

Micro Motion® ELITE® Coriolis Technology

Unparalleled performance in two-phase flow conditions



“Entrained gas in my process reduces measurement accuracy and my profitability.”

Two-phase flow (or entrained gas) can cause uncertainties and variations that reduce profitability due to inaccurate accounting of received or dispensed fluids, measurement of feeds, blends and additives, and even damaged equipment. Although installation best practices can eliminate or reduce entrained gas, if you have low levels of entrained gas, Micro Motion® ELITE® Coriolis flowmeters provide the best performance on the market.

What if you could ...

Maintain accuracy and repeatability for fluids with gas entrainment?

Micro Motion ELITE Coriolis flowmeters perform with unparalleled accuracy in the field and in plant applications with two-phase flow, and measure fluids with any Gas Void Fraction (GVF).

Deliver on-specification products with confidence?

When you use a Micro Motion ELITE flowmeter for process measurement, even with small levels of entrained gas, you can be sure that the measured feeds, blends and additives used in production are correct the first time, every time.

Avoid over and under-filling from small vessels to industrial tanks?

Micro Motion Coriolis ELITE flowmeters accurately measure the mass flow of fluids during filling processes. Since gas occupies a large volume with a very low weight, it can cause measurement inaccuracies when volumetric flowmeters are used to measure two-phase mixtures.

An inaccurate measurement can cause a container to be over or under-filled. Over-fills can result in spills and potential safety and environmental concerns; under-fills cause inaccurate accounting.

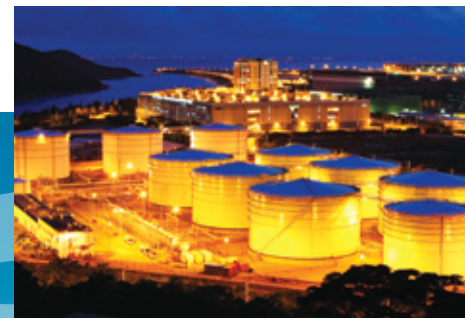


Micro Motion Coriolis technology addresses entrained gas challenges with improvements to sensor stability and digital signal processing algorithms.

The result?

Accurate and reliable measurement flexible to changing fluid conditions.

COROLIS OPTIMIZED
for entrained gas measurement



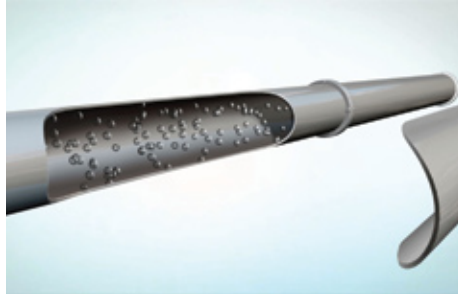
How does entrained gas affect a process?

Entrained gas (also known as two-phase or multi-phase flow) is caused by:

Bubble Flow

Continuous, evenly distributed bubbles entrained in a fluid

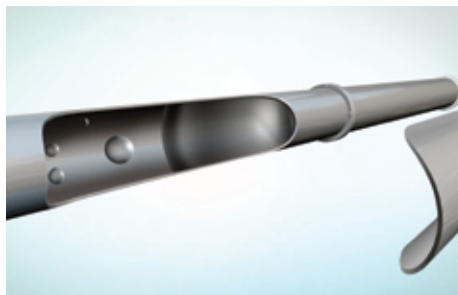
- Intentional air in whipped cream, butter, beer or shampoo
- Emulsions that capture gases
- Air in viscous fluids



Slug Flow

Periodic coalesced bubbles usually caused by process upsets

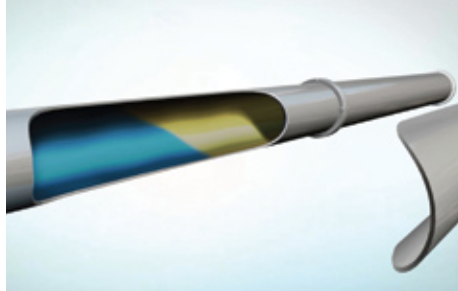
- Natural gas slugs
- Leaks in pump suctions or faulty seals
- Long fluid stream drops into tanks
- Fluid flashing and cavitation conditions



Empty-Full-Empty Batching

Precise liquid-to-gas interface

- Truck loading and off-loading
- Clean-in-Place (CIP) or fluid changeover that clears process lines
- After equipment replacement when lines are open
- Tank stripping



Entrained Gas Measurement

Entrained Gas in flowing Coriolis meter

Most two-phase flow applications with entrained gas are difficult to measure and operate. It is easy to overestimate the content of air in fluids. Although these images appear to have very high levels of entrained air, the GVF is only 1.5%.



The images show CMF200 ELITE Coriolis flowmeter flow at a 300 lb/min flowrate (5:1 turndown) with tubes in the "down" position.

Coriolis Flowmeter Best Practices for Entrained Gas

Although the best way to improve your process is to remove all sources of entrained gas, ELITE Coriolis flowmeters deliver unparalleled performance in two-phase flow conditions.

