

MRV TP-1 ENGINE OIL PUMPABILITY D 4684

SIGNIFICANCE AND USE

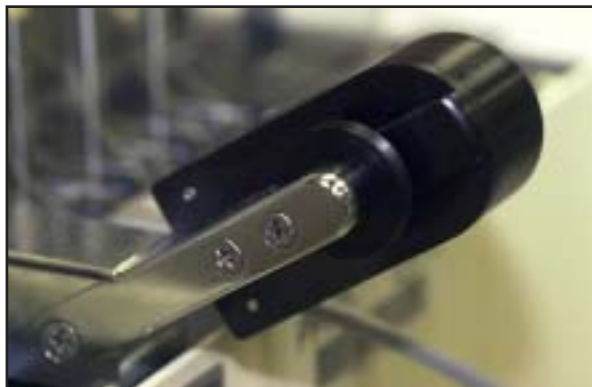
When an engine oil is cooled, the rate and duration of cooling can affect its yield stress and viscosity. In this laboratory test, an engine oil is slowly cooled through a temperature range where wax crystallization is known to occur, followed by relatively rapid cooling to the final test temperature. These laboratory test results have predicted as failures the known engine oils that have failed in the field due to the lack of oil pumpability. These documented field failing oils have all consisted of oils normally tested at -25°C . These field failures are believed to be the result of the oil forming a gel structure that results in excessive yield stress or viscosity of the engine oil, or both.

TEST PARAMETERS

This test method covers the measurement of the yield stress and viscosity of engine oils after cooling at controlled rates over a period exceeding 45 hours to a final test temperature between -10 and -40°C . The viscosity measurements are made at a shear stress of 525 Pa over a shear rate of 0.4 to 15 s^{-1} .

TEST METHOD/SUMMARY

An engine oil sample is held at 80°C and then cooled at a programmed cooling rate to a final test temperature. A low torque is applied to the rotor shaft to measure the yield stress. A higher torque is then applied to determine the apparent viscosity of the sample.



DSC_0144



DSC_0123



DSC_0133

APPARATUS/TEST FIXTURES

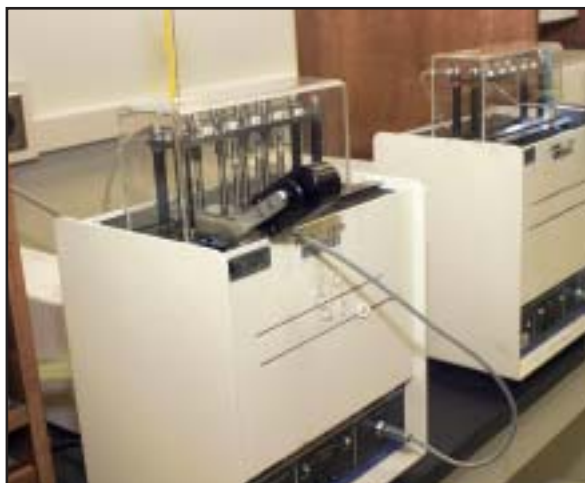
A mini-rotary viscometer, an apparatus that consists of one or more viscometric cells in a temperature-controlled aluminum block, is used. Each cell contains a calibrated rotor-stator set. Rotation of the rotor is achieved by an applied load acting through a string wound around the rotor shaft. A temperature control system operates the heater in the mini-rotary viscometer block and regulate the coolant flow to the block. The temperature controller is the most critical part of this procedure. Thermometers measure the temperature of the block. A refrigeration device that is capable of maintaining a coolant to at least 10°C below the lowest test temperature is required. A circulating system that will circulate the liquid coolant to the block as needed is also required. A chart recorder will verify that the correct cooling curve is being followed and many also monitor the block temperature.

REPORT

The final test temperature and either the apparent viscosity or the existence of yield stress — but not both — will be reported.



DSC_0141



DSC_0130

