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Assignment: LCA-1

Subject: Fluid Mechanics

### Experiment 1

Aim: To study the determination of viscosity of liquids and its variation with temperature.

Introduction: Viscosity is a property of fluid. It's the resistance to flow by one layer due to attraction between one layer and another adjacent to it. It's due to cohesion. Fluids which follow the Newton's law of viscosity are called Newtonian Fluids.

Dynamic Viscosity: Resistance to flow and shear under the forces of internal friction. Larger the molecule, larger the viscosity and higher internal friction.

Kinematic Viscosity: Measures oil's resistance to flow and shear under gravity. Pipe friction charts and pump corrections used by engineers refer to kinematic viscosity.

Viscosity Index (VI): VI is a petroleum industry term. It's a lubrication oil quality indicator. Viscosity decreases with temperature increase. High VI refers to low change in viscosity with respect to temperature and thus low change in lubricating action.

Description:- Redwood viscometer is used to measure the kinematic viscosity and it is based on principle of laminar flow through capillary



tube of standard dimension under falling head. The outer cylinder containing water can maintain the temperature of the liquid to be tested in inner cylinder. The inner cylinder is filled with the liquid till fixed height. Then orifice is opened and time required to fill 50 cc of oil container is noted.

Apparatus :- Redwood Viscometer, thermometer, Stop watch, 50ml narrow flask, sample of oil etc

Specification:

- 1) Diameter of cylinder = 45.5mm
- 2) Height of cylinder = 86 mm
- 3) Diameter of orifice = 1.75mm
- 4) Height/Length of orifice = 12mm

Procedure: 1) Fill oil cup with oil till required level.

2) Heat the water at uniform temperature.

3) When temperature is attained lift the ball of orifice hole.

4) Let the oil pass through the orifice hole and allow 50 cc of oil in volumetric flask.

5) Measure the time taken to fill the flask

6) repeat for different temperatures

7) Plot the relevant graph.

Significance:-

- It's a property of lubricating oil. Viscosity determines it's ability to lubricate.

- Used in evaluating load carrying capacity.

- In denoting the effect of temperature changes and for determining the presence of contaminants in oil.



- Absolute viscosity used in bearing calculations and other lubricating related engineering technical designs.

Conclusion :- Kinematic and Absolute viscosity were determined at different temperatures and relevant graphs were drawn. Viscosity varies with increase in temperature and has negative exponential trend.