Date 13/11/15

Expt. No. 5

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AIM OF THE EXPERIMENT -

To determine the viscosity of a lubricating oil by Red-wood's viscometer.

REQUIREMENTS -

Chemical : lubricating oil

Apparatus : Red-wood's viscometer, kohlrausch flask, Thermometer, Stopwatch.

Description of the apparatus -

The viscosity of the lubricating oil can be determined by the use of viscometer, in which a known volume of oil is allowed to flow from a given height through a standard capillary tube under its own weight and the time of flow in seconds is noted. This time is proportional to the viscosity of the oil. Generally, two types of viscometer are used.

(1) Red-wood viscometer (used in Britain)

(2) Say-bolt viscometer (used in USA)

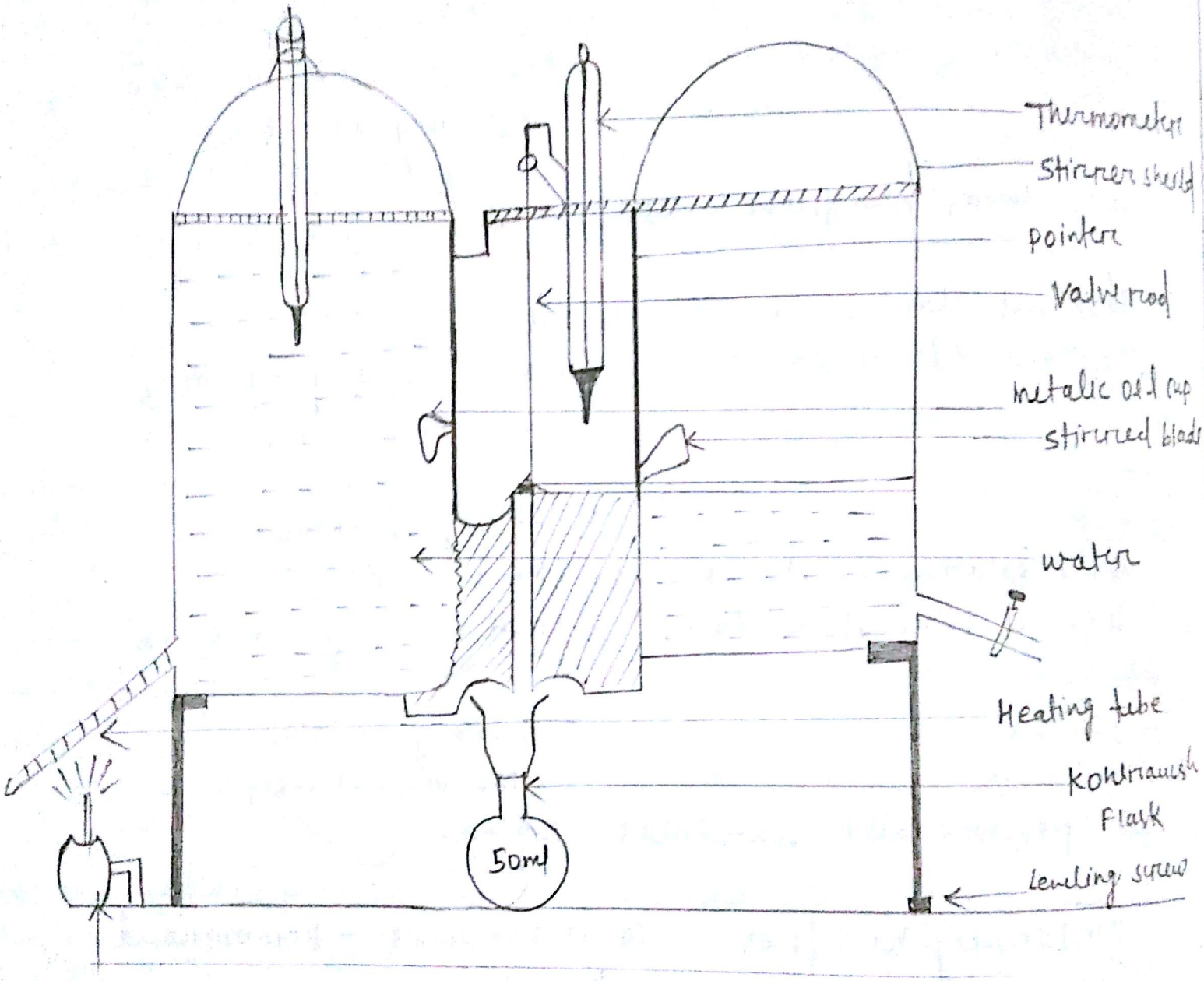
In India red-wood viscometer is used, which are available in two sizes 1. Universal and 2. Admiralty.

