

## **COAT MM Sensor Calibration Procedure Conference 1-26-2017**

Teleconference Attendees:

Jim Gutzwiller (Chairman), Elisa Santos – Infineum

Jim McCord, Jim Carroll (Secretary), Randy Harmon – SwRI

Alex Ebner – Lubrizol

Tim Griffin – Intertek

Hind Abi-Akar - Caterpillar

**Agenda:** Update on progress to run new calibration procedure.

Use CAT DEO-ULS at all labs.

Lubrizol and SwRI are expecting new Micromotion parts next week.

SwRI will have Emerson technician remove the Puck 800 processor from the sensor and put it into a remote housing to shield it from high temperatures.

SwRI will redesign and build instrument enclosure to reach higher temperatures.

Intertek's maximum box temperature now is <80°C and was very slow to stabilize. Plans to add insulation and run a prove out test of the calibration procedure.

Changes to calibration procedure:

- Calibration temperatures can stabilize  $\pm 2^\circ\text{C}$  of target.

During prove out tests:

- Run calibration prove-out with CAT DEO-ULS oil
- Measure density of the CAT DEO-ULS using D4052.
- Run at 30, 50, and  $70 \pm 2^\circ\text{C}$  stabilized temperatures.
- If higher temperatures are reachable, then check if the calibration is linear at the higher temperatures. Do not use the higher temperatures to create a new calibration, it is only a verification.

Next meeting February 2, 2017 at 2:30 CST.

Resolved: Agreed that all will use Smart Meter Verification (SMV) and Puck 800 processor.

Discussed Micromotion sensor codes ending in E3ZZ (guaranteed to 0.0002 g/ml) vs EZZZ (guaranteed to 0.0005 g/ml) calibration. Emerson states that they will guarantee their calibration of the sensor only using a known fluid within 0.0002 g/ml. But the resolution of either sensor is the same.

Since we will calibrate in house, and the resolution is the same between the two sensors, we will require that 0.0005 is the minimum initial calibration required when ordering a sensor.

Resolved: Sensor must be calibrated by Emerson at time of purchase to at least 0.10% mass flow and at least 0.0005 g/cm<sup>3</sup> (0.5 kg/m<sup>3</sup>) density calibration.

Resolved: Software and firmware versions are to be reported to TMC for both references and candidate tests.

Resolved: All sensors will use 4-20mA output for density, and make it equivalent to 0-1.5 g/ml.

Minimum recorded and reported values will be flow, density, plus sensor's RTD temperature (as an average and standard deviation) on Form 6 of the report and flat file.

Note: Current rules need to be changed to allow removal of the sensor from the system, and allow flow calibration without requiring multiple references.

The labs will run prove out tests of the procedure and present the data to the panel once their systems are capable of higher temperature control.

First prove out test will be run at all labs. Run with CAT DEO oil flowed through the system using the engine for 10 minutes, as per new calibration procedure. Measure density at 30, 50, and 70C ( $\pm 0.75C$ ) at a minimum. Higher temperatures are allowed if possible. Record temperature in and out of MM, plus the sensor's measured temperature. Once data is discussed, the procedure will be re-run at all labs with a different oil to check if the density readings match the D4052 results.

Procedural wording will allow for >30C to be used as the minimum if ambient temperatures are higher. Use D4052 to extrapolate density at the stabilized temperature.

Intertek offered to run a prove out test.

SwRI and Lubrizol will update the group on their progress.