Viscosity

The flow behavior of paints and varnishes plays a key role in the processing stage. Apart from other parameters, viscosity is an important variable of a paint system. Viscosity has a physical significance as a measure of the internal friction of a liquid which is caused by intermolecular interactions. The shear forces in a flowing material depend, among other factors, on the deformation velocity. For certain liquids viscosity is a material constant that only depends on temperature and pressure. This group of materials is termed Newtonian liquids. The Newtonian two-plate model shows the ratio of shear stress to the velocity gradient. This factor is called dynamic viscosity.

Liquids which do not follow this proportional ratio are called non-Newtonian. The viscosity of pseudoplastic materials, for example, will decrease with an increasing shear rate (shear thinning).

The viscosity of dilatant products, however, will increase when shear forces are applied.

This behavior is known as ”shear thickening“. When shear forces are applied, the liquid becomes more viscous. In practice, time-dependent viscosity is called thixotropy.

If a liquid is sheared at a constant velocity gradient, viscosity will slowly decrease. As soon as the shear forces are removed, viscosity will recover and return to the initial value. In the paint industry a number of measurement methods, from simple flow cup to computer controlled rotation viscometers, have been established for the determination of viscosity.