Advantages of ultrasonic flow measurement in chemical applications

Considerations for choosing an ultrasonic flowmeter (clamp-on) in the chemical industry

Benefits at a glance

- Non-intrusive clamp-on installation (no wetted parts, no new leak paths)
- Can be applied where opening the pipe is costly or undesirable (retrofit-friendly)
- Free pipe cross-section (no pressure loss introduced by the flowmeter)
- Supports common chemical use cases: utilities, transfer lines, verification and troubleshooting (application dependent)
- Improved usability on existing piping using configuration support such as flow disturbance compensation and diagnostics (where available)
- Low maintenance (no buildup on a wetted sensor, no moving parts in the line)
- Helps reduce exposure to the process during installation and maintenance activities

Summary Endress+Hauser's ultrasonic clamp-on flow measurement technologies provide a practical way to add or improve flow visibility in chemical plants without opening the pipe. Because the sensors mount externally, there are no wetted parts and no additional leak paths, which can be advantageous for corrosive, hazardous or difficult-to-handle fluids. For chemical applications, two common choices are Proline Prosonic Flow W 400 for standard liquid services and Proline Prosonic Flow P 500 for demanding requirements such as high temperature, hazardous area approvals or functional safety (SIL).

Challenge In chemical service, adding flow measurement can be challenging when the process fluid is corrosive, hazardous, abrasive or when a shutdown is difficult to schedule. Traditional inline flowmeters often require pipe cutting, hot work permits, drain-and-vent procedures and new sealing surfaces, driving cost, risk and downtime.

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Proline Prosonic Flow W 400

Proline Prosonic Flow P 500

At the same time, chemical plants still need dependable flow data for mass balance, utility management, transfer verification and process control. Existing piping layouts may also limit available straight runs (valves, elbows, reducers) and make it challenging to achieve stable readings with some technologies, especially when a fast, low-disruption retrofit is required.

Our solution Clamp-on ultrasonic flowmeters use the transit-time principle: ultrasonic signals travel with and against the flow, and the resulting travel-time difference is proportional to flow velocity. With externally mounted sensors, measurement is non-intrusive, supporting installation without opening the line, keeping the pipe cross-section free and adding no pressure loss.

For chemical plants, Endress+Hauser offers two clamp-on ultrasonic flowmeter technologies to match typical requirements: Proline Prosonic Flow W 400 for many standard liquid services, and Proline Prosonic Flow P 500 for higher-demand applications such as elevated temperatures, hazardous area approvals and/or functional safety (SIL), depending on configuration.

Because retrofit points can have limited straight runs, projects that require clamp-on flowmeters typically focus on selecting a suitable mounting locations and using configuration support to handle disturbed flow profiles. Where available, features such as flow disturbance compensation and diagnostics can speed commissioning and simplify troubleshooting on existing piping.

A common requirement is adding or verifying flow on existing transfer or utility lines without scheduling a shutdown. Clamp-on measurement is often selected for services where corrosion, temperature or safety requirements make invasive work difficult (for example, cooling water and reuse water distribution, solvent transfer, hot acids and thermal oil loops).

Here are a few common applications, for reference:

- **Acids and corrosive chemicals (e.g., sulfuric acid)**: Clamp-on measurement keeps the process closed and eliminates wetted sensor materials that could be challenged by aggressive chemistry. Proline Prosonic Flow P 500 HT (high temperature) can be used to safely measure sulfuric acid in high-temperature services where intrusive work would increase exposure risk and require additional safeguards.

- **High-temperature thermal oil/ heat-transfer oil loops**: In heater and heat exchanger circuits, invasive flowmeter installation often drives shutdown scope and leak-path concerns. Proline Prosonic Flow P 500 HT supports clamp-on flow measurement for high-temperature thermal oil applications (heat-transfer systems), enabling retrofit measurement for energy monitoring, balancing and troubleshooting.

- **Utilities and transfer lines**: Cooling water, reuse water and many solvent or intermediate transfer services can often be instrumented quickly with clamp-on sensors—supporting verification, mass balance and process optimization without cutting pipe.

In these applications, clamp-on installation provides quick flow visibility while keeping the process closed. Proline Prosonic Flow W 400 covers many day-to-day liquid lines, while Proline Prosonic Flow P 500 extends clamp-on measurement to higher-requirement projects—including high-temperature variants for services such as hot acids and thermal oil loops.

Proline Prosonic Flow P 500 HT (high temperature)

Results In practice, ultrasonic clamp-on flow measurement can help chemical operations reduce the disruption that often blocks flow instrumentation projects. By avoiding pipe cutting and additional sealing surfaces, teams can lower installation risk and often shorten implementation timelines. Flow data that was previously missing or uncertain can then be used to support mass balance, utility management, transfer verification and process control.

By offering both a standard option (Proline Prosonic Flow W 400) and an advanced option (Proline Prosonic Flow P 500), Endress+Hauser helps maintenance and engineering teams match ultrasonic flow measurement to the realities of chemical service, from quick retrofits to higher-requirement projects, while keeping the measurement non-intrusive and low maintenance.

Learn more about the Proline Prosonic Flow W 400 ultrasonic clamp-on flowmeter

learn more about the Proline Prosonic Flow P 500 ultrasonic clamp-on flowmeter

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