

Engineering Insights: Conductivity Measurement

Part 2 of 4

Conductive Conductivity Sensors

Direct Contact Measurement - Where Contact Measurement Still Outperforms Every Alternative

How They Work

Conductive conductivity sensors measure conductivity by placing two or four metallic electrodes directly into the process liquid.

An alternating voltage is applied across the electrodes. The ions dissolved within the liquid carry the electrical current between the electrodes, and the instrument calculates conductivity based on the measured electrical resistance.

Because the electrodes are in direct contact with the process, the sensor measures conductivity very accurately, particularly in liquids with low ionic concentrations.

Advantages

Conductive conductivity sensors offer several important benefits:

- Excellent accuracy at very low conductivity values.
- High sensitivity in purified and ultra-pure water applications.
- Well suited to laboratory and pharmaceutical water systems.
- Relatively simple measuring principle.
- Excellent repeatability when properly maintained.



Limitations

Because the electrodes are exposed to the process fluid, they are susceptible to several practical issues:

- Fouling from fats, proteins and product build-up.
- Scaling caused by mineral deposits.
- Electrode corrosion in aggressive chemicals.
- Increased maintenance requirements.
- Measurement drift if the electrodes are not cleaned regularly.

In hygienic food processes, even small deposits on the electrodes can influence measurement accuracy over time.

Typical Applications

Conductive sensors are commonly selected for:

- Ultra-pure water.
- Purified water systems.
- Water for Injection (WFI).
- Boiler feedwater.
- Laboratory analysis.
- Low-conductivity chemical processes.

These applications benefit from the high sensitivity that conductive measurement provides at low conductivity levels.

Engineering Takeaway

Conductive conductivity sensors are the preferred choice when high sensitivity and accurate measurement of low-conductivity liquids are critical.

