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Emerson Introduces New Coriolis Flowmeters for High-Pressure Chemical Injection

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Summary

In the oil & gas industry, chemical injection is widely employed to prevent scaling, corrosion, or hydrate plugging in pipelines, pumps, and other critical onshore and offshore assets. This important application requires accurate chemical injection measurements and control to reduce chemical costs, increase operational efficiency, and optimize the process. Until now, the industry relied largely on positive displacement (PD) flowmeters for measurement. While PD meters often provide acceptable performance in this high-pressure application, they are less accurate than some other technologies and more difficult to maintain because of their moving parts.

Until now, operators relied largely on PD flowmeters for high pressure chemical injection application. Micro Motion's new Coriolis meters now bring the reliability and accuracy of Coriolis flowmeters to high-pressure applications.

Representatives from Emerson Process Management's Micro Motion and Regulator Technologies divisions recently briefed ARC Advisory Group about the company's two new Micro Motion Coriolis flowmeters and Tescom Electronic Pressure Controller, designed specifically for high-pressure chemical injection applications in demanding offshore environments.

The Micro Motion F100P and HPC010P meters will be the newest addition to Emerson's high pressure chemical injection portfolio. These two meters further strengthen the portfolio and offer higher pressure ratings than previously available. The two meters, which will be available for delivery later this year, bring the accuracy and ease of maintenance of Coriolis flowme-

ters to high-pressure chemical injection applications. According to the company, the new flowmeters will help owner-operators and service companies overcome many challenges of chemical injection applications and reduce chemical costs while increasing operational efficiency and system reliability.

Chemical Injection: A Critical Application

To prevent plugging or asset degradation from hydrate formation, scaling, and corrosion, owner-operators and service companies inject appropriate chemicals into oil or gas wells. Managing flow assurance issues such as these is critical, since they can cost the oil & gas industry billions of dollars in repairs and maintenance. According to NACE International, corrosion alone costs the US upstream oil & gas industry an estimated $1.4 billion every year.

Hydrate Formation
Source: Giarvarini, C. & Hester, K. (2011). Gas Hydrates. p. 98.

Under-injection of treatment chemicals can result in corrosion and/or scale and hydrate build up. This can lead to infrastructure failures, impair production, delay re-startup of shut in wells, result in leaks and environmental penalties, and, on occasion, require complete well shutdowns. Experts indicate that hydrate plugging may cost the gas industry more than $1 million per day that production is shutdown; and once a hydrate has formed it can take months to dissociate it safely.

Fearing the extreme consequences associated with under-injection, many companies end up over-injecting treatment chemicals. Emerson found that many companies were over-dosing by as much as 20 percent. Although over-injecting helps reduce the risk of under-dosing, the practice is extremely costly. The chemicals themselves are expensive and involve associated transportation, storage, and handling costs. As a result, over-injection results in unnecessary costs that the upstream industry cannot tolerate in today's environment, when oil prices are low and operators face tremendous pressure to cut costs in all areas. One example cited showed that over-injection on one well alone could cost an operator over $2 million annually.

Flowmeters for Accurate Dosing Measurement

To avoid both the risks of chemical under-injection and the avoidable costs of over-injection, flow measurement accuracy is paramount. While a number of technologies can be used to accurately measure flow, the harsh environments and high-pressure conditions of this application limit the choice of flowmeters. Positive displacement (PD) flowmeters have been the meter of choice for chemical injection applications, as these meters work well in high-pressure conditions.

Coriolis flowmeters have become the preferred meter for several applications in the oil and gas industry owing to their high accuracy and low maintenance requirements. However, in the past, due to their limitations in high-pressure applications, Coriolis meters have not been widely used for high-pressure chemical injection. The two new Coriolis flowmeters by Emerson Micro Motion have overcome this major limitation, opening the doors for using Coriolis meters in high-pressure applications.

New Solutions to an Old Problem

The two new flowmeters, Micro Motion F100P and HPC010P, represent Emerson's latest addition to its chemical injection portfolio. The ability to operate under high pressure is the top feature of these meters. While the F100P meter has a maximum operating pressure of 6,250 psi, the HPC010P can handle pressures up to 15,000 psi. The HPC010P is the first ultra-high pressure Coriolis meter commercially developed by Emerson. Since meters are still under development, final specifications may change slightly.

