Ministry of Higher Education and Scientific Research
AL Mustaqbal university college
Chemical Engineering Department

Petroleum products Properties Laboratory

3rd. stage

Exp.No.1

Drop Point Test

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The Aim:

This test method covers the determination of the dropping point of lubricating grease.

Introduction:

Grease is a semi solid material that functions as a lubricant when applied on movable machine components. The composition of grease includes Soap emulsified with Petroleum Oil or Vegetable Oil. Grease is one of the alternatives for lubricating oil that serves the purpose of reducing wear and tear, friction and heat dissipation generated between moving mechanical machine devices. Grease has wide industrial and household applications like: (i) As a sealant to prevent the seepage of water and is also used as a sealant in the stuffing box of various electrical devices
(ii) As a lubricant in mechanical devices that are operated continuously where grease take the form of a lubricating film, (iii) As a lubricant in areas that are isolated and in accessible, (iv) As a lubricant in machinery operating at higher temperature and pressure.
Grease is also convenient to use when compared to lubricating oil in view of its high rigidity. The operation of a circulating system and holding devices as is required for a lubricating oil system. Grease is composed of base oil, a thickener and additives. The base oil is derived from petroleum oil source or a vegetable oil source. The petroleum oil source of the base oil is also known as lubricant base fluid which is categorized into five groups indicated by American Petroleum Institute (API).

Significance and Use:

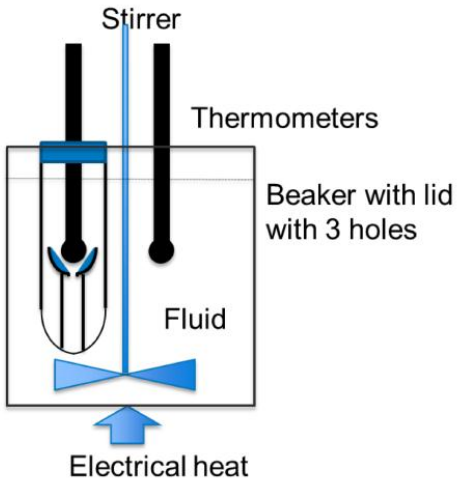
In general, the dropping point is the temperature at which the grease passes from a semisolid to a liquid state under the conditions of test. This change in state is typical of greases containing as thickeners soaps of conventional types. Greases containing as thickeners materials other than conventional soaps can, without change in state, separate oil. This test method is useful to assist in identifying the grease as to type and for establishing and maintaining bench marks for quality control. The results are considered to have only limited significance with respect to service performance as dropping point is a static test.

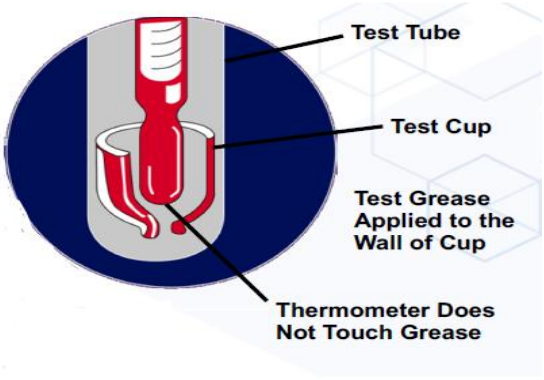
Theory :

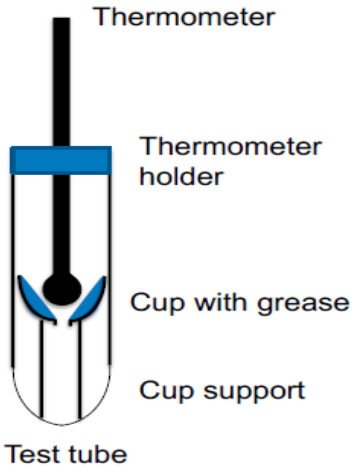
Drop point is defined as the "temperature at which it passes from the semi-solid to the liquid state". At this condition, a drop of grease sample falls from the orifice of the test apparatus. This methodology confirms to the ASTM D 2265. This temperature determines the upper temperature limit of the applicability of the grease. The dropping point is not the melting point of lubricating grease. Dropping point is used in many grease specifications. However, this test has very limited relevance to service performance . The dropping point test procedures are given in ASTM standards D-566 and D-2265. The following precautions are to be taken while conducting the experiment:
(i) not to inhale ethylene glycol vapors because it causes respiratory track irritation, (ii) the fluid for oil bath must have flash point greater than the maximum temperature at which the bath is used and (iii) an open flame must not be used for heating bath liquid. Figure 1 shows the experimental setup for obtaining drop point of the given grease sample.

