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An American National Standard

Standard Test Method for Load-Carrying Capacity of Petroleum Oil and Synthetic Fluid Gear Lubricants¹

This standard is issued under the fixed designation D 1947; 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 reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

This test method has been approved for use by agencies of the Department of Defense to replace Method 6512 of Federal Test Method Standard No. 791b. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense

^{ε1} NOTE—Paragraph 13.2 was editorially corrected in October 1994.

1. Scope

1.1 This test method covers the determination of the load-carrying capacity of petroleum oil and synthetic fluid gear lubricants.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information purposes only.

1.3 *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 consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* For specific hazard statements, see 7.2.

2. Referenced Document

2.1 *ASTM Standard:*

D484 Specification for Hydrocarbon Drycleaning Solvents²

3. Terminology

3.1 *Definition:*

3.1.1 *load-carrying capacity* of the test oil (or fluid)—the tooth load, in pounds per inch of tooth face width, at which an average tooth face scuffing of 22½ % has been reached.

4. Summary of Test Method

4.1 The oil (or fluid) under test is evaluated in a standard gear machine, at a series of increasing loads, under controlled conditions. The amount of tooth-face scuffing occurring at each load increment is measured. The percentage of tooth-face scuffing is plotted against the load to determine the load-carrying capacity of the test oil (or fluid).

5. Significance and Use

5.1 This test method is used to establish the load carrying ability of petroleum and synthetic fluid gear lubricants. Lubricant load carrying capacity up to approximately 5600

lb/in.² (98.0 N/m²) can be determined using the method presented here. Field experience indicates a relation with test results in gear lubricant performance. (Excluding worm and hypoid gear applications.) Specific correlation needs to be established in the particular application. Temperature data is taken only in °F and pressure data is indicated only in psig. No other units are recorded.

6. Apparatus

6.1 *Erdco Universal Tester*,³ or equivalent—This tester comprises a drive system, a support and load oil system, a test oil system, and the necessary instruments and controls. The tester is described as universal in that the drive system may be used to drive other lubricant test devices. Figure 1 shows the Erdco Universal Tester. Figure 2 is a photograph of the control console.

6.1.1 *Ryder Gear Machine*³—The Ryder Gear Machine operates on the power circulating principle. As shown in Fig. 3, two parallel shafts, *P* and *Q*, are connected by two slave gears, *R* and *S*, and two test gears, *T* and *U*, to form a square, so that the power required to operate the machine is that required to overcome the friction losses in the gears and bearings. The slave gears are helical gears, made integral to the shafts (Fig. 4). The replaceable test gears are spur gears, which are installed on the shaft (Fig. 5). Load on the test gears is obtained through the application of a controlled oil pressure in two load chambers (Fig. 3, *Y* and *Z*), which causes an axial movement of one shaft relative to the other. Because of the integral helical slave gears, a torsional load is thus applied on the shafts, thereby loading the test gears. The relation between the tooth load on the test gears and the load oil pressure is obtained by arithmetic calculation, calibration, or both.

6.1.2 *WADD Gear Machine*³—The operating principle of the WADD Gear Machine is identical to that of the Ryder Gear Machine. However, improvements in material and design permit its operation at speeds up to 30 000 r/min, and test gear temperatures of 700°F (370°C) or higher. As shown in Fig. 6, the WADD Gear Machine differs from the

¹ This test method is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.C on Turbine Fuels.

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² Discontinued; see 1983 Annual Book of ASTM Standards, Vol 05.01.

³ At present, manufacturers of the Ryder Gear Machine are very limited. Information regarding obtaining or manufacture of this machine, or both, can be obtained by inquiries addressed to Secretary of Committee D-2, American Petroleum Institute, 1220 L St., N.W., Washington, DC 20005.