RheoSense
Simply Precise®

Measuring Viscosity of Engine Oil at 100°C with *m*-VROC II

If you need to measure your sample across a broad temperature range, ***m*-VROC® II** now offers the capability to assess viscosity from 4 ˚C to 100 ˚C. This feature allows you to test specific samples, such as engine oil, at high temperatures, which cannot be measured by other viscometers available on the market. Highlighted features of the instrument include:

- Ability to test small sample quantities repeatedly, thanks to the microfluidics and the sample retrieval feature.
- High accuracy, ±2%, and excellent repeatability, ±0.5%.
- Precise temperature control with Peltier technology

In this application brief, the viscosity of Quaker State Full Synthetic Dexos Motor Oil, SAE 0W-20, was measured using *m*-VROC II. The test procedure involved the following steps:

1. To measure the sample across a broad shear rate range, two chips are required: B05 and E05.
2. For the B05 chip, 80 µL of the sample is back loaded into the 100 µL test syringe using a positive displacement pipette.
3. For the E05 chip, a 2.5 mL syringe is used, and ~1.5 mL of the sample is front loaded to the syringe.
4. A level generator measurement protocol is employed to determine the viscosity of the sample over a wide shear rate range at 100 ˚C.
5. The Chip Cleaning Station (CCS) is used for the final cleaning of both the chip and reservoir using the pre-loaded oil cleaning protocol.

The plot here illustrates the viscosity of engine oil as a function of shear rate, from 2000 s^{-1} to 500,000 s^{-1}, as measured with the B05 and E05 chips. Each data point is an average of five repeated measurements. All error bars, smaller than data pts., correspond in length to the standard deviation. As shown, engine oil exhibits non-Newtonian shear thinning behavior. Synthetic engine oils often contain polymers, specifically viscosity modifiers, which play a crucial role in their performance and the shear thinning characteristics.