

Fig. 1. Absolute Viscosity vs. Pressure - Oil No. 1.

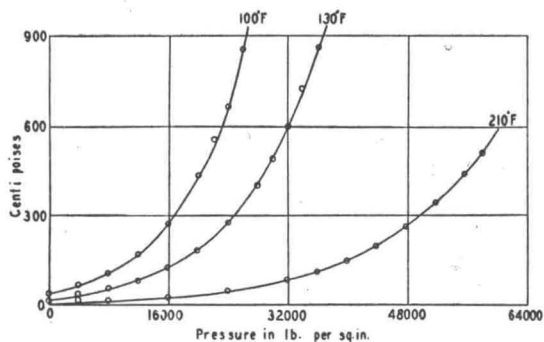


Fig. 2. Absolute Viscosity vs. Pressure - Oil No. 2.

The pressure effects were studied in the High Pressure Laboratory of the Department of Physics and the apparatus was similar to that used in the previous study.¹ A rolling-ball viscometer, the temperature of which was regulated by a thermostated bath, was used in measuring viscosity over a pressure range of

TABLE I. Data on Pennsylvania oils at atmospheric pressure.

OIL No.	CHARACTERISTICS	BOILING-POINT RANGE		MOLECULAR WEIGHT	VISCOSITY INDEX	DENSITY (g/cm ³)		
		IN DEGREES F	10 mm Hg ABSOLUTE PRESSURE			100°F	130°F	210°F
1.	Commercial "Bright Stock"	583-604	706	102	0.879	0.869	0.841	
2.	Commercial "Neutral"	459-588	368	100	.860	.849	.821	
3.	High Boiling Point Fraction From Oil 4	517-534	370	117	.841	.830	.801	
4.	Solvent Refined "Neutral"	450-507	352	116	.838	.827	.798	
5.	Medium Boiling Point Fraction From Oil 4	482-504	342	122	.836	.825	.796	
6.	Low Boiling Point Fraction From Oil 4	453-478	310	127	.832	.821	.792	

58,000 lb./in.² at temperatures of 100°, 130° and 210°F. A new calibration curve was necessary since the angle of tilt was less than that used in the previous study. Consequently, for long roll times the absolute coefficient of viscosity, μ , is given by (See Eq. (3) of previous paper):¹

$$\mu(7.36 - \rho)/155.5T.$$

As before, ρ is the density of the oil in absolute units and T is the corrected roll time in seconds. The characteristics of the calibration curve were so similar to the one used previously that it is unnecessary to reproduce it here.

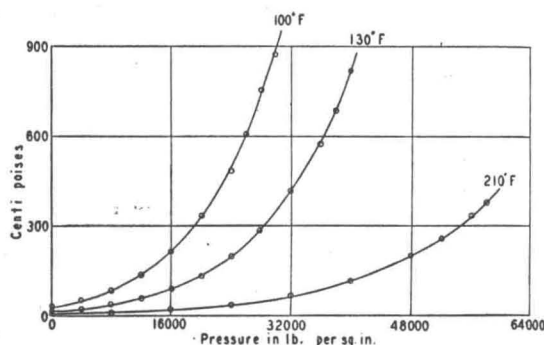


Fig. 3. Absolute Viscosity vs. Pressure - Oil No. 3.

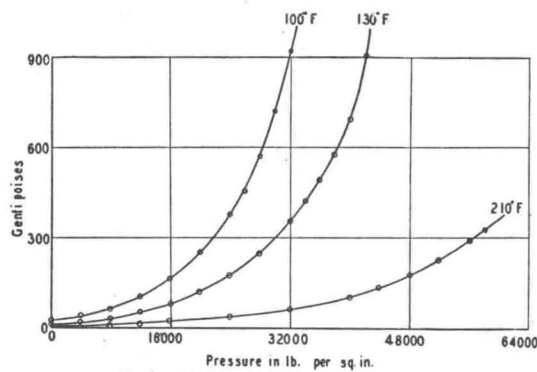


Fig. 4. Absolute Viscosity vs. Pressure - Oil No. 4.

DATA AND DISCUSSION

The viscosities, measured independently by the capillary pipette and rolling-ball methods, are given in Table II. The results by both methods agree closely, the worst disagreement being about eight percent at 210°F for a viscosity of about four centipoises.

The viscosities at higher pressures are recorded in Figs. 1-6.

On examining the data shown on curves in Figs. 1-6, it will be observed that the oil having

the higher coefficient of viscosity at any pressure at any temperature, the greater the increase in the viscosities with pressure. The viscosities increased uniformly with pressure, those of the oil having the higher viscosity and more pronouncedly when fractional pressures are used.

Table III compares the results of the temperature coefficient over the range of data.

While the pressure of the oil is related to the

TABLE II. Viscosities.

OIL NUMBER	CAPILLARY PIPE
1.	406.
2.	34.
3.	26.
4.	23.
5.	20.
6.	14.

TABLE III. M

OIL No.	14.2 lb./in. ²	10.0 lb./in. ²
1.	0.00850	0.008
2.	.00778	.008
3.	.00762	.008
4.	.00757	.007
5.	.00745	.007
6.	.00730	.007