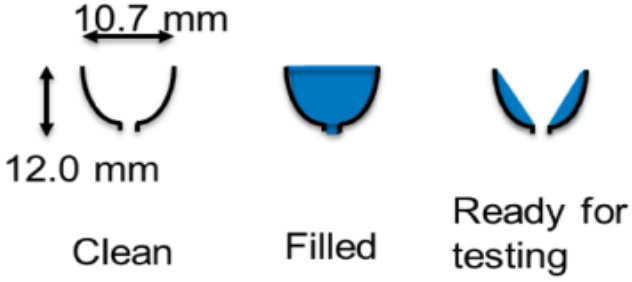
Fig.1: the experimental setup for obtaining drop point of the given grease sample.

Dropping Point Test Apparatus:









The test apparatus consists of a

-grease cup with a small hole in the bottom,

-test tube,

-two thermometers,

-a container,

-stirring device if required

-electric heater.

Fig.2 : Drop point apparatus .

Preparation of Apparatus:

1 - Thoroughly clean the cup and test tube with mineral spirits conforming to Specification D 235.
2 - Use only cups that are clean and free from any residue from previous runs. When the interior plating of the cup shows indications of wear, discard.
3 - When new cups are to be used, check their dimensions by using the cup plug gage .
To check the bottom opening a 2.72-mm rod should fit easily while a 2.82-mm rod should not.8 If the hole is undersized, ream to correct size. If too large, discard.
4 - Test tube shall be clean and free of residues. Inspect the tube for evidence of chipping or cracking, particularly the points of indentation. Replace when necessary.
5 - Inspect both cork ring guide and upper cork for charring or distortions in shape. Total clearance between the cork ring guide and the inside wall of the test tube is 1.5 mm. When either cork is abnormal, replace.
6 - Inspect the bulb end of the thermometer to be used in the test tube. Clean if there is any residue build-up.

Procedures :

1 -Fill a test cup with sample by pressing the larger opening into the grease to be tested until the cup is filled. Remove excess grease with a spatula. Gently press the cup, held in a vertical position with the smaller opening at the bottom, down over the metal rod until the latter protrudes about 25 mm. Press the rod against the cup in such a manner that the rod makes contact at both upper and lower peripheries of the cup. Maintain this contact, rotating the cup on the rod along the index finger to give a spiral-like motion down the rod to remove a conical section of the grease which adheres along the rod. As the cup approaches the end of the rod, carefully slip the rod out of the cup so that a smooth film, free of air bubbles and of reproducible thickness, remains inside the cup.

2 - Place the corks on the thermometer to be used in the test tube With the thermometer depth gage in position in the test tube, adjust the position of the upper cork on the thermometer so that the thermometer bulb bottoms snugly in the depth gage. Observe the relative position of the top edge of the upper cork to the thermometer stem as well as the relative position of the top edge of the test tube to the cork. Care must be taken to be certain that the thermometer is inserted to the same depth when the apparatus is reassembled with the grease cup in position.

3 - Replace the depth gage with the grease cup so that the thermometer is inserted to the previously gaged depth. When properly inserted, the bulb of the thermometer does not touch either the grease sample or the cup.

4 - Suspend the test tube in the oil bath to a depth corresponding to the 76 mm immersion mark on the thermometer. This should leave the test tube rim at least 6 mm above the oil level.

5 - Suspend the second thermometer in the oil bath so that its bulb is at approximately the same level as the bulb of the test tube thermometer.

6 - Stir the oil bath and heat at a rate of 4 to 7°C/min until the bath reaches a temperature of approximately 17°C below the expected dropping point of the grease. At this point reduce the rate of heating so that the temperature difference between the test tube and the oil bath is maintained between 1 and 2°C. This condition is established when the oil bath is heated at a rate of about 1 to 1.5°C/min. As the temperature increases, material will gradually protrude through the orifice of the grease cup. When a drop of material falls, note the temperatures on the two thermometers and record their average to the nearest degree as the dropping point of the grease.

Results:

Temp. of bath °C	Temp. of sample°C	Drop point °C

Discussion:

1. What is the purpose of experiment ?
2. Discuss your result ?
3. Why is it necessary that the temperature difference between the bath and the sample be 3 degrees Celsius ?
4. Define drop point ?

Reference:

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