Designation: D8022 – 20

Standard Test Method for Roll Stability of Lubricating Grease in Presence of Water (Wet Roll Stability Test)[1]

This standard is issued under the fixed designation D8022; 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 a procedure for determining the roll stability of lubricating grease in the presence of water (wet roll stability) by using a roll stability test apparatus.

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

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D217 Test Methods for Cone Penetration of Lubricating Grease

D1193 Specification for Reagent Water

D1403 Test Methods for Cone Penetration of Lubricating Grease Using One-Quarter and One-Half Scale Cone Equipment

D1831 Test Method for Roll Stability of Lubricating Grease

D4057 Practice for Manual Sampling of Petroleum and Petroleum Products

3. Terminology

3.1 *Definitions:*

3.1.1 *consistency, n—of lubricating grease*, degree of resistance to movement under stress.

3.1.1.1 *Discussion*—The term consistency is used somewhat synonymously with penetration. Generally, consistency refers to the worked penetration of a grease. **D217**

3.1.2 *lubricating grease, n*—semi-fluid to solid product of a dispersion of a thickener in a liquid lubricant.

3.1.2.1 *Discussion*—The dispersion of the thickener forms a two-phase system and immobilizes the liquid lubricant by surface tension and other physical forces. Other ingredients are commonly included to impart special properties. **D217**

3.1.3 *penetration, n—of lubricating grease*, the depth that the standard cone, when released to fall under its own weight for 5 s, enters the sample.

3.1.4 *reduced-scale worked penetration, n—of a lubricating grease*, the penetration at 25 °C (77 °F), without delay, of a sample after 60 double strokes in a ¼-scale or ½-scale grease worker.

3.1.5 *thickener, n—in a lubricating grease*, a substance composed of finely divided particles dispersed in a liquid lubricant to form the product's structure.

3.1.5.1 *Discussion*—The thickener can be fibers (such as various metallic soaps) or plates or spheres (such as certain non-soap thickeners) which are insoluble or, at the most, only very slightly soluble in the liquid lubricant. The general requirements are that the solid particles be extremely small, uniformly dispersed, and capable of forming a relatively stable, gel-like structure with the liquid lubricant.

3.1.6 *worked penetration, n—of lubricating grease*, the penetration at 25 °C (77 °F), without delay, of a sample after 60 double strokes in a standard grease worker.

3.1.7 *working, n—of lubricating grease*, the subjection of a sample to the shearing action of the standard grease worker.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *wet roll stability, n—of lubricating grease*, change in consistency of a mixture of sample and small amount of water after a specified amount of rolling in a roll stability test apparatus.

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.G0.02 on Consistency and Related Rheological Tests.

Current edition approved June 1, 2020. Published September 2020. Originally approved in 2015. Last previous edition approved in 2015 as D8022 – 15. DOI: 10.1520/D8022-20.

[2] 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.

***A Summary of Changes section appears at the end of this standard**

4. Summary of Test Method

4.1 A grease sample mixed with a small amount of water is subjected to low shear at 20 °C to 35 °C for a specified time in a roll stability apparatus. The difference between the cone penetration before working and the cone penetration after is used as a measure of the wet roll stability of the grease.

5. Significance and Use

5.1 It is known that contamination by water can affect the structural stability of some greases in service. The test procedure specified in this method is widely used to determine the wet structural stability of greases in service. Many grease specifications require this procedure as a wet structural stability test. No accurate correlation is established between the test results and wet structural stability of grease in actual service.

6. Apparatus

6.1 *Roll Stability Test Apparatus,* as specified in Test Method D1831.

6.2 *Penetrometer and/or One-quarter or One-half Scale Cone and Shaft,* as specified in Test Methods D1403.

6.3 *One-quarter or One-half Scale Cup and Worker,* as described in Test Methods D1403.

6.4 *Spatula,* with a blade longer than 150 mm.

7. Reagents and Materials

7.1 *Appropriate Volatile Gum-Free Solvent,* for example, mineral spirits.

7.2 *Cloth or Paper Wiper,* for wiping grease from the penetrometer cone. The wiper should be soft, so as not to scratch the surface of the cone.

7.3 *Distilled Water,* Specification D1193, Type II minimum purity.

8. Procedure

8.1 The sample of grease is obtained in accordance with Test Methods D4057.

8.2 Determine the reduced-scale worked penetration of the grease to be tested in accordance with Test Methods D1403.

NOTE 1—The precision of the test method is improved when using the ½-scale cup instead of the ¼-scale cup. Therefore, when the sample size permits, it is preferable to use the ½-scale cup when measuring penetration before and after exposing the grease sample to low shear forces in the presence of distilled water.

8.3 Transfer 63.0 g ± 0.2 g of unworked grease to test cylinder. Distribute the grease uniformly on the inside wall of the cylinder with a spatula.

NOTE 2—A non-abrasive, non-metallic spatula has been found to prevent damage to the roller or cylinder.

8.4 Place the weighed roller in the cylinder.

8.5 Add 7.0 g ± 0.2 g distilled water to the cylinder, and tighten the cap.

NOTE 3—The relative amount of grease and water added can be adjusted to the desired ratio but the total amount of material should be maintained at 70 g. An example being 56 g of grease, 14 g water would equal 20 % water.

8.6 Mount the cylinder in position, start the machine, and record the time and room temperature which should be limited to 20 °C to 35 °C. If the cylinder is enclosed within a cabinet, the temperature around cylinder shall be maintained at 20 °C to 35 °C.

8.7 After rolling the cylinder for 2 h ± 5 min, remove the grease from the cylinder promptly and proceed with the requirements of reduced-scale worked penetration in Test Methods D1403. Record the reduced-scale worked penetration. After transferring the grease to the ¼-scale or ½-scale worker cup, clean the test apparatus by wiping with clean cloth or tissue.

NOTE 4—The same scale cup must be used to measure penetration before and after exposing the grease to low shear forces in the presence of distilled water, and it is preferred that the ½-scale cup is used for this measurement (see Note 1). Care should be taken when removing the grease from the cylinder so that there is adequate sample available to make ½-scale penetration measurements

8.8 Convert the reduced-scale penetration values determined by Test Methods D1403 (before and after test) into the equivalent full scale cone penetration values using the appropriate equations described in Test Methods D1403.

9. Calculation or Interpretation of Results

9.1 Calculate the change in consistency of the sample as follows:

$$\text{Penetration change} = P2 - P1 \quad (1)$$

where:

P2 = final full-scale equivalent penetration reading, and
P1 = initial full-scale equivalent penetration reading.

NOTE 5—Penetration reading is measured in tenths of a millimetre. A negative penetration change indicates hardening of grease while a positive penetration change indicates softening.

10. Report

10.1 The value calculated in 9.1 is reported with the test procedure as the wet shear stability of the grease. A notation if free water is present is useful information.

11. Precision and Bias[3]

11.1 *Precision*—The precision of this test method as determined by a statistical examination of interlaboratory test results shown in Table 1. Their round robin samples are listed in Table 2.

11.1.1 *Repeatability*—The difference between successive results obtained by the same operator with the same apparatus under constant operating conditions on identical test materials would, in the long run, in normal and correct operation of the test method exceed the following values only in 1 case in 20:

Repeatability = 22 penetration units

11.1.2 *Reproducibility*—The difference between two single and independent results obtained by different operators working in different laboratories on identical test material would, in

[3] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D02-1825. Contact ASTM Customer Service at service@astm.org.