ANSI/ASHRAE Standard 86-1994 (RA 2006)
Reaffirmation of ANSI/ASHRAE Standard 86-1994

ASHRAE STANDARD

Methods of Testing the Floc Point of Refrigeration Grade Oils

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(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process.)

FOREWORD

This is a reaffirmation of ASHRAE Standard 86-1994. This standard falls under the Standards Committee classification of Standard Method of Measurement. This standard was prepared under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). It may be used, in whole or in part, by an association or government agency with due credit to ASHRAE. Adherence is strictly on a voluntary basis and merely in the interests of obtaining uniform standards throughout the industry.

This standard describes a standard test method for measuring the floc point (waxing tendency) of refrigeration grade oils. Petroleum-derived lubricating oils are mixtures of large numbers of chemically distinct hydrocarbon molecules. At the low temperatures encountered in the low-pressure side of refrigeration units, some of the larger molecules separate from the bulk of the oil in the form of wax-like deposits. Wax deposition in refrigeration systems is undesirable, as wax is known to clog capillary tubes and to cause expansion valves to stick.The floc point procedure requires, in addition to the oil, a fluid in which the oil is completely miscible with the fluid to a temperature below that at which floc will form. R-12 was selected because it fits this requirement and it is a commonly used refrigerant. R-22, for example, cannot be used because phase separation would, generally, result before the floc point was reached. The ensuing hazing, clouding, and separation into two different layers precludes obtaining a floc point. The industry has a great deal of faith in extrapolating floc point data from the test tube to field application. History shows this faith to be justified.

Development of a floc point using some other fluid is feasible. However, it would require a research project, and extrapolation of the data from another fluid without the field correlation, which has been available for R-12 floc point data, could result in major field problems.

The changes made for the 2006 reaffirmation were: Degree symbols were added to the table in Appendix A.

1. PURPOSE

This standard provides a method for measuring the waxing tendency of refrigeration grade oils.

2. SCOPE

The test for floc point is intended to determine the waxing tendency of refrigeration grade oils at low temperatures. The test is based on evaluation of the wax precipitation tendency of a mixture containing 90% R-12 and 10% by volume of the oil being tested. The results can be used to compare several different oils.

3. DEFINITION

floc point: the highest temperature at which wax or other solid substances precipitate when a mixture 10% by volume of oil and 90% by volume of R-12 is cooled under specified conditions.

4. APPARATUS

4.1 Cooling Bath. A cooling bath suitable for obtaining the required temperature can be prepared using dry ice or by using a refrigeration system as the cooling source. The cooling bath should be large enough for testing three sample tubes at one time. A large, wide-mouthed, clear dewar flask is satisfactory. Dry ice in a suitable liquid such as ethanol or acetone is recommended. The use of ethanol is preferred because this liquid has the advantage of reduced frosting when the sample tube is raised from the bath for observation. A mechanical stirrer shall be provided for stirring the bath. Proper stirring is important to eliminate temperature differences. A small piece of aluminum foil in the liquid will indicate the degree of stirring obtained. If an electric motor is used, it should be of a type safe for use above the cooling medium. A wire mesh basket with small openings shall be provided in the bath for the introduction of the dry ice so small pieces of dry ice cannot come into contact with the sample tube and cause local cold spots. The wire mesh basket can be raised or lowered to control the bath temperature.

4.2 Temperature-Measuring Devices. The temperature is measured with a precision electrical digital thermometer, a mercury thermometer, or an alcohol thermometer. ASTM standard thermometers 6°F or 6°C have been found suitable for this purpose. For accuracy, thermometers should be periodically calibrated as covered in ASTM Specification E1.[1]

4.3 Sample Tube. The sample tube consists of a thick-walled borosilicate glass tube with a flared end and round bottom, as shown in Figure 1. Tube dimensions are 0.375 in. (9.5 mm) ID × 0.600 in. (15 mm) OD × 9 in. (228 mm) long. The tube shall be permanently graduated at the 10.0 mL volume (calibrated at room temperature).

4.4 Metal Connector Fittings. The metal connector fittings shall be as shown in Figure 1.

4.5 Graph Paper. In certain instances, graph paper is used with a glass plate to judge the cloudiness of the test sample. The graph should have 20 lines per 1.0 in. (25.4 mm).

4.6 Mechanical Vacuum Pump. A mechanical vacuum pump suitable for obtaining an absolute pressure of 0.1 mm Hg shall be used.

5. TEST PROCEDURE

5.1 Use proper safety precautions, such as a face mask, safety shield, and heavy gloves, when handling the charged pressure tube outside the cooling bath or when evacuating the tube. The glass tube is under pressure and a safety hazard exists whenever the temperature is above –21°F (–30°C). When using ethanol or acetone, take appropriate precautions