The two viscometer RW_1 and RW_2 are identical in principle, shape and method of testing a sample. The difference lies in the dimensions of the discharge capillary tube.

RW_1 = 1.62 mm diameter and 10 mm length.

RW_2 = 3.8 mm diameter and 15 mm length.

Viscosities of the thin lubricating oil like kerosene, mustard oil etc are determined by RW_1, RW_2 is used to determine the viscosity of highly viscous oil like mobil and fuel oil etc.



(REDWOOD VISCOMETER) ✓

The viscometer consists of the following parts.

i) Oil cup - It is a silver plated brass cylindrical vessel 90mm in height and 46.5mm diameter. Its upper end is open and the lower end is fitted with an agate jet having bore of diameter 1.62 mm and length 10mm (RW,). The jet can be opened or closed by a valve rod. The valve rod is small silver-plated brass ball fixed to a strong wire. There is a pointer, which indicates the level to which the cylinder is to be filled with oil. The pointer is fixed to the inner side of the cylinder. The cover of the cup is filled with thermometer to indicate the temperature of the oil.

2) Heating Bath - The oil cup is surrounded by a cylindrical bath made of copper. It contains water and also provided with a tap for emptying water from it. It has also got an electric heater used for heating the water of the bath to the derived temp.

3) Stirrer - The heating bath is provided with a stirrer, which stirs the water in heating bath for maintaining uniform desired temperature. The stirrer is scaled at the top to prevent water rushing into the oil cylinder.

4) Sprit level - The covers of the cup is provided with a spirit level for vertical leveling of the jet.

5) Leveling screw - The entire apparatus rests on the legs provided at the bottom with leveling screws.

6) The flask receives the oil from jet outlet. Its capacity is 50ml upto the mark in the neck.

PRINCIPLE -

Viscosity is the measure of flow ability at a definite temperature. The flow properties of oils influence the rate of

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production of oil, the transport of crude oil and refined products in the pipelines and the performance of oil as lubricant in machine.

Lubricating oil should have sufficient viscosity to enable it to stay in position. It is the measure of bearing function, heat generation and rate of flow under specified conditions of load, speed and design.

Viscosity of a liquid is defined as the property by virtue of which it tends to appose the relative motion between its different layers.

Resistance to flow is largely due to the intermolecular forces i.e. vander used forces in liquids. Variation of viscosity with temp. is known as viscosity index. It is determined by calculating the viscosity of oil at different temperatures. With rise in temperature forces of cohesion between the molecules of a fluid are weakened resulting in a decrease in viscosity.

PROCEDURE -

(I) The viscometer leveled with the help of the leveling screws.
(II) The outer bath is filled with water.
(III) The cup was cleaned and the discharge was cleaned with suitable solvent.
(IV) The ball of valve rod was placed on the a gate jet to close it and pour the test oil into the cup to such a level that the metal indicator fixed on the wall of the oil cup just dips in the oil.
(V) The empty and clean kohlrausch flask was placed immediately blow the jet.

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Tabulation -

i) For cold water :-

No. of observation	Name of oil	Temp.	time of flow (in sec)	Mean value (in sec)
1	Supplied oil	25°C	90	88.33
2			86	
3			89	

ii) For Hot water -

No. of observation	Name of oil	Temp.	time of flow (in sec)	Mean value (in sec)
1			67	66.66
2	Supplied oil	35°C	68	
3			65	

Viscosity decreases with increase in temperature.

(6) The water in the bath was stained till a constant temp. is maintained.

(7) The temperature of the oil is same as the temperature of the water bath. when the oil obtained the desired temperature lift the ball valve with one hand and simultaneously start with the stopwatch with other.

(8) The oil flowing through the orifice of flask. The timer is stoped when the lower meniscus of the oil reaches some mark on the neck of the Koolaraush flask.

(9) The orifice carefully with the ball of the valve rod is closed to prevent the overflow of the oil.

(10) The experiment was repeated at least five times and report the mean value in seconds.

CONCLUSION -

Viscosity of supplied lubricating oil is found to be decreasing with increasing temperature.

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