

The pressure-volume isotherms can be described mathematically by two equations. Of chief interest is the Tait equation (Slide #2):

$$v_0 - v = C \log (1 + P/B)$$

where v_0 is the specific volume at atmospheric pressure, v is the specific volume at pressure P , and C and B are constants. C/v_0 is a constant independent of temperature. The average value of C/v_0 from this study and others conducted by API #42 (covering 103 isotherms for 20 compounds) is 0.2058. The standard deviation is 0.0045. The B is temperature dependent and can be expressed as a quadratic about 79.4°C . For example, for PSU 87: (Slide #3)

$$v_0 - v = C \log (1 + P/B)$$

$$C = 0.2058 v_0$$

$$B = B_{79.4} + a(t - 79.4) + b(t - 79.4)^2$$

$$B = 1048 - 5.916(t - 79.4) + 0.0121(t - 79.4)^2$$

A comparison between observed values of the specific volume change and the specific volume change computed from the Tait equation was made. The average per cent of difference, without regard to sign, was 0.45%, which is less than the experimental uncertainty in the data. The largest differences are at low pressures, this being particularly true for the normal paraffins.

An intermolecular force law proposed by Hudleston can be put in the following form: (Slide #4)

$$\log \left[v^{2/3} P / (v_0^{1/3} - v^{1/3}) \right] = A + B(v_0^{1/3} - v^{1/3})$$

where v_0 is the specific volume at atmospheric pressure, v is the specific volume at pressure P , and A and B are constants. To check the Hudleston equation with the data obtained in this study, $\log \left[v^{2/3} P / (v_0^{1/3} - v^{1/3}) \right]$ was plotted against $(v_0^{1/3} - v^{1/3})$. If the Hudleston equation is valid the locus of the points plotted