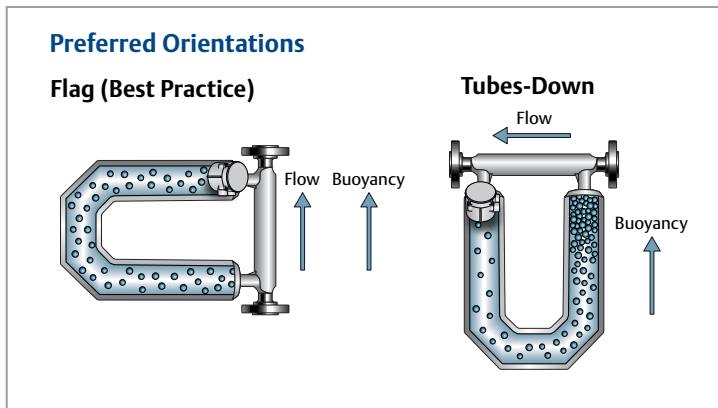
For all applications, the following guidelines minimize the uncertainty contribution of entrained air:

METER SIZE

Size the Coriolis flowmeter to operate at the highest flow velocity possible, at the upper end of its flow range to keep the fluid well mixed. To ensure adequate mixing, the meter should be operated at 30% or higher of the nominal flow, if possible.

METER ORIENTATION

The meter should be mounted in a flag or tubes-down orientation. A table top orientation should be avoided. In the tubes down position, bubbles get stuck on the inlet side at low rates. Keep flow rates high to avoid this.



EMPTY-FULL-EMPTY APPLICATIONS

Care should be taken during meter sizing and installation to keep fill times as short as possible. The meter should be installed close to the transfer point in a drainable configuration, be filled quickly at the start, and drained or blown out quickly at the end of the batch.

USE FACTORY METER ZERO

When two-phase conditions are present, do not re-zero the meter. If the meter is re-zeroed, then re-install the factory zero.

MICRO MOTION SOLUTION

Use low frequency flowmeters such as the Micro Motion ELITE Coriolis flowmeter with an Enhanced Core Processor and unmatched transmitter technology to improve performance with entrained gas present.

KEEP YOUR PROCESS
running smoothly



Micro Motion® ELITE® Coriolis Flowmeters

Micro Motion ELITE Coriolis Technology delivers
Unparalleled performance in two-phase flow applications

For two-phase flow, the best measurement is provided by dual-tube sensors with a low tube frequency, such as Micro Motion ELITE Coriolis meters

If a sensor with high tube frequency is used, the two-phase mixture does not vibrate directly with the flow tube, and results in large measurement errors.



Micro Motion unmatched MVD™ transmitter technology is the superior choice for two-phase flow applications

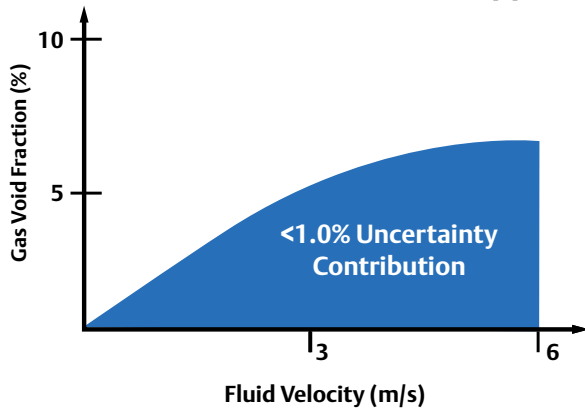
The MVD technology employs the latest digital signal processing (DSP) for the fastest speed of response.

When entrained gas is present, the transmitter removes or "looks through" the noise imposed by the two-phase flow, and reports only the "real flow measurement of the liquid."

The DSP algorithms in the MVD electronics effectively filter the noise and provide continuous measurement for liquids with entrained gas present.

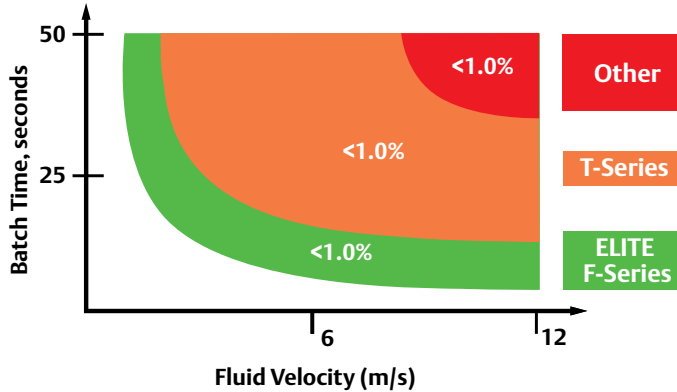


Continuous Entrained Air Applications



Micro Motion ELITE meters deliver less than 1% uncertainty contribution for GVFs below 5%. Results improve as fluid velocities increase.¹

Empty-Full-Empty Applications



For empty-full-empty applications, ELITE and F-Series meters can operate with an uncertainty contribution of less than 1.0% with shorter batch times.¹ Longer batch times improve performance. Other meters in the graph show similar uncertainties at longer batch times.¹

¹ Results are shown from lab tests with low viscosity fluids (water with air). Higher viscosity fluids tested may perform better, and field application performance varies based on conditions.

WORLD-LEADING
MICRO MOTION CORIOLIS
flow and density
technology

SETS THE STANDARD
FOR RELIABLE, REPEATABLE,
HIGH PERFORMANCE
MEASUREMENT



Emerson's Micro Motion devices are known globally in over 85 countries for quality, reliability, application expertise, and support not available elsewhere.

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