Experiment No. 11: Effect of temperature on viscosity

I Practical Significance

Redwood viscometer -1 is equipment used by the oil manufacturing companies to determine the property like viscosity of their products. Oils are used in many industries as lubricant for different machines working on different temperature levels. Determination of effect of temperature on viscosity of various lubricating oil will help in selecting the relevant lubricating oil for different machines on different temperatures. Since the viscosity of lubricating oils changes with temperature the selection of lubricating oil for any machine become critical. Determination of effect of temperature on viscosity of various lubricating oil will helps us in use of relevant engineering materials in industry.

II Relevant Program Outcomes (POs).

PO3 Experiments and practices

PO10 Life-long learning

III Relevant Course Outcomes

e) Use paints, varnishes and relevant engineering materials in industry.

IV Practical Learning Outcome

Determine the effect of temperature on viscosity for given lubricating oil using Redwood viscometer-I.

V Practical Skills

Measurement skills

1. Measurement of the temperature
2. Measurement of flow rate

VI Relevant Affective domain related Outcomes

1. Demonstrate working as a leader/a team member
2. Practice good housekeeping

VII Minimum Theoretical Background

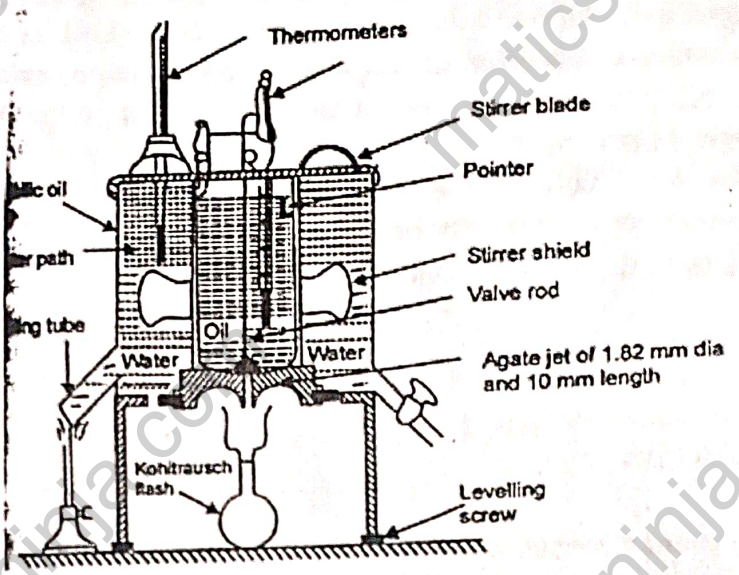
a) Viscosity is the property of a homogeneous fluid, which causes it to offer frictional resistance to motion.

b) Viscosity is the property of a fluid that determines its resistance to flow. It is an indicator of flow ability of a lubricating oil; the lowest the viscosity, greater the flow ability.

c) Viscosity generally decreases with increase in temperature. The rate of change of viscosity over the range of temperature is called as the viscosity Index. A relatively small change/no change in viscosity with temperature is indicated by high viscosity index whereas low viscosity index shows relatively large change in viscosity with temperature.

d) **Viscosity is resistance to flow. Viscosity and flow rate are inversely proportional to each other . This resistance in turn is directly proportional to the viscosity.**

VIII Experimental set-up



Redwood Viscometer

IX Resources required

Sr. No.	Name of resources	Specifications	Quantity	Remark
1	Red Wood viscometer no. 1		02	
2	Stop watch		02	
3	Kohlrausch flask		02	
4	Thermometer		04	
5	Filter Paper			
6	Oil sample			

X Procedure

1. Clean the viscometer with the help of water.
2. Level the viscometer with the help of leveling screws.
3. Fill the outer cup with water for determining the viscosity at different temperatures.
4. Place the ball valve on the jet to close it and pour the test oil into the cup up to the tip of indicator.
5. Place a clean dry Kohlrausch flask immediately below and in the line with discharging jet.
6. Insert a clean thermometer and a stirrer in the cup and cover it with a lid.

