

Maximize ROI with high-performance Coriolis flowmeters

Modern Coriolis flowmeters provide outstanding accuracy—in addition to multivariable measurement, onboard instrument and process diagnostics and in-situ verification—helping manufacturers optimize their processes and operate profitably across a multitude of applications

By Lauton Rushford, Endress+Hauser



In today's industrial landscape, every investment and decision are subject to scrutiny, and oftentimes, justifying the cost of high-performance instrumentation against lower-grade alternatives can be challenging. However, as manufacturers know, the equation for calculating value from plant floor instrumentation comprises much more than simply capital cost. It must instead consider a combination of upfront investment, maintenance requirements, ease of hardware commissioning and software integration, workforce enablement, operational efficiency facilitated and more. For simplicity's sake, total value can be distilled into productivity gains as return on investment (ROI) minus purchase price and ongoing operational costs.

While Coriolis flowmeters are the established standard for direct mass flow measurement in the process industries, their full value is often understated. Coriolis benefits are not merely limited to precise and accurate measurement; they also include the integration of advanced diagnostics and long-term operational stability into control systems. These diagnostics help plant personnel detect issues that can cause shutdowns or failures, reducing both safety incidents and downtime.

This article explores how Endress+Hauser's Coriolis technology provides these tangible returns, helping process manufacturers avoid costly shutdowns and optimize plant performance.

How do Coriolis flowmeters work?

Coriolis flowmeters are named for their elegant mechanical resemblance to the physics concept of Coriolis force. Inside these instruments, one or more tubes are oscillated at a frequency induced by pulses from an exciter. As gas or liquid process media, or a mixture of the two, flows through each tube, its inertia imposes additional twisting, changing the oscillatory pattern. Two detectors—one upstream and one downstream of the exciter—distinguish this phase difference, which directly correlates to mass flow, providing a highly accurate and direct measurement that is independent of process media properties (Figure 1).

However, modern Coriolis flowmeters are useful for measuring far more than just mass flow, as they are multivariable powerhouses that provide rich streams of critical process data, such as process media density, temperature and viscosity. This consolidation of measurement tasks reduces the complexity and cost of installing multiple instruments, while providing a more holistic view of a process by making the various datapoints available to higher level host systems. This data, both raw and conditioned, provides invaluable instrument and process diagnostic information that is useful for preemptively identifying process issues, implementing predictive maintenance and informing operational decisions.

Flowmeters operate at a known resonance frequency due to fluid properties. Thus, a change in this value can lead towards increased information regarding the process or the status of the flowmeter. This can mean the process media's density has changed or perhaps unwanted air has entered the line. By monitoring deflections and the entire exciter system, these flowmeters provide more diagnostic test points than most instruments, providing comprehensive real-time health monitoring for both the process and the device itself.

Selecting the right Coriolis flowmeter for your application

Given the expansive variety of industries where Coriolis flowmeters can provide benefits, Endress+Hauser maintains an application-centric approach to developing and specifying instrumentation. The primary goal with every flowmeter solution is thoroughly understanding process requirements—from process media and control loop characteristics to industry regulations—to specify the ideal instrument for the task. This ensures maximum value delivery throughout an instrument's lifecycle.



Proline Promass F 300

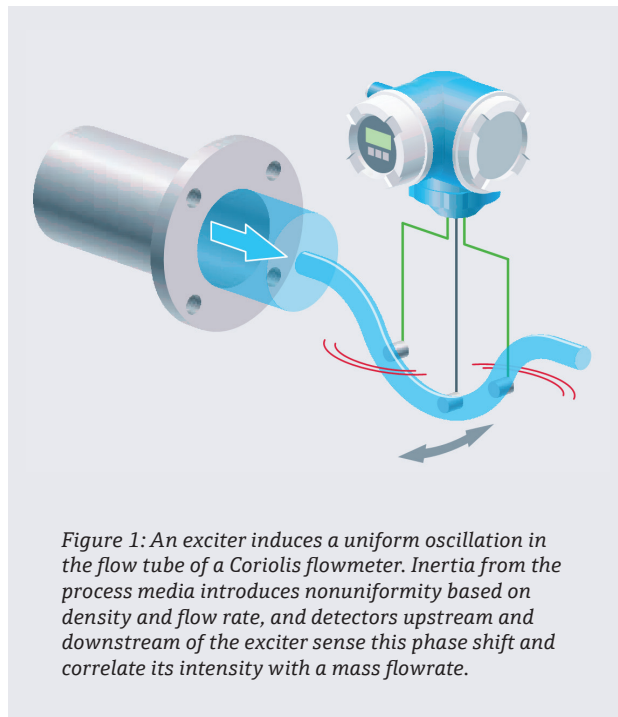


Figure 1: An exciter induces a uniform oscillation in the flow tube of a Coriolis flowmeter. Inertia from the process media introduces nonuniformity based on density and flow rate, and detectors upstream and downstream of the exciter sense this phase shift and correlate its intensity with a mass flowrate.

