

Control CIP and Disinfection

Measuring the Refractive Index for Monitoring CIP and Disinfection Processes

Challenge, Applications & Method

CHALLENGE

- Avoiding cross-contamination during product changeovers
- Maintaining correct chemical concentrations during CIP and disinfection
- Need for real-time, automated phase detection and process control

APPLICATIONS

- Continuous monitoring of media transitions in CIP (Cleaning in Place) sequences
- Inline concentration measurement of disinfectants (e.g., H₂O₂)
- Real-time control of valve switching, rinsing, and product release
- Documentation and validation of cleaning and disinfection protocols

METHOD

- Temperature-compensated RI values for accurate concentration tracking
- Integration with SCADA and process control systems
- Direct control of process steps based on threshold values (e.g., switching, dosing, alarms)

Cleaning in Place (CIP) and disinfection are automated cleaning procedures used in food and beverage to maintain hygienic process conditions without the need for equipment disassembly. These systems ensure the internal cleaning of pipes, tanks, valves, and filling lines and play a critical role in avoiding cross-contamination, ensuring product safety, and meeting regulatory standards. CIP systems typically follow a standardized sequence: pre-rinse, alkaline cleaning, intermediate rinse, acid cleaning, disinfection, and final rinse. Accurate phase separation between media is essential for cleaning effectiveness and to avoid product contamination.

CIP and disinfection processes are essential in:

- Beverage production (e.g., for beer, dairy, juice, or soft drinks)
- Aseptic filling lines and sterile processing
- Automated cleaning of tanks and piping in hygienic environments

Reliable differentiation between cleaning phases—also known as phase separation or interfacing—is crucial. Inline process refractometers provide real-time monitoring by measuring the refractive index of liquids, which changes depending on concentration and composition.



Solution From SCHMIDT + HAENSCH

Using the SCHMIDT + HAENSCH Full-Range Inline Process Refractometer (iPR FR²) provide a robust, real-time method for monitoring cleaning and disinfection in beverage production. Installed directly in the process line, iPR detect even small changes in media concentration by measuring the refractive index of fluids. These measurements allow precise identification of interfaces during cleaning cycles. Unlike conductivity or temperature sensors, refractometers are not affected by the fluid's color, temperature or reactivity making them ideal for high-speed, dynamic processes. This enables automated phase detection, optimized use of cleaning agents, and minimal product loss during transitions.



iPR FR²
Refractometer

Product packages	Product	ID-N°
Process refractometer	iPR FR ² Full-Range Inline Process Refractometer	10970
Process refractometer	iPR B ⁴ Basic Inline Process Refractometer	15510
Accessories	Calibrating standards (e.g. silicon oil)	
Accessories	Suitable inline Housing (e.g. APV or VariVent)	

ADVANTAGES

- Real-time detection of media interfaces in CIP cycles
- Accurate concentration control of cleaning and disinfecting agents
- No need for sample extraction or color-based interpretation
- Reduces product loss and increases cleaning efficiency
- Enables automated, self-monitoring CIP sequences
- Supports hygienic design (EHEDG-compliant) for food-grade installations

TYPICAL INDUSTRIES

- Beverage production (juice, beer, soft drinks, dairy)
- Food processing (aseptic filling lines)
- Plant engineering and system integration for hygiene-critical processes