transitions between products and CIP cycles.



**Overview**

Many beverage and beer processing plants utilize the same filling line for multiple products, including beer, soft drinks, flavored waters, and diet beverages. Maximizing the efficiency of high-speed filling operations is crucial.

Real-time refractive index (R.I.) measurement technology enables seamless product transitions and automated control of Clean-In-Place (CIP) processes. Inline monitoring ensures immediate detection of interfaces, improving productivity, reducing downtime, and safeguarding product quality.

**Refractive index measurement applications**

CIP cleaning is essential for eliminating product residues in filling lines to ensure food safety and quality assurance. Typically, after filling the product batch, lines are flushed with CIP cleaning chemicals followed by water rinsing.

Upon completion of the CIP cycle, the pipeline is ready for the next product. To optimize production schedules, the next product is pumped through immediately following the CIP cycle. This requires precise and instant detection of the product-to-CIP liquid interface and product-to-product transitions to avoid cross-contamination and minimize product loss.

While alternative methods such as conductivity and turbidity can detect interfaces, they have limitations:

- Conductivity sensors:** Detect interfaces but cannot measure Brix for quality control.
- Turbidity sensors:** Detect interfaces and CIP fluids but do not measure Brix for quality control.

In contrast, the DCM-20 inline refractometer detects interfaces, CIP fluids, and measures Brix, thus serving as a comprehensive solution for quality control in beverage processing.

**Additional application: H<sub>2</sub>O<sub>2</sub> sterilization of packaging surfaces**

Aqueous hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) is widely used in the food and beverage industry to sterilize packaging surfaces, ensuring product safety and shelf-life. Precise inline refractometer is used to control H<sub>2</sub>O<sub>2</sub> concentrations in spraying systems and immersion baths, optimizing sterilization effectiveness and chemical consumption.

Additionally, after sterilization cycles, refractometer verifies that residual H<sub>2</sub>O<sub>2</sub> concentrations meet regulatory limits, confirming that packaging surfaces are safe and free of chemical residues. The KxS DCM-20's high accuracy and repeatability guarantees compliance with food safety standards, enhancing consumer protection and operational reliability.

**Instrumentation and installation considerations**

The KxS Technologies DCM-20 Inline Brix Refractometer is installed directly at the outlet of the filling line. It continuously measures the concentration level of the flowing medium, instantly identifying product-to-CIP liquid interfaces and transitions between different beverage products. When the measured concentration reaches a predefined setpoint indicating product purity and the absence of water or CIP chemicals, the refractometer output signal (4-20 mA or

digital Ethernet) immediately activates filling operations without delay.

In installations where separate pipelines exist for products and CIP cleaning fluids, the refractometer precisely detects interfaces, instantly triggering alarms to switch valve directions.

During normal filling operations, valves are directed towards product packaging lines, preventing contamination. During CIP cycles and initial product release after cleaning, valves divert residual water or CIP fluid to drainage, ensuring only uncontaminated product enters the filling process.

**Accuracy and repeatability for beverage applications**

The KxS DCM-20 inline refractometer offers superior accuracy tailored specifically for beverage and beer applications:

**Measurement accuracy:**

- ±0.1 Brix** across the full measurement range
- ±0.03 Brix** within the low-concentration range of 0-30 Brix, achievable with field adjustment

**Measurement repeatability:**

- 0.00002 nD**

This level of accuracy and repeatability is ideal for precise control in applications involving low-concentration beverages, diet drinks, flavored waters, and similar products, where consistency and quality control are paramount.



**Unique benefits of KxS DCM-20 refractometers**

- **Real-time quality assurance:** Continuous inline monitoring eliminates delays and inaccuracies associated with periodic sampling or indirect measurement methods, ensuring consistent product quality and compliance with beverage specifications.
- **Operational efficiency:** Automation of sugar content measurement reduces the need for manual sampling, streamlining operations and reducing labor costs.
- **Modern connectivity:** Two independent 4-20mA outputs and a digital Modbus TCP output for connectivity to automatic process control systems.
- **Enhanced food safety:** The DCM-20's hygienic design, featuring 3A Sanitary Symbol authorization and EHEDG certification, ensures compliance with stringent food safety standards.
- **Compact and easy installation:** The small footprint and versatile mounting options of the DCM-20 allow for easy integration into existing processing lines without significant modifications.