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Subject: Recommended Calibration Practices for Micro Motion Coriolis meters used to comply with AGA Report No. 11 and API MPMS Chapter 14.9

This document defines the official Emerson “manufacturer recommended practice” to assist users in their compliance with AGA regulations governing Micro Motion Coriolis Field Maintenance and Meter Verification. AGA-11/API MPMS Ch 14.9 suggests procedures that check these elements of the measuring system:

- Meter Transmitter Verification (calibration, correction factors unchanged and diagnostics in normal state)
- Coriolis sensor verification (see below)
- Temperature verification (using an external temperature reference to verify the Coriolis RTD is within specified uncertainty)
- Meter zero verification (see below)

1. Initial Baseline Calibration

All Micro Motion Coriolis meters produced by Emerson are factory calibrated in a laboratory traceable to the International System of Units (SI) through NIST or other national metrology labs. This water calibration has been proven to transfer to all fluids, including gases (See AGA-11/API MPMS Chapter 14.9, at www.aga.org). Calibration reports are shipped with each meter, and a copy retained by serial number at the factory. Documentation showing ISO/IEC 17025 accreditation supporting traceability is available.

2. Meter Transmitter and Coriolis Sensor Verification

New applications: Emerson recommends the purchase and installation of Micro Motion Coriolis meters with on-board Smart Meter Verification (SMV). SMV is “manufacturer recommended practice” for verifying that calibration factors are unchanged from most recent calibration. SMV also verifies that diagnostic indicators are in a normal state and can be run as frequently as the user desires. Emerson suggests a *once per quarter verification* to establish a robust set of data. In the unlikely event the meter was to “fail” the SMV, repeat the SMV two additional times, and if there are 3 out-of-spec data points, then a “wet-calibration” is warranted. Data shows that if the meter passes SMV, then it is within manufacturer specification, *which is well within the requested AGA accuracy requirements*, and a wet-calibration is not needed. Wet-calibration options include a) master meter, b) “catch-and-weigh”, c) return to factory or c) a third-party lab such as CEESI or SwRI. SMV also verifies if the calibration or scaling factors are unchanged since the last check (configuration), and if all transmitter diagnostics are in their normal state, as prescribed by AGA-11.

For existing applications: Where the application warrants, Emerson recommends upgrading per above. If the installed meter is an Elite, F or H-series meter with 800 ECP (Enhanced Core Processor) or 5700 transmitter, then a software upgrade to add SMV may be performed in the field, in-situ by a trained and factory certified Micro Motion Service Technician. If the meter is of other vintage, and the process is continuous, Emerson recommends upgrading to a Micro Motion Coriolis meter with SMV for the previously cited reasons.

3. Meter Zero Verification

At a minimum, inspection of the meter zero should be performed seasonally in the first year of operation, using the transmitter’s Zero Verification feature, to identify any installation or process condition issues. After the first

year of operation, zero verification intervals can be extended based on the historic performance of the meter's zero for the application. Zero Verification should be performed when the sensor is full of fluid under thermally stable no-flow conditions. Stop flow through the sensor by shutting the downstream valve, and then the upstream valve if available. (Precautions should be taken to avoid sudden stops in flow that could cause severe pipeline disruption.) SMV has the ability to detect sensor (tube) coating, which may affect the meter zero.

If the Zero Verification procedure fails: Confirm the sensor is completely blocked in, that flow has stopped, and that the sensor is completely full of process fluid. Verify that the process fluid is not flashing or condensing, and that it does not contain particles that can settle out. Then repeat the Zero Verification procedure.

For more information, please feel free to contact your local Sales Representative, or me directly. For more complete details as outlined in AGA-11, see www.aga.org

Sincerely,

Dean Standiford

Director Global Calibration Quality