Endress+Hauser Coriolis product lines include:

- **Proline Promass F:** As a workhorse for the demanding environments of oil and gas, chemical and other heavy industries, the Promass F line is engineered for robustness and accuracy. This is required in custody transfer applications, which often include corrosive or challenging process media and where accurate financial results depend on precision.
- **Proline Promass X:** The four-tube Promass X provides premium accuracy (0.05 %) at ultra-high volumes for on- and off-shore applications in the oil and gas industry.
- **Proline Promass A:** This series provides performance in a compact, single-tube design. It is ideal for use in the life sciences industry where ensuring product quality and compliance is critical, as well as for integration into modular process skids where space is at a premium.

- **Proline Promass S:** Promass S is ideal for hygienic applications in the food and beverage industry that require easy wash-down, sanitization and maintenance. The self-drainable single-tube system ensures careful treatment of process media. Whether dosing high-value syrups, measuring milk fat content via density or ensuring the correct carbon dioxide concentration in carbonated drinks, the multivariable accuracy minimizes waste and ensures consistent products.
- **Proline Promass U:** This single-use flowmeter provides reliable performance in agile biotech Current Good Manufacturing Practice (cGMP) compliant applications. This groundbreaking development aids the industry's increasing transition to smaller batches and continuous manufacturing without compromising accuracy.
- **Proline Promass K:** Promass K provides the core benefits of Coriolis technology in a versatile and cost-effective package. It is an excellent choice for industries like pulp and paper, power and energy and water/wastewater, which can benefit from Coriolis accuracy and installation versatility—e.g., no straight run inlet and outlet requirements—in many applications, without requiring the full suite of features found in higher-tier models. In these industries, integrated onboard verification and documentation generation enable regulatory bodies, such as the United States Environmental Protection Agency (EPA), to extend calibration intervals, which reduces maintenance costs without sacrificing compliance.



Proline Promass K 10

Most of these product lines can generate comprehensive diagnostics with integrated Heartbeat Technology for on-demand verification and monitoring by host systems, in addition to HistoROM for automatic data storage and simple component exchange in the event of equipment failure. These capabilities provide the data and onboard documentation needed to optimize maintenance and ensure compliance in many industries, while integrating seamlessly into control systems via modern digital protocols.

Endress+Hauser's Applicator tool simplifies daily engineering work by helping find the 'best fit' product for applications. Enter known parameters, and Applicator will determine a reliable selection of suitable devices. Users can make safe decisions with product comparison functionality and access to in-depth product information. The transfer of selected and sized products to the configuration function supports basic engineering.

Cost savings and ROI

While ROI can be felt through process optimization over time, it is even more apparent when shutdowns are alleviated or reduced. At one chemical processing plant with Heartbeat Technology-enabled Proline Promass F Coriolis mass flowmeters, the system's diagnostic index value changed over time, alerting operators to a developing buildup issue long before it could have been detected by most flowmeters. This early warning prompted maintenance scheduling during a planned outage, preventing an unscheduled shutdown, which would have resulted in an estimated \$250,000 in lost production plus emergency labor costs.

ROI also accumulates through routine operational savings. At a food and beverage facility, ten flowmeters in critical applications required annual removal and calibration to confirm accuracy. By replacing these instruments with Proline Promass S Coriolis flowmeters with in-situ Heartbeat Verification, the plant received EPA approval to extend calibration cycles to once every three years. In just the first three years, the estimated savings on labor, minimized production downtime and eliminated third-party calibration services exceeded \$50,000—more than the cost of the technology upgrade.

Maximize ROI with the right technology

Instrument specification and selection should consider holistic aspects of the target application, then focus on maximizing value accordingly. Too often, implementors fixate on price point, but there is far more to the value equation.

With more Coriolis flowmeters being equipped with onboard diagnostics, verification and monitoring capabilities, like Heartbeat Technology, plants are moving towards smarter, diagnostic-capable instrumentation.

Having a diverse portfolio designed for numerous industries, Endress+Hauser experts are close at hand to advise on the right instruments for any application, providing clear and measurable benefits via increased ROI.



About the author Lauton Rushford is a national marketing manager for flow products at Endress+Hauser USA. He graduated from Purdue University in 2018 with a Bachelor of Science in nuclear engineering. Lauton joined Endress+Hauser shortly thereafter as an inside sales engineer. Throughout his seven years with the company, he also held a regional industry management role focusing on solutions in the water and wastewater industry.

www.addresses.endress.com

WP01263D/24/EN/01.25-00