7. Heat the water bath slowly with constant stirring. When the oil in the cup attains a desired temperature, stop the heating.
8. Lift the ball valve and start the stop watch. Oil from the jet flows into the flask.
9. Stop the stop watch when lower meniscus of the oil reaches the 50 ml mark on the neck of receiving flask.
10. Perform the experiment at three elevated temperatures to get readings of flow time.

XI Precautions

1. An oil should be filtered thoroughly using muslin cloth to remove solid particles that may clog the jet.
2. The receiving flask should be placed in such a manner that the oil stream from Jet strikes the neck of receiving flask and do not cause any foaming
3. After each reading the oil should be completely drained out from receiving flask

XII Actual procedure followed

Procedure followed in experiment No 11

XIII Resources used (with major specifications)

Stop watch, thermometer, oil sample etc

XIV Precautions followed

Handle the instrument with care

XV Observations

Sr. No	Temperature of oil	Temperature of water	Flow time 't' in seconds
1	40°C	29	28
2	60°C	50	26
3	80°C	70	25

XVI Results

Viscosity of oil sample at 40°C is ....22..... (Highest/Moderate/Lowest)
Viscosity of oil sample at 60°C is ....26..... (Highest/Moderate/Lowest)
Viscosity of oil sample at 80°C is ....25..... (Highest/Moderate/Lowest)

XVII Interpretation of results

Viscosity of oil ..increase..... (increases/decreases) with ..decrease..... (increase/ decrease) in temperature and thus its flow rate..50...(Increase/Decreases).

XVIII Conclusions and Recommendations

As the viscosity

XIX Practical Related Questions

1. Describe the process for cleaning of Redwood viscometer.
2. Explain the importance of water bath in the Redwood viscometer.
3. Write precautions to be taken while performing the practical.
4. Explain proper way to place the receiving flask.
5. Name various types of viscometer.

XX References / Suggestions for further Reading

Sr. No.	Title of Book	Author	Publication
1	Engineering Chemistry	Jain and Jain	Dhanpat Rai and sons; New Delhi, 2015, ISBN : 9352160002
2	Engineering Chemistry	Dara, S. S.	S.Chand. Publication, New Delhi, 2013, ISBN: 8121997658
3	Experiments and calculations in engineering chemistry	Dr.S.S.Dara	S.Chand. Publication, New Delhi, 2011, ISBN: 8121908647
4	Practical Chemistry	Dr.N.K.Verma	Laxmi publication New Delhi 2012 ISBN : 81-7008-594-2
5	Engineering Chemistry	Shashi Chawla	S.Chand. Publication, New Delhi, 2013, ISBN: 1234567155036

XXI Assessment Scheme

Process related assessment scheme

Sr. No.	Process related	Weightage(60%)
1	Process for cleaning of Redwood viscometer.	15%
2	Process for maintaining temperature.	15%
3	Reading of temperature.	15%
4	Operation of stopwatch.	15%

Product related assessment scheme

Sr. No.	Product related	Weightage(40%)
1.	Determination of the viscosity index	40%

List of Student Team Members

1. .....
2. .....
3. .....
4. .....

Marks Obtained			Dated Signature of Teacher
Process Related (15)	Product Related (10)	Total (25)	
14	09	23	

[Space to Write Answers]

Q.1 ——— ?

Clean viscometer is essential if accurate measur-ment are to be made first step is to cleaning bulk of test example sample for low viscocity liquid viscometer, may be turned upsite down allowed to hand while the test for high viscocity sample may have to be drawn out under vacuum petrolllum weast, lubricant weast, lubricant, dissolved in naptha or opctan after ~~A~~ remove last traws of high viscocity standard from viscometer.

Q.2 ——— ?

It is used to incubute sample in water at a constant temperature over a long period of time.

Q.3 ——— ?

An oil should be filtered throughly using muslin cloth to remove solid pratteals that maty clog the test.

Q.4 ——— ?

Ostwalds viscometer falling sphere visometer

vibraHand, Viscometer, quarts, viscometer, electromagnetically spinning viscometer redwood viscometer.