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VISCOSITY MEASUREMENT USING CAPILLARY FLOW VISCOMETERS

Capillary flow viscometers are generally in the form of a U- tube.
These types of viscometers are very simple, inexpensive and suitable for low-viscosity fluids. There are different designs of capillary viscometers. A typical design of capillary viscometer is as follow:

- Measure the time for a standard volume of fluid to pass (flow) through a length of capillary tubing.
- The driving pressure (causing the flow) is usually generated by the force of gravity acting on a column of the liquid, although it can be generated by the application of compressed air or by mechanical means.
- Glass capillary viscometers are widely used for measuring low to medium viscosity Newtonian fluids because of their high degree of accuracy, ease of operation and low cost 6.
- The diameter of a capillary viscometer should be small enough to provide laminar flow.
- Capillary viscometers are calibrated with Newtonian oils of known viscosities since the flow rate depends on the capillary radius, which is difficult to measure. For the viscosity measurement.
- The viscometer is accurately filled with an accurately known volume of test fluid and the apparatus is immersed in a constant temperature bath until equilibrium is reached.
- Then, fluid is sucked up from the other limb through the capillary tube until it is above the marked level (A) above.
- Then, suction is removed and fluid flows through the capillary tube under the influence of gravity or the induced pressure head and the time for the fluid to flow from mark A to B is recorded.
- This time is a direct measure of the kinematic viscosity since it depends on both viscosity and density of fluid 13.
- The calculation of dynamic viscosity (ASTM D445–79) for use of capillary viscometers on Newtonian fluids.

- Corrections need to be made when very accurate results are needed from glass capillary viscometers. These include correction for the kinetic energy lost in the stream as it issues from the bottom of the capillary, and effects due to the change in the meniscus size and shape as it enters or leaves the capillary, possible turbulence in the capillary and inadequate drainage due to liquid adhering to the walls of the viscometer.
- Standard specifications and operating instructions for glass capillary kinematic viscometers (ASTM-D446–79).

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