Viscosity Measurement Using CANNON-FENSKE Viscometers

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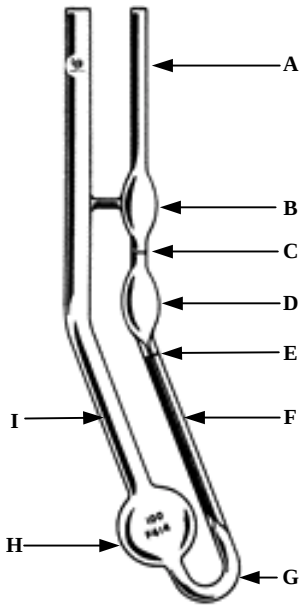

Instructions

(adapted from Cannon Instruments)

1. The viscometer should be cleaned with a suitable solvent and dried in a stream of clean, filtered or N_2.
2. The instrument should be periodically cleaned with chromic acid to remove any possible traces of organic deposits.
3. If a possibility of lint, dust, or other solid material is present in the liquid sample, this may be removed by filtering through sintered glass filter or fine mesh screen. *(NB: This may not be feasible with crude oils.)*
4. To introduce sample into the viscometer, invert viscometer, immerse tube "A" into liquid and apply suction to "I", which causes the sample to rise to etched line "E". Turn the viscometer to normal position and wipe tube "A" clean.
5. Insert the viscometer into a holder and place in constant temperature bath. Allow 10 minutes for viscometer to reach equilibrium at 100°F (38°C) or 15 min at 210°F (98.89°C), or whatever amount of time is required for temperature equilibration.
6. Vertical alignment may be accomplished in bath by suspending a plumb bob in tube "I".
7. Apply suction to tube "A" and bring sample into bulb "B" a short distance above mark "C".
8. The efflux time is measured by allowing the sample to flow freely through mark "C", measuring the time for the meniscus to pass from "C" to "E".
9. To repeat efflux time measurement, repeat steps 7 and 8.
10. The kinematic viscosity is calculated by multiplying the efflux time by the viscometer constant.

dynamic viscosity (cP) = kinematic viscosity (cSt) × density (g/cm^3)

See ASTM D445 and D2515 for more complete instructions.

It is particularly important to remember the following points:

(1) Use the correct viscometer size. Measuring ranges overlap, but the best results will be obtained if you are operating near the center of the viscometer's range. If your sample has a viscosity of about 100 cSt, for example, the size 300 (range 50-250 cSt) viscometer will give more accurate results than either size 200 (range 20-100 cSt) or size 350 (range 100-500cSt). Refer to the table below as a guide to size selection.

Recommended Viscosity Ranges for Cannon-Fenske Routine Viscometers

size	approx. C (cSt/s)	viscosity range (cSt)	
		from	to
25	0.002	0.5	2
50	0.004	0.8	4
75	0.008	1.6	8
100	0.015	3	15
150	0.035	7	35
200	0.1	20	100
300	0.25	50	250
350	0.5	100	500
400	1.2	240	1200
450	2.5	500	2500
500	8	1600	8000
600	20	4000	20000
650	45	9000	45000

(2) Avoid overloading the viscometer. Using either too much or too little sample will produce inaccurate values of viscosity. The volume that fills the tube from E to the inlet of the A tube will approximately half fill the bulb marked H.

(3) Use the correct calibration factor, C. Each viscometer comes with its own serial number and calibration constants, which vary from one instrument to another. Note that the constants listed in the table above are only approximate values. The constant varies with temperature and applies only if the correct amount of fluid has been charged into the viscometer. If the calibration constants have been lost, they can be redetermined using viscosity standards.

(4) After loading the sample, wait at least 10 minutes before making measurements. Some time is required to allow the sample to equilibrate at the temperature of the water bath and to allow air bubbles to seggregate.

(5) Use special methods for opaque samples. For high viscosity oil samples, which are sometimes quite opaque, it is often necessary to use auxiliary illumination to improve judgments of the passage of the interface past the starting and ending marks. Another option is to use a “reverse flow” viscometer.