Designation: D 6203 – 97 (Reapproved 2001)

An American National Standard

Standard Test Method for Thermal Stability of Way Lubricants[1]

This standard is issued under the fixed designation D 6203; 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 is designed primarily to evaluate the thermal stability of hydrocarbon based way lubricants, although oxidation may occur during the test.

1.2 The values stated in SI units are to be regarded as the 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 2070 Test Method for Thermal Stability of Hydraulic Oils[2]

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products[3]

2.2 *Other Standards:*

UNS C11000 Electrolytic Tough Pitch Copper[4]

AISI W1 1% Carbon Tool Steel[5]

3. Summary of Test Method

3.1 A beaker containing test oil and copper and steel rods is placed in a gravity convection electric oven for 24 h at a test temperature of 100°C. At the completion of the test, the copper and steel rods are visually rated for discoloration and the beaker is visually evaluated for deposits.

4. Significance and Use

4.1 Thermal stability characterizes physical and chemical property changes which may adversely affect an oil's lubricating performance. This test method evaluates the thermal stability of a way lubricant in the presence of copper and steel rods at 100°C. Deposits and rod colors are the evaluation criteria. No correlation of the test to field service has been made.

4.2 This test method is intended for use in qualifying a way lubricant, rather than for quality control or condition monitoring purposes.

5. Apparatus

5.1 *Gravity Convection Electric Oven*, capable of maintaining the samples at a test temperature of 100 ± 2°C.

5.2 *Calibrated Temperature Indicator*, suitable for measuring and controlling the oven temperature.

5.3 *Griffin Beakers*, borosilicate glass, 100 mL.

5.4 *Copper Test Specimens*, in accordance with UNS C11000, 99.9 % pure electrolytic tough pitch copper, 6.4 mm in diameter by 7.6 cm in length (0.25 by 3.0 in.).

5.5 *Steel Test Specimens*, in accordance with AISI W1 1 % carbon steel, 6.4 mm in diameter by 7.6 cm in length (0.25 by 3.0 in.).

5.6 *Silicon Carbide Abrasive*, 320 grit with cloth backing.

5.7 *Crocus Cloth.*

5.8 *Cincinnati Milacron Color Chart.*[6]

5.9 *Facial Tissue*.

6. Reagents

6.1 *Reagent Grade Acetone*. (**Warning**—Flammable, health hazard.)

6.2 *Reagent Grade Heptane*. (**Warning**—Flammable, health hazard.)

7. Preparation of Metal Rods

7.1 Handle the rods at all times using forceps, facial tissue, or suitable gloves.

7.2 Clean the iron and copper catalyst rods, whether new or previously used, prior to use. Clean the rods with the 320 grit silicon carbide abrasive cloth while rotating the rods in a drill chuck at 1700 to 1800 rev/min. Clean the surface until it has a bright copper or steel appearance. Discard rods when diameter is less than 6 mm.

7.3 Prepare surfaces finally with a crocus cloth. Remove all grind marks. Finish the rods to a lightly polished surface finish.

7.4 Wash the rods individually with acetone and air dry on completion of the polishing operation.

---

[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.L on Industrial Lubricants.

Current edition approved Dec. 10, 1997. Published February 1998.

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

[3] *Annual Book of ASTM Standards*, Vol 05.02.

[4] Available from Copper Development Assoc., 2 Greenwich Office Park, Box 1840, Greenwich, CT 06836.

[5] Available from American Iron and Steel Institute, 1133 15th St., NW, Washington, DC 20005.

[6] Available from Cincinnati Milacron, 470 Marburg Ave., Dept 97B Lubricants and Tribology, Cincinnati, OH 45209.

8. Test Procedure

8.1 Place a representative 75 mL sample of test oil obtained in accordance with Practice D 4057 sampling procedure in a clean 100 mL Griffin beaker containing one each of the cleaned and polished iron and copper rods.

8.2 Place the rods crossed in the beaker so that they are in contact at one point. The oil should completely cover the rods.

8.3 Place the beaker and its contents on a tray in the oven. Keep the beakers as far from the walls as possible.

8.4 Maintain the temperature at the center of the oven at 98 to 102°C for 24.0 to 24.5 h.

8.5 Keep the oven doors closed during the entire test period.

8.6 At the completion of 24 h, remove the beakers from the oven and allow to cool to room temperature before proceeding. Continue within 2 h. Individually remove the rods from the oil sample. Inspect for deposits clinging to the rods. Wipe with a piece of facial tissue and inspect for color and etching.

8.7 *Copper Rod Inspection*—Visually evaluate the color of the rod against the Cincinnati Milacron color chart and record. Record any etching that is evident to the naked eye.

8.8 *Steel Rod Analysis*—Visually evaluate the color of the rod against the Cincinnati Milacron color chart and record. Record any etching that is evident to the naked eye.

8.9 *Beaker Inspection*—Invert the beaker and allow the sample to drain for at least 30 min. Rinse with two 50-mL portions of heptane. Inspect the beaker and record any deposits that are visible to the naked eye.

9. Report

9.1 Report the following information:

9.1.1 Color of the copper and steel rods using the numerical designations on the chart.

9.1.2 Any etching.

9.1.3 Whether any deposits were found on the rods or beaker

10. Precision and Bias

10.1 The precision of this test method is now under study.

10.2 *Bias*—Since there is no accepted reference material suitable for determining the bias for the procedure, bias has not been determined.

11. Keywords

11.1 bed lubricants; Cincinnati Milacron; copper corrosion; deposits; heat test; oil sludging; slideway lubricants; steel corrosion; thermal stability; way lubricants