Both meters offer high-accuracy measurement capabilities. The flowmeters offer mass flow accuracy of 0.2 percent and density accuracy of 0.01 g/cc at 14.7 psi and 68°F. This high flow measurement accuracy combined with

Micro Motion High Pressure Coriolis Meter	HPC010P	F100P
Pressure Rating	15,000 psi / 1034 bar	6250 psi / 431 bar (CL2500)
Flow rate range (min – max, liquids)	0.37-3.7 lb/min 10-100 kg/hr	18-734 lb/min 500-10,000 kg/hr
Mass accuracy (at 14.7 psi & 68°F)/ Repeatability	± 0.2% / 0.1%	
Density accuracy (at 14.7 psi & 68°F)/ Repeatability	± 0.01 g/cc / 0.005 g/cc	
Electronics	Smart Meter Verification	
Zero Stability (turndown)	Flat spec @ 10:1	Flat spec @ 20:1
Pressure Drop	< 30 psi / 2 bar at maximum flow rates	
Material	C22	
Process Connections	9/16" Autoclave, Medium Pressure	1", 1.5" SS or C22 ASME 16.5 CL2500 flanges

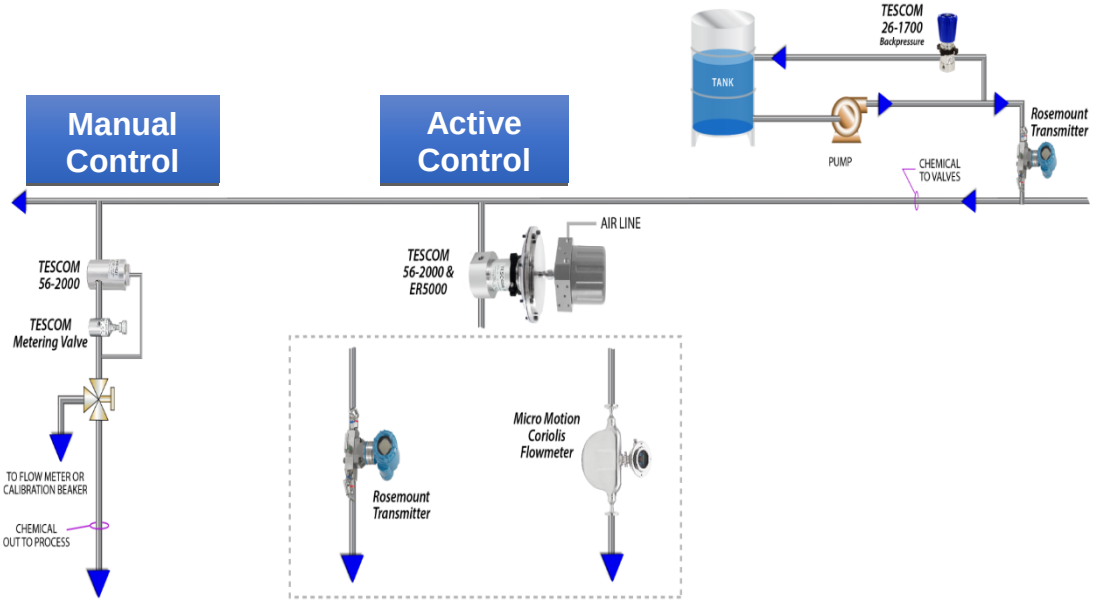
Micro Motion HPC010P and F100P Specifications

the ability to determine chemical quality via density measurement help ensure that right level of chemical is injected to avoid interruptions due to hydrate and scale build-up. Accurate and repeatable measurement also instill confidence in operator to avoid over-dosing and thus can help save on chemical costs.

With no moving parts, the Coriolis meters have low maintenance requirements and offer high reliability. Furthermore, the meters come with Smart Meter Verification electronics, an automatic diagnostic tool that helps operator check flowmeter performance in-line without stopping the process flow. This "one-button/one-answer" feature provides a quick, reliable indication of complete sensor health – from tube structure to electronics. These advanced capabilities can help operators reduce costs associated with process interruptions, calibration, and maintenance and repair. The Coriolis meters are also immune to fluid viscosity and density changes, providing flexibility to modify treatment plans.

These new flowmeters can also be used in conjunction with the company's Tescom regulators and controllers to help operators achieve closed-loop control of chemical injection to further improve accuracy and repeatability to +/- 0.1 percent.

Together, these technologies enable automatic adjustment for downhole pressure / temperature / density changes, minimizing any drift from the operator's desired setpoint. These capabilities help companies significantly



Chemical Injection System
Source: Emerson Process Management

reduce the need for frequent field trips or other human intervention, a major advantage, especially with the increasing remoteness of many offshore production assets and today's current shortage of skilled personnel in the oil & gas industry. This type of chemical injection solution also provides effective monitoring of pump performance and flexibility to optimize production by balancing production rate and yield as a well's production changes and matures over time.

Conclusion

As oil and gas exploration moves to deeper waters and harsher environments, proper flow assurance management is becoming even more critical. Accurate measurement and control of chemical inhibitors is required to manage challenges such as corrosion and formation of scale, asphaltene, and hydrates. Users should seek out chemical injection solutions that help improve system reliability, reduce chemical costs, increase operational efficiency, reduce the need for human intervention, and reduce safety risks.

With the addition of these two new Coriolis flowmeters in conjunction with ER5000 active control, it appears that Emerson's chemical injection portfolio is well positioned to help owner-operators and service companies meet these challenges.

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