Accurate Flow Measurement Improves Profit

Two-wire Coriolis Flowmeter for Loop Powered Applications

Rough Economic Seas – The current economic climate means that many managers are taking a keen interest in the selection of their flow-measuring devices. Today's decision makers understand the benefits of different flow technologies and accept that when migrating to higher performing technologies, there may be cost implications resulting from, for example, increased wiring and associated installation costs. In a new installation, these extra costs can usually be minimized through good engineering practices.

Coriolis meters are accurate and reliable. Because there are no moving parts, maintenance is reduced to a minimum.

The chemical and life science industries, like many other process industries, are facing challenging times. Over the past decade, the various market sectors have seen greater competition from other world areas, an abundance of new legislation, increasing raw material costs and an increase in energy costs. This is driving manufacturing companies to improve the efficiency of their processes with better and more reliable measurement technologies. Whereas 15 years ago "repeatability" was the magic word, what really counts today is what is dosed into the reactor, or transferred to the crystalliser, and how well we control temperature in the fermentation vessel to optimise the process. To address these challenges and to remain competitive, the managers and engineers in charge of plant processes have been looking for ways to optimize their assets, maximizing product quality, plant throughput and availability, while minimizing operations and maintenance costs, reducing waste and rework, cutting the cost of utilities and cutting the cost of complying with safety health and environmental legislation without increasing risk.One of the areas attracting special attention is that of flow measurement, as this often has a direct impact on the profitability of the plant. Get it right, and the plant is more efficient, produces less waste, minimizes rework and lowers maintenance costs. Get it wrong and the consequences can be significant.Inaccurate measurement in fiscal applications can lead to a plant being overcharged for raw materials or effectively giving away the product. Inaccurate meters used to measure utilities can also add to costs. Meters used to provide a mass balance across the plant need to be accurate or technicians will either spend time chasing product losses that aren't there, or they will set the tolerance so wide that product losses are not identified early enough.In addition to the problems associated with meter accuracy and repeatability, many flowmeter technologies require regular maintenance and calibration to maintain their accuracy. This adds cost to the maintenance budget and also has cost implications with regards to record keeping.

Flowmeter Designs

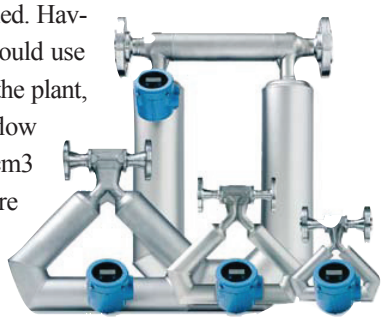
There are several technologies available to measure flow, many of which are interchangeable for any flow application. The choice of technology depends on several factors, including cost, required accuracy, the unit to be measured and the understanding of the overall return on investment. Volumetric flow rates can be inferred by measuring the differential pressure across a restriction in the pipe. The mass flow rate will vary depending on temperature and pressure and so some form of calculation has to be performed in the transmitter or the controller in order to give an accurate measurement. The accuracy of this calculation is dependant on the density of the fluid remaining constant. One of the disadvantages of differential pressure (DP) flow measurement is that it requires a good flow profile to work properly, so installation needs to be in a relatively long length of straight pipe. In addition, the technology does not offer a wide flow range and accuracy is limited. A further drawback is that the pipe restriction, whether this is an orifice plate, a venturi or any other device, may wear, meaning that regular calibration checks will be necessary to ensure accuracy.Another means of measuring volumetric flow is by using some form of positive displacement (PD) meter where a mechanical device is caused to rotate by the flow passing over or around it. PD meters include turbine meters and oval gear meters. Because these devices have moving components they require regular calibration checks and regular maintenance, especially when being used with non-lubricating fluids. In addition, and in common with DP measurement, PD meters add a restriction to the line causing a pressure drop.Other flow measurement techniques include ultrasonic flow measurement, which uses sound waves to determine the velocity of the media, and vortex flow measurement which measures the frequency of vortices created by inserting an obstruction in the pipeline. Both techniques have their place but are limited in their application.Finally there is Coriolis mass flow metering. Coriolis measurement is based on the principle that when fluid is moving through an oscillating tube, forces are induced which causes the tube to twist. The amount of twist is directly proportional to the mass flow rate of the fluid flowing through the tube. Coriolis flow meters have been in existence since the 1970s, when pioneering companies such as Micro Motion first introduced commercial meters based on this technology.

The Benefits of Coriolis Flowmeters

Coriolis meters have become acknowledged as the meter of choice when high accuracy is required. Ongoing development has led to improved accuracies and also the introduction of predictive diagnostics to warn when calibration or maintenance is necessary. In addition to the higher accuracy characteristics, a further benefit is that there are no moving parts. By selecting the right materials for an application, the effects of erosion and wear can be avoided and maintenance reduced to virtually zero. These advantages have resulted in a growing market for Coriolis meters as they are increasingly specified for new applications and retrofits.One limitation when applying Coriolis measurement, particularly in retrofit applications, is the need for between four and nine wires for operation (depending on the manufacturer). Two wires have always been necessary to power the device with an additional two wires required for the instrument signal. Coriolis manufacturers have been challenged by the energy needs of the sensor to oscillate and the energy available from loop power instrument wiring. Many users have indicated that the applications for Coriolis flow and density meters would be greatly expanded if a two-wire version was available. While the need for four wires can easily be accommodated in new installations when changing out an existing two wire device, the cost of running an additional cable versus the benefits from the installation can mean that it is not a viable option. However this has now changed with the introduction by Emerson Process Management of a two-wire Micro Motion Coriolis mass flow and density meter.

Two-wire Coriolis Mass Flow Meters

Over the last 31 years, the Micro Motion division of Emerson Process Management has made significant investments in Coriolis technology and has recently addressed challenges in applications where entrained gas is present and the need for customers to understand if the metering tubes maintain their integrity by means of inline meter verification. One of the major enablers for these features is the total energy management of the metering system which comprises the sensor and transmitter. This provided a platform for the development of a two-wire Coriolis metering solution which allows users to install Coriolis metering, with all its inherent benefits which include direct mass, no moving parts, online density measurements, low pressure drop and more, in applications where at present a two-wire traditional flow metering device is installed. Having benefitted from Coriolis technology in the past, process engineers and managers wanted a meter they could use more broadly. The new two-wire meter provides a perfect solution for loop-powered flow points throughout the plant, delivering measurement accuracy, repeatability and operational savings on a level not previously possible for flow loops with older flow measurement technologies. The new meter delivers +0.10 % liquid flow and +0.0005 g/cm3 liquid density accuracy in continuous process and mass balance applications.The new Micro Motion two-wire Coriolis is ideally suited for use in the chemical, petrochemical and refining industries, and for continuous process and mass balance applications.



Emerson's new two-wire Coriolis meters are especially valuable for upgrading older loop-powered technologies without adding more power or installing new cabling.

Coriolis Meters Can Now Be Installed Virtually Anywhere

The introduction of two-wire Coriolis flowmeters means that accurate and reliable Coriolis technology can be used to upgrade older loop-powered technologies without adding more power or installing new cabling. The new two-wire meter delivers measurement accuracy, repeatability and operational savings on a level not previously possible for flow loops with older flow measurement technologies. The loop-powered design makes for seamless integration into existing control systems and is ideal for long wiring runs and applications in hazardous areas. It has no moving parts and requires no maintenance.

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