CORROSION PROTECTION BY UNIVERSAL GEAR LUBRICANTS IN THE PRESENCE OF WATER

1. SCOPE

1.1 This method is used for determining the protective characteristics of universal gear lubricants on ferrous metals in the presence of water. It consists of rotating two sandblasted steel strips in a mixture of the test lubricant and water at 180°F for four hours, and rating the lubricant by visual evaluation of the rust on the strips.

2. SAMPLE

2.1 Approximately 400 grams of the lubricant to be tested.

3. APPARATUS

3.1 Motor, stirring, 550 ± 25 rpm.

3.2 Shaft, stirring, drill rod, 5/32 inch diameter, threaded at the immersion end for attachment of steel test strip (blade) by nuts.

3.3 Bath, constant-temperature, 180° ± 1°F, (to accommodate beaker (par. 3.4) approximately three-quarters immersed).

3.4 Beaker, Pyrex, 400 ml.

3.5 Desiccator, containing desiccant.

3.6 Forceps, laboratory.

3.7 Drill, No. 19 (0.1660-inch).

4. MATERIALS

4.1 Steel strips (2), low-carbon, (1015 to 1020), (QQ–S–698) 1 by 2 by 0.0239 inches.

4.2 Sand, sandblast, clean, sharp, dry, nearly white. Grain size limits as follows:

Sieve No.	*Percent Pass*
10	100
20	90 minimum
48	10 maximum

4.3 Cleaning solution, glass (concentrated sulfuric acid saturated with potassium or sodium dichromate, technical grade).

CAUTION

Handle this solution is highly corrosive and must be handled with caution. Proper eye and skin protection should be used.

4.4 Naphtha (MIL–N–15178).

4.5 Petroleum ether (O–E–751).

4.6 Ethyl alcohol, 95 percent (MIL–E–463).

4.7 Acetone (O–A–51).

5. PROCEDURES

5.1 Prepare the steel strips as follows:

(a) Drill a hole in the center of each strip, using a No. 19 (0.1660 inch) drill.

(b) Bend two diagonally opposite corners of each strip upwards along lines from the middle of the leading edge to the corner of the trailing edge at an angle of 15 ± 2 degrees as measured along the trailing edge. (See Figure 1.)

(c) Rinse thoroughly in naphtha.

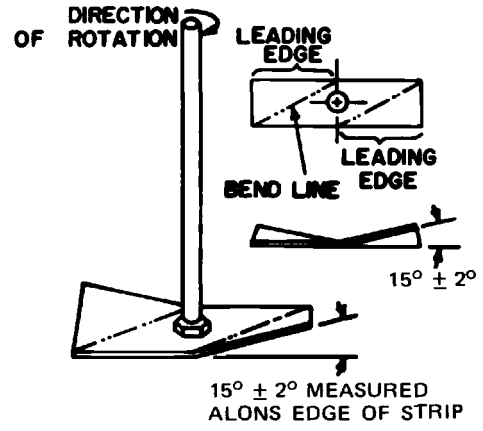

FIGURE 1.—Stirring shaft and strip assembly.

(d) Sandblast each side of each strip to remove the original surface and leave a fresh uniformly abraded surface.

CAUTION

Handle only with forceps after sandblasting.

(e) Remove all of sand from each strip by tapping it against a smooth hard surface (or with clean, dry, compressed air), and store it in desiccator until ready for use. (Use the strips preferably the same day or within a maximum of seven days.)

5.2 Heat the bath to 180° ± 1°F.

5.3 Clean beaker, stirring shaft (and nuts) as follows:

(a) Rinse with naphtha.

(b) Rinse with glass-cleaning solution.

(c) Rinse with distilled water.

(d) Rinse with ethyl alcohol or acetone.
(e) Allow to air dry.

5.4 Place 200 g. of the sample and 5 ml. of distilled water in the 400-ml. breaker, and immerse the beaker in the bath to three-fourths of its depth.

5.5 Using clean forceps to handle the steel strip and clean tools to secure the nuts, mount one of the strips on the stirring shaft so that the tips of the strip are bent toward the motor end of the shaft.

5.6 Attach the shaft to the motor, and position the assembly so that the center of the strip is in the center of the beaker and is 1 ± 0.1 inch from the bottom of the beaker.

5.7 Start the stirrer rotating at 500 ± 25 r.p.m. and observe the temperature of the lubricant until it reaches 180° ± 0.1°F. When the test temperature is reached, note the time and continue the rotation for four hours.

5.8 At the end of 4 hours, stop the rotation, remove the stirring shaft from the beaker, and using forceps, disassemble the strip from the shaft.

5.9 Using forceps to handle the steel strip, wash it in petroleum ether, and immediately examine it for indications of rust.

5.10 Report the degree of rusting of the steel strip as follows:

(a) None.
(b) Light (only a few rust spots).
(c) Moderate (rust streaks).
(d) Severe (approximately one-half the surface covered with rust).

5.11 Repeat the operations in paragraphs 5.5 to 5.10 inclusive, using the second steel strip in the same sample.

5.12 If rust is noted on only one of the steel strips, repeat the entire test, using fresh lubricant and new steel strips.