



In-Line Ultrasonic Flowmeters Gain Acceptance

Why the 93C in-line ultrasonic flowmeter is more than an alternative for many customers.



16" (DN400) 93C measures bi-directional flow in the vault of a water tower in Oswego, Illinois USA



12" (DN300) 93C measures river water intake in Beaumont, Texas USA. 4-20mA signals are transmitted via wireless solar panel system from several remote locations.



24" (DN600) 93C measures fresh water in Orlando, Florida USA after odorous hydrogen sulfide gas is removed.

Endress + Hauser is globally recognized as a quality supplier of process measurement instrumentation and services.

Long known as a competent supplier and leader in level measurement technology, ultrasonic and "Time of Flight" became synonymous with Endress + Hauser. Today however, innovation in ultrasonic measurement has multiple meanings.

The introduction of Prosonic™ flow extended the market leading product basket with an innovative product to compete in a rapidly emerging measurement field-ultrasonic flow measurement.

Ultrasonic flow measurement technology is gaining acceptance at a rapid pace.

While the benefits of clamp-on ultrasonic flow measurement are easily explained, electromagnetic flowmeters are still an overwhelming choice to solve volumetric liquid flow applications.

Ultrasonic technology offers the end user a unique ability to measure flow without pressure loss while providing a high degree of confidence and reliable measurement under laminar, low velocity start-up and low usage conditions as well as turbulent, peak usage, and high flow ranges that extend far above traditional or mechanically contacting measurements.

The Proline Prosonic™ 93C provides end users access to some of the advantageous characteristics of clamp-on ultrasonic devices while meeting the traditional specification of in-line meters.

In many cases, the use of 93C is a result of successfully installing and demonstrating the Prosonic 90/93W or 92T clamp-on systems. For many end users, this is their first experience with ultrasonic flow. For others, it is their first experience with the Endress + Hauser clamp-on system. The technology and its benefits are easily demonstrated to the end user without the need to break

"Retrofit" and "replace" are terms typically reserved for clamp-on measuring systems. Cost savings associated with installing a non-intrusive meter in existing applications and lined pipe are clear. For in-line meters however, retro-fit and replace are also possibilities. **93C can be manufactured to match the installed face to face length of existing devices or customer specific requirements. In the case of electromagnetic flowmeters, this can be difficult due to the tooling associated with applying the insulating liner.**

Life Cycle Costs are sometimes a difficult concept when providing meters on a project basis. 93C however, is quite flexible. Near and long term costs are apparent to the customer. **93C is comparably less expensive than traditional electromagnetic flowmeters while the potted, removable sensors can be replaced overtime and retain NEMA6P/IP68 submersible approval**

There are several reasons for this and they vary by installation.

The easiest argument to make against a non-intrusive measurement is the stated accuracy of the measuring system. “What does typically better than 2% mean?” Many specification forms request a simple accuracy statement of +/-0.5%. These simple accuracy statements fail to account for rangeability, turndown, and zero point stability, but are often enough to deter the use of non-intrusive ultrasonic flowmeters at face value.

Reliability of non-contact flow measurement is often questioned. Clamp-on ultrasonic transducers require an acoustic coupling fluid or paste to transmit a sound wave through the pipe wall. A common argument against this component is that the paste must be re-applied or does not provide a fit-and-forget measurement. In reality however, the coupling paste can be selected for the application in the same manner that chemical compatibility would be analyzed for selecting the electrode metallurgy in an electromagnetic flowmeter. The differing coupling fluids possess a wide variety of temperature ranges and resistances to moisture.

In many cases, traditional measurements such as electromagnetic or differential pressure flowmeters are selected because a vast majority of end users lack experience with ultrasonic flowmeter technology or witnessed a failed application in the past. Often times however, this can be attributed to the overwhelming fact that unlike Magnetic, Coriolis, or DP flow, there is not a clear market leader in ultrasonic flow measurement to drive the positive benefits associated with the technology and assist the customer in successfully applying the device.

Customer Value Proposition

- ☒ Ease of transition to in-line ultrasonic
- ☒ Accuracy of in-line device
- ☒ Cost versus traditional meters
- ☒ Increased access to the measuring point

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open an existing pipe or interfere with an operating process.

The advantage becomes even clearer when the ultrasonic flowmeter is compared to an existing device. In this manner, the performance of ultrasonic is undeniably brought to the forefront against an “accepted”, “reliable”, and “installed” metering standard.

Non-intrusive testing makes the transition to in-line ultrasonic easier. 93C provides the same user interface and intuitive quick set-up as the clamp-on device that is already proven in the respective installation while offering a degree of improvement. The in-line device is more like the existing meters, increases the overall measurement accuracy, and reduces the straight run requirements and site commissioning data associated with the clamp-on device.

Additionally, the 93C in-line ultrasonic device provides several advantages to existing, traditional technologies.

Prosonic 93C In-line Flowmeters:

Provide a calibrated system accuracy of +/-0.5% and eliminate pressure loss to match the performance of an electromagnetic flowmeter.

Provide a standard NEMA6P/IP68 product thereby reducing concerns or electrical problems with coils and electrodes in an electromagnetic flowmeter body and eliminate thermal influence in capillary tubes and sensor membranes in a filled pressure system.

Eliminate concerns associated with vacuum pressures that can damage or stress electromagnetic flowmeter liners or membranes in filled pressure systems.

Increase the rangeability of the flow measurement as compared to an electromagnetic flow meter or differential pressure with flow nozzle or venturi solution.

Increase access to the meter for routine service and maintenance by allowing the active portion of the sensor to be removed and tested without interrupting the process.

Eliminate excess spare parts by providing a single sensor design for all flowtube line sizes 12”(DN300)- 78”(DN2000).

Ultrasonic flowmeters are limited in some applications by solids content and entrained air. The solids content should not exceed 5% and the entrained air or gas content should not exceed ~3%. **Realizing the 93C limitations emphasizes the overall product portfolio capabilities and know-how of Endress + Hauser. Ultrasonic is not capable of replacing all electromagnetic flowmeter applications today. Straight run requirements, solids content, system pressure, chemical compatibility, hazardous area approvals, and requested calibrated accuracy should be observed.**

Areas of application within the water industry are subjected to wetted materials and construction requirements that are typically specified by the end user or engineer.

93C ultrasonic flowmeter tubes are coated with an epoxy finish suitable for use in drinking water and wastewater systems. Regional approvals for wetted materials are available to comply with NSF61, KTW, and WRC.

Ultrasonic flowmeters are typically seen as portable or temporary devices by many end users. As such, digital communication is often perceived as a luxury associated with electromagnetic flowmeters or loop-powered devices like differential pressure based systems.

93C ultrasonic flowmeters are a member of the Proline™ family of measuring instruments from Endress + Hauser. Profibus PA®, Foundation Fieldbus®, and HART® protocols are all supported and have successfully passed the appropriate tests for interoperability and functionality with other approved devices.

In the past, hand held verification tools have been promoted quite heavily by manufacturers to support electromagnetic flowmeters due to the cost associated with re-calibration or the complexity of electrode replacement.

93C flowmeters provide simple access to the measuring sensors for uninterrupted maintenance and replacement with calibrated spares and are capable of in-field verification protocol and testing with the use of Fieldcheck™ support tools that are already in use with Promag, Promass, Prowirl, and t-mass.

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