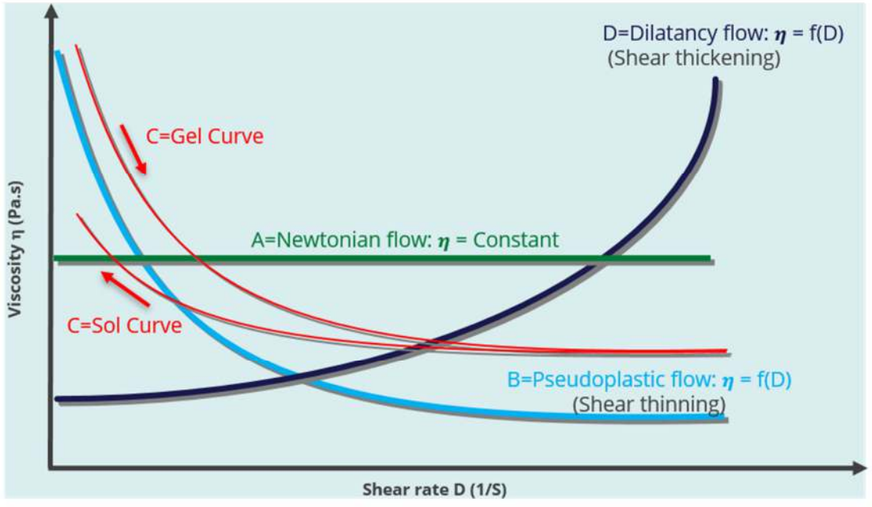
Rheology control additives effect changes in viscosity over a specific range of shear rate, and this leads to non-Newtonian flow.

In contrast, thickeners effect an increase in viscosity over the whole range of shear rate by increasing only the viscosity of the liquid phase (liquid phase thickeners).

Figure (A) shows Newtonian flow in which the viscosity does not depend on the shear rate (viscosity is constant).
As an example of non-Newtonian Flow , Figure (B)



Viscosity curves and thixotropic flow

shows shear thinning (pseudoplasticity), in which the viscosity decreases with increase in shear rate.

Another example of non-Newtonian flow that is important in coatings technology is thixotropy like in Figure C, in which, again, the viscosity decreases with increase in shear rate (gel curve) and increases with decrease in shear rate (sol curve), but not to the same extent as in the case of the gel curve.

If the system is allowed to stand for some time, it returns to its initial viscosity. The greater the difference between the sol and gel curves, the greater is the degree of thixotropy.

Unlike shear thinning, which is time-independent, thixotropy is time-dependent.

Rheology modifiers can become active at different shear rates encountered during manufacture or application of the paint.

At rest, many rheological additives build up a 3-D network (gel) in paints (clear or pigmented solvent- or water-based systems). During shearing (e.g. stirring), this network is broken temporarily (sol) but re-forms fairly rapidly at rest (reversible sol-gel transition).

In order to influence the rheology of liquid systems, use is made predominantly in the industry of silicas, organically modified bentonites, hydrogenated castor oil, polyamide waxes, etc.

A disadvantage of these substances is that they are usually dry solids which have to be incorporated into the liquid system in a form in which they are compounded by means of solvents, with shearing forces, to form a semi-finished

product or by means of careful temperature control.

The other drawback is that they lead to haziness and turbidity in clear and unpigmented systems.

KAM Kimya offers rheology control additives based on urea.

On being admixed to liquid systems, these additives precipitate in the form of very tiny needle-shaped crystals, generating a 3-D rheologically active network structure. The resulting thixotropic flow behavior is highly suited for preventing sedimentation and increasing the anti-sagging properties without impairing leveling.

The other advantage of these types of rheology modifiers is that they can be incorporated into liquid systems without undergoing a chemical reaction. However, intensive stirring is required, as otherwise specks can form.

KAM-RCA 410 & KAM-RCA 410A

KAM-RCA 410 and KAM-RCA 410A are liquid rheology control additives for medium-polarity solvent-based and solvent-free coating systems as well as PVC-based plastisols and ambient-curing resin systems.

KAM-RCA 410 contains N-Methylpyrrolidon (NMP) as a carrier and KAM-RCA 410A is the NPM-free version of KAM-RCA 410.