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An American National Standard

Standard Test Method for Wear Life of Solid Film Lubricants in Oscillating Motion[1]

This standard is issued under the fixed designation D 2981; 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.

1. Scope

1.1 This test method covers the evaluation of wear life of a bonded solid film lubricant under oscillating motion by means of a block-on-ring[2] friction and wear testing machine.

1.2 The values stated in either inch-pound units or SI (metric) units are to be regarded separately as standard. Within the text the SI units are shown in brackets. The values stated in each system are not exact equivalents, therefore each system must be used independently of the other. Combining values of the two systems may result in nonconformance with the specification.

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 establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 2714 Test Method for Calibration and Operation of the Falex Block-on-Ring Friction and Wear Test Machine[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *coefficient of friction, μ or f—in tribology*, the dimensionless ratio of the friction force (*F*) between two bodies to the normal force (*N*) pressing these two bodies together.

$$\mu \text{ or } f = (F/N) \quad (1)$$

3.1.1.1 *Discussion*—A distinction is often made between *static coefficient of friction* and *kinetic coefficient of friction*.

3.1.2 *friction force*—the resisting force tangential to the interface between two bodies when, under the action of an external force, one body moves or tends to move relative to the other.

3.1.3 *kinetic coefficient of friction*—the coefficient of friction under conditions of macroscopic relative motion between two bodies.

3.1.4 *wear*—damage to a solid surface, generally involving progressive loss of material, due to relative motion between that surface and a contacting substance or substances.

4. Summary of Test Method

4.1 The test machine is operated using a coated steel testing ring oscillating against a steel test block. The oscillating speed is 87.5 ± 1 cpm at a 90° arc. The specimens are worn-in for 1 min at 13.6 kg (30 lb) normal load obtained by application of 0.454 kg (1 lb) of dead weight to the 0:1 ratio lever system. Wear-in is followed by application of a normal load of 283 kg (630 lb) obtained by application of 9.53 kg (21 lb) of dead weight to the 30:1 ratio lever system for the duration of the test.

4.2 One measurement is made:

4.2.1 *wear life*—the number of cycles required for the frictional force to rise to a predetermined value.

5. Significance and Use

5.1 This test method is used for determining the wear life properties of bonded solid lubricants in oscillating motion under the prescribed test conditions. This test method differentiates between bonded solid lubricants with respect to their wear life. If the test conditions are changed, relative wear life may change and relative ratings of the bonded solid film lubricants may be different.

6. Apparatus

6.1 *Block-on-Ring Test Machine*,[2] equipped with oscillating drive, load cell transducer and recorder described in detail in Annex A1 and illustrated in Fig. 1.

6.2 *Test Ring*,[4] *SAE 4620 Steel*, having a Rockwell hardness of HRC 58-63. Each ring had a ground face of 8.163 mm ± 0.127 mm (0.321± 0.005 in.), a diameter of 34.9885 ± 0.0254, −0.1270 mm (1.3775 ± 0.001, −0.005 in.) and an eccentricity between the inner and outer surface of ±0.038 mm (0.0015 in.). The surface finish of the outside diameter of each ring prior to lubricant coating application should be from 500 to 750 nm (20 to 30 μin.) rms.

6.3 *Test Block*,[2] *SAE 01 Steel*[5] with test surface of 0.635 ± 0.021, −0.000 mm (0.250 ± 0.0005, −0.0000 in.) wide and

[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 D02.0L on Industrial Lubricants.

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[2] The Block-on-Ring Test machine is available from Falex Corp., 1020 Airpark Dr., Sugar Grove, IL 60554.

[3] *Annual Book of ASTM Standards*, Vol 05.01.

[4] Available from Falex Corp., 1020 Airpark Dr., Sugar Grove, IL 60554.

[5] SAE 01 is also known as Starrett 406 or Marshall Oilcrat.