~~Designation:D7216–08a~~ Designation: D 7216 – 09

Standard Test Method for Determining Automotive Engine Oil Compatibility with Typical Seal Elastomers[1]

This standard is issued under the fixed designation D 7216; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Any properly equipped laboratory, without outside assistance, can use the test method described in this standard. However, the ASTM Test Monitoring Center (TMC)[2] provides a reference oil (TMC 1006-1) and an assessment of the test results obtained with this oil and the reference elastomers. By these means, the laboratory will know whether their use of the test method gives results statistically similar to those obtained by other laboratories.

The TMC also use the reference oil results on different batches of elastomers from different laboratories to update continually the total and within-laboratory standard deviation estimates. Some specifications, for example, Specification D 4485, use the updated TMC standard deviation estimates, pertaining at the time test oils are evaluated, to adjust specification limits for the effects of the industry test variability.

Various agencies require that a laboratory utilize the TMC services in seeking qualification of oils against specifications. For example, the U.S. Army imposes such a requirement in connection with several Army engine lubricating oil specifications.

Accordingly, this test method is written for use by laboratories that utilize the TMC services. Laboratories that choose not to use those services may simply ignore those portions of the test method that refer to the TMC.

This test method may be modified by means of information letters issued by the TMC. In addition, the TMC may issue supplementary memoranda related to this test method.

1. Scope

1.1 This test method covers quantitative procedures for the evaluation of the compatibility of automotive engine oils with ~~five~~several reference elastomers typical of those used in the sealing materials in contact with these oils. Compatibility is evaluated by determining the changes in volume, Durometer A hardness and tensile properties when the elastomer specimens are immersed in the oil for a specified time and temperature.

1.2 Effective sealing action requires that the physical properties of elastomers used for any seal have a high level of resistance to the liquid or oil in which they are immersed. When such a high level of resistance exists, the elastomer is said to be compatible with the liquid or oil.

NOTE 1—The user of this test method should be proficient in the use of Test Methods D 412 (tensile properties), D 471 (effect of rubber immersion in liquids), D 2240 (Durometer hardness), and D 5662 (gear oil compatibility with typical oil seal elastomers), all of which are involved in the execution of the operations of this test method.

1.3 This test method provides a preliminary or first order evaluation of oil/elastomer compatibility only. Because seals may be subjected to static or dynamic loads, or both, and they may operate over a range of conditions, a complete evaluation of the potential sealing performance of any elastomer-oil combination in any service condition usually requires tests additional to those described in this test method.

1.4 The ~~five~~several reference elastomer formulations specified in this test method were chosen to be representative of those used

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.B0.07 on Development and Surveillance of Bench Tests Methods.

Current edition approved ~~Dec. 1, 2008.~~April 15, 2009. Published ~~January~~September 2009. Originally approved in 2005. Last previous edition approved in 2008 as D 7216–08a.

[2] Until the next revision of this test method, the ASTM Test Monitoring Center will update changes in the test method by means of information letters. Information letters may be obtained from the ASTM Test Monitoring Center, 6555 Penn Avenue, Pittsburgh, PA 15206. (www.astmtmc.cmu.edu) Attention: Administrator. This edition incorporates revisions in all information letters through No. 07-1.

in both heavy-duty diesel engines and passenger-car spark-ignition engines (the latter are covered in Annex A2). The procedures described in this test method can, however, also be used to evaluate the compatibility of automotive engine oils with different elastomer types/formulations or different test durations and temperatures to those employed in this test method.

NOTE 2—In such cases, the precision and bias statement in Section 12 does not apply. In addition to agreeing acceptable limits of precision, where relevant, the user and supplier should also agree: *(1)* test temperatures and immersion times to be used; *(2)* the formulations and typical properties of the elastomers; and *(3)* the sourcing and quality control of the elastomer sheets.

NOTE 3—The TMC may also issue Information Letters on this matter.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.7 This test method is arranged as follows:

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D 297 Test Methods for Rubber ProductsChemical Analysis
D 412 Test Methods for Vulcanized Rubber and Thermoplastic ElastomersTension
D 471 Test Method for Rubber PropertyEffect of Liquids
D 1193 Specification for Reagent Water
D 1566 Terminology Relating to Rubber
D 2240 Test Method for Rubber PropertyDurometer Hardness
D 4175 Terminology Relating to Petroleum, Petroleum Products, and Lubricants
D 4485 Specification for Performance of Engine Oils
D 5662 Test Method for Determining Automotive Gear Oil Compatibility with Typical Oil Seal Elastomers
E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E 178 Practice for Dealing With Outlying Observations

2.2 *SAE Standard*[4]

SAE J2643 Standard Reference Elastomers (SRE) for Characterizing the Effect of Liquids on Vulcanized Rubbers

3. Terminology

3.1 *Definitions:*

3.1.1 *automotive*, *adj*—descriptive of equipment associated with self-propelled machinery, usually vehicles driven by internal combustion engines. **D 4175**

3.1.2 *candidate oil*, *n*—an oil that is intended to have the performance characteristics necessary to satisfy a specification and is to be tested against that specification. **D 4175**

3.1.3 *elastomer*, *n*—a natural or synthetic polymer having the rubber-like property of substantially recovering its size and shape after removal of a deforming force. **D 4175**

3.1.4 *engine oil*, *n*—a liquid that reduces friction or wear, or both, between the moving parts within an engine; removes heat particularly from the underside of pistons; and serves as combustion gas sealant for the piston rings.

[3] 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.

[4] ~~Aerosol OT has been found satisfactory for this purpose. (Aerosol is a trade mark of American Cyanamid Co.). Preparation of the wetting agent solution from the solid reagent is not recommended.~~

[4] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, http://www.sae.org.