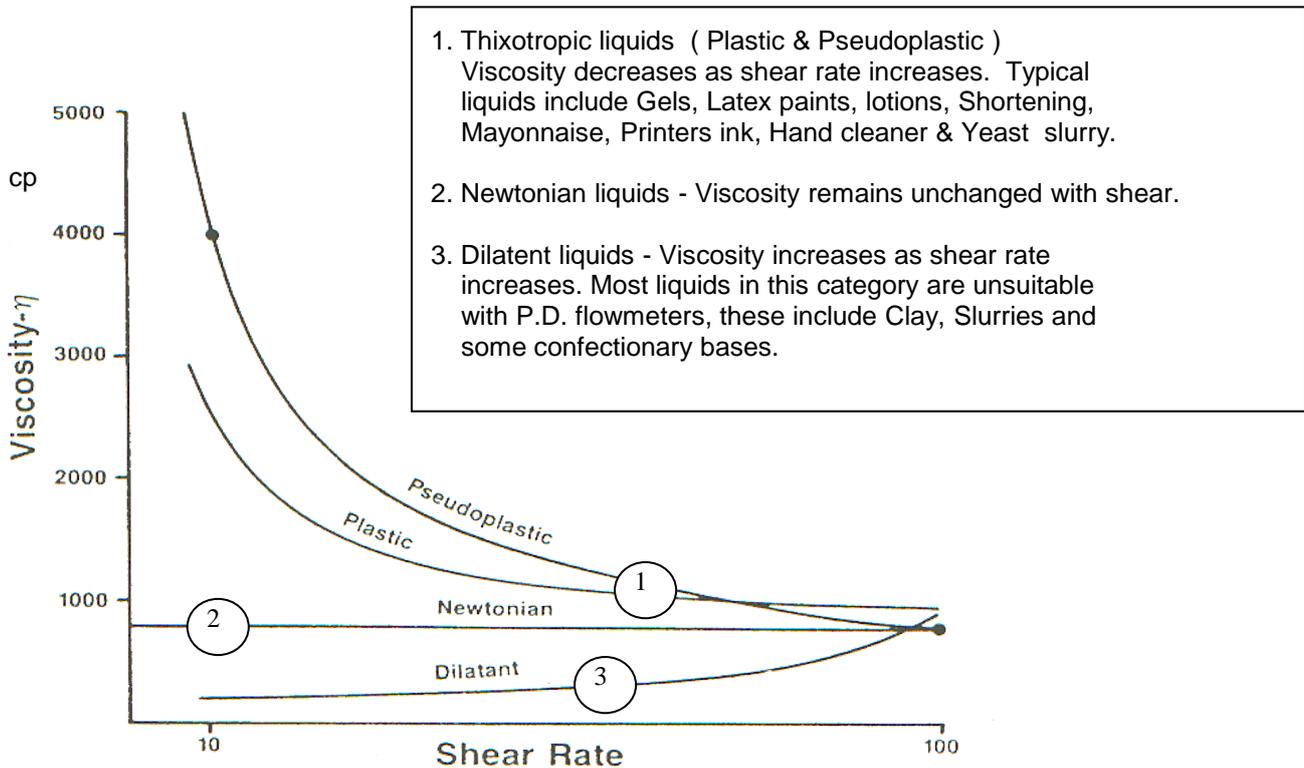


VISCOSITY OF LIQUIDS

Viscosity is the property of a fluid that is a measure of its resistance to flow. Among the earliest to express this quantitatively was Sir Isaac Newton. He reasoned that the viscosity of a liquid was proportional to its shear stress (or resistance to shear). Liquids that behave in this manner are referred to as "Newtonian" liquids and are typified by petroleum fluids, water, and similar liquids.

Other types of fluids are grouped into a general category called "Non Newtonian" which includes dilatant, plastic, pseudoplastic and thixotropic. Liquids in this group are characterised by viscosity that changes with the rate of shear as compared to the Newtonian fluids where viscosity is basically constant with shear and flow rate. As a consequence, Newtonian fluids are much easier to predict with regard to their performance through a flowmeter than are the Non Newtonian liquids.

Many of the more viscous liquids pumped through Multipulse are Plastic and Pseudoplastic and as such are reduced in effective viscosity after being pre-sheared by the pump. The diagram below shows how viscosity varies as a function of shear rate on various types of liquids.



Most empirical and test data for flowmeters and pumps have been developed using Newtonian liquids. When working with Non-Newtonian liquids we use "EFFECTIVE VISCOSITY" to represent the viscous characteristics of the liquid after it has been pre-sheared by the pump. Under these circumstances it is not unusual that the EFFECTIVE VISCOSITY of Thixotropic liquids can be many times less than the theoretical viscosity.