A Program of ASTM International

Test Monitoring Center

Carnegie Mellon University
6555 Penn Avenue, Pittsburgh, PA 15206, USA

http://astmtmc.cmu.edu
412-365-1000

Sequence IIIG Information Letter 08-2
Sequence No. 18
November 6, 2008

Approved by ASTM D02.B on October 29, 2008

TO: Sequence III Mailing List

SUBJECT: Sequence IIIGB Test Creation

The Sequence III Surveillance Panel approved, via electronic ballot, the creation of a new version of the Sequence IIIG test measuring only percent phosphorus retention. Appendix X3 has been added to Test Method D7320 to define the requirements for conducting this procedure, referred to as the Sequence IIIGB. Sections 1.1.1, 1.4, and 2.1 have also been updated. This change is effective the date of this information letter.

Bruce Matthews
Engine Oil Test Development and Support
GM Powertrain Materials Engineering

John L. Zalar
Administrator
ASTM Test Monitoring Center

Attachment

c: ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceiii/procedure_and_ils/IIIG/IL08-2.pdf

Distribution: Electronic Mail

1.1.1 Additionally, with non-mandatory supplemental requirements, a IIIGA Test (Mini Rotary Viscometer and Cold Cranking Simulator measurements), a IIIGVS Test (EOT viscosity increase measurement), or a IIIGB Test (phosphorus retention measurement) can be conducted. These supplemental test procedures are contained in Appendixes X1, X2, and X3, respectively.

1.4 This test method is arranged as follows:

2.1 *ASTM Standards:*[1]

D 86 Test Method for Distillation of Petroleum Products at Atmospheric Pressure
D 130 Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test
D 235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
D 240 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter
D 323 Test Method for Vapor Pressure of Petroleum Products (Reid Method)
D 381 Test Method for Gum Content in Fuels by Jet Evaporation
D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
D 525 Test Method for Oxidation Stability of Gasoline (Induction Period Method)
D 1319 Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption
D 2699 Test Method for Research Octane Number of Spark-Ignition Engine Fuel
D 2700 Test Method for Motor Octane Number of Spark-Ignition Engine Fuel
D 3231 Test Method for Phosphorus in Gasoline
D 3237 Test Method for Lead in Gasoline by Atomic Absorption Spectroscopy
D 3244 Standard Practice for Utilization of Test Data to Determine Conformance with Specifications
D 3338 Test Method for Estimation of Net Heat of Combustion of Aviation Fuels
D 3343 Test Method for Estimation of Hydrogen Content of Aviation Fuels
D 4052 Test Method for Density and Relative Density of Liquids by Digital Density Meter
D 4175 Terminology Relating to Petroleum, Petroleum Products, and Lubricants
D 4485 Specification for Performance of Engine Oils
D 4684 Test Method for Determination of Yield Stress and Apparent Viscosity of Engine Oils at Low Temperature
D 4815 Test Method for Determination of MTBE, ETBE, TAME, DIPE, tertiary-Amyl Alcohol and C_1 to C_4 Alcohols in Gasoline by Gas Chromatography

[1]For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

D 5185 Test Method for Determination of Additive Elements, Wear Metals, and Contaminants in Used Lubricating Oils and Determination of Selected Elements in Base Oils by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)
D 5191 Test Method for Vapor Pressure of Petroleum Products (Mini Method)
D 5293 Test Method for Apparent Viscosity of Engine Oils Between -5 and -35°C Using the Cold-Cranking Simulator
D 5452 Test Method for Particulate Contamination in Aviation Fuels by Laboratory Filtration
D 5453 Test Method for Determination of Total Sulfur in Light Hydrocarbons, Spark Ignition Engine Fuel, Diesel Engine Fuel, and Engine Oil by Ultraviolet Fluorescence
D 5862 Test Method for Evaluation of Engine Oils in Two-Stroke Cycle Turbo-Supercharged 6V92TA Diesel Engine
E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E 191 Specification for Apparatus For Microdetermination of Carbon and Hydrogen in Organic and Organo-Metallic Compounds
E 608/E 608M Specification for Mineral-Insulated, Metal-Sheathed Base Metal Thermocouples
E 1119 Specification for Industrial Grade Ethylene Glycol
IEEE/ASTM SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System[3]

