The literature quotes a narrow dilatancy range for iron oxide suspensions, 1 or 2% around 12.0 vol. %, and as expected the 12.0 vol. % solids sample indicated strong dilatancy. Upon doubling this concentration the iron oxide suspension exhibited slight pseudoplasticity as evidenced by n' being less than unity. This is curious since increasing solid concentration would usually enhance dilatant characteristics, but this anomalous quality of iron oxide suspensions was mentioned above.

ZINC OXIDE SUSPENDED IN LIGNIN SOLUTION. Zinc oxide suspensions are thought to flow as dilatants for solid volume concentrations of greater than 30%. This material will also show a time dependency with continued shearing of a sample; owing to a structural rearrangement, thixotropy is sometimes noticed. However, in the capillary rheometer, new material is constantly being sheared, hence the dilatancy of a concentrated suspension should be manifest despite thixotropy.

Settling presented no appreciable problem in the zinc oxide suspensions when the dispersing agent was employed. Daniel (*2*) presents a comprehensive discussion of zinc oxide suspensions, where dilatancy was used as a measure of particle dispersion.

Final zinc oxide samples were prepared having 29.7 and 31.0 vol. % solids. The effect of aging on the 29.7% sample was noted semiquantitatively. The rheological constants were measured after 19 hours and 79 hours; n' values were essentially the same, but k' increased 15% over the 60-hour aging period. Both zinc oxide samples were tested at essentially the same temperature, ambient. The volume-weighted density values were used for both concentrations (Table I).

The slope of the curves on the logarithmic plot in Figure 2 are the respective n' values. The constant, k', is calculated, where extrapolation is impractical, by selecting some arbitrary point on the log τ_w *vs.* log $8\,\bar{u}/D$ curves. Equation 6 defines the wall shear rate, $(-du/dr)_w$; and, results for each of the zinc oxide suspensions are shown in Figure 3. In obtaining this zinc oxide data, there was an effort to show a change in flow property, perhaps from pseudoplasticity to dilatancy as the assumed lower limit for dilatancy (about 30 vol. % solids) was crossed. A 32.9 vol. % solids suspension was prepared, but unfortunately this sample was too dry and immobile to flow through the rheometer.

Consistent with the definitions of pseudoplasticity and dilatancy, Figure 3 shows that the zinc oxide sample with greater solid volume displays a lower shear stress for a given wall shear rate while the opposite effect is noted for the dilatant starch suspensions in Figure 3.

CONCLUSIONS

This study has provided data which give some insight into flow behavior of dilatant suspensions; also indicated were various pitfalls encountered when an effort was made to establish reproducible flow conditions. The intent has been to provide additional data for the limited compilation of flow properties of non-Newtonian fluids and in particular dilatant suspensions, having in mind the needs of the hydraulic engineer.

ACKNOWLEDGMENT

This study was made possible through a fellowship awarded the author by the Westinghouse Electric Corp. and the United States Atomic Energy Commission in conjunction with the University of Pittsburgh. The author greatly appreciates the initial suggestions of George Sonneman of the University and the use of laboratory facilities in the Mechanical Engineering Department. Invaluable suggestions regarding the preparation of the manuscript were given by Frances M. Richardson of North Carolina State College.

NOMENCLATURE

du/dr = velocity gradient or shear rate; referred to tube wall with subscript w, sec.$^{-1}$
D = capillary diameter, ft.
g = gravitational constant, 32.2 ft./sec.^{2}
g_c = conversion factor, 32.2 lb. mass ft./lb. force sec.^{2}
H = elevation head of fluid in rheometer, ft.
k' = fluid consistency index (lb. force) (sec.^{n})/ft.^{2}
L = capillary length, ft.
n' = flow behavior index, dimensionless
P_1 = pressure applied to induce flow, lb. force/ft.^{2}
ΔP_T = pressure loss in laminar flow, lb. force/ft.^{2}
ΔP_f = calculated friction pressure drop, lb. force/ft.^{2}
r = distance along tube radius, ft.
$\underline{u}$ = local velocity, ft./sec.
u = bulk fluid velocity, ft./sec.
X = pressure loss due to slippage at tube walls, lb. force/ft.^{2}
μ = Newtonian viscosity lb. force sec./ft.^{2}
ρ = density, lb. mass/ft.^{3}
τ = shear stress, referred to the tube wall with subscript w, lb. force/ft.^{2}

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RECEIVED for review August 27, 1962. Accepted April 11, 1963.

CORRECTION:

In the article "Low Temperature Heat Capacity and Entropy of Basic Potassium Aluminum Phosphate" by Edward P. Egan, Jr., Zachary T. Wakefield, and Basil B. Luff [J. CHEM. ENG. DATA 8, No. 2, 184–5 (1963)] there is an error in Table II. The line of entries for 290° K. should be replaced by the two lines of entries.

290	74.99	68.32	11,180
300	76.87	70.90	11,940