APPENDIX

X3. SEQUENCE IIIGB TEST PROCEDURE

X3.1 *Overview*

X3.1.1 The Sequence IIIGB supplement to the Sequence IIIG test was developed to generate used oil samples to measure the phosphorus retention of a test lubricant after 100 h of Sequence IIIG test operation. No parts ratings or measurements are required in the Sequence IIIGB test. A separate Sequence IIIGB Report Form Set is available from the TMC for reporting Sequence IIIGB test results. Do not use the Sequence IIIG Report Form Set to report Sequence IIIGB test results. The oil samples used for measurement of the phosphorus retention in the Sequence IIIGB test are the initial oil sample, removed from the engine following the initial run-in, and the end-of -test 100-h oil sample. The phosphorus retention calculation is:

$$\text{Phosphorus Retention} = (Ca_{tI} / Ca_{t100}) \times (P_{t100} / P_{tI}) \times 100$$

where Ca_{tI} and P_{tI} are analytical results from the initial oil sample and Ca_{t100} and P_{t100} are analytical results from the end-of-test oil sample. Use Test Method D 5185 to measure calcium and phosphorus concentrations. For oils where calcium is not the highest concentration detergent metal, substitute the highest concentration detergent metal into the equation for calcium

X3.2 *Preparation of Apparatus* – Prepare the Sequence IIIGB test engine in the same manner as a Sequence IIIG or IIIGA test engine; except that the pre-test camshaft and lifter measurements are not required. No special preparations are required or permitted on test engines for Sequence IIIGB testing.

X3.3 *Calibration*

X3.3.1 There is no stand-alone calibration system for the Sequence IIIGB test. A stand that is calibrated for the Sequence IIIG is also calibrated for Sequence IIIGB testing. Conduct a Sequence IIIIGB test simultaneously with each Sequence IIIG reference oil test.

X3.3.2 No special calibration of stand instrumentation is required for Sequence IIIGB testing.

X3.3.3 A Sequence IIIGB test counts as one run against the Sequence IIIG calibration period in which it was run. A test run as a combined Sequence IIIG, IIIGA, or IIIGB test counts as only one run against the calibration period.

X3.4 *Test Procedure* – The Sequence IIIG/B test can be conducted in one of two ways:

X3.4.1 *Stand-alone Sequence IIIGB Test* – If only a Sequence IIIGB test result is needed, conduct the test in the normal manner as detailed in Test Method D 7320 with the exception of ratings, wear measurements, or assessment of stuck rings. At the end of test, report all results as a stand-alone IIIGB test using the Sequence IIIGB Report Form Set.

X3.4.2 *Combined Sequence IIIG, IIIGA, IIIGB Sequence Test* – If Sequence IIIG, IIIGA, and IIIGB test results are desired on a non-reference oil, conduct the test in the normal manner as listed in Test Method D 7320, identify the test as a Combined Sequence IIIG, IIIGA, IIIGB on Report Form 1 and complete all forms in the standard Sequence IIIG, IIIGA, and IIIGB Report Form Sets including all ratings, measurements, and used oil analyses.

X3.5 *End-of-Test Oil Sample Testing*- The phosphorus and calcium elemental concentrations for all oil samples are to be reported in mg/kg as determined using Test Method D 5185. All samples, initial and end-of-test, are to be run sequentially, in duplicate, using the same calibration (i.e. as close in time as practical). Background correction, internal standard, and peristaltic pump are required. Use sample dilutions of at least 1:20. Once a dilution is established, use it for all samples from a test. Report the average of the two determinations as the final result. If the duplicate determinations are outside the repeatability calculations shown in Table 2 of Test Method D 5185, follow the procedure in Test Method D 3244 Section 6.2.

X3.6 *Quality Index* – Calculate quality index results for a Sequence IIIGB test in the same manner as for the Sequence IIIG.

X3.7 *Test Reporting* – Report Sequence IIIGB test results using the standard IIIGB Report Form Set, available from the TMC.

X3.8 *Precision and Bias* – The precision and bias of this test procedure for measuring phosphorus retention has yet to be determined.