A Primer for **MaxxThix®** Rheology Modifiers

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The **evolution** of solutions™

Terms used to describe various Rheology Modifiers

- **Rheology** is the science of the flow and deformations of materials (usually liquids) under different shear stress.

- **Viscosity** is the resistance to flow when fluid layers slide over each other (ie: molten lava flow). Viscosity is not an absolute value for a material. It can be quite different depending on the condition under which it is measured (shear rate) or the recent shear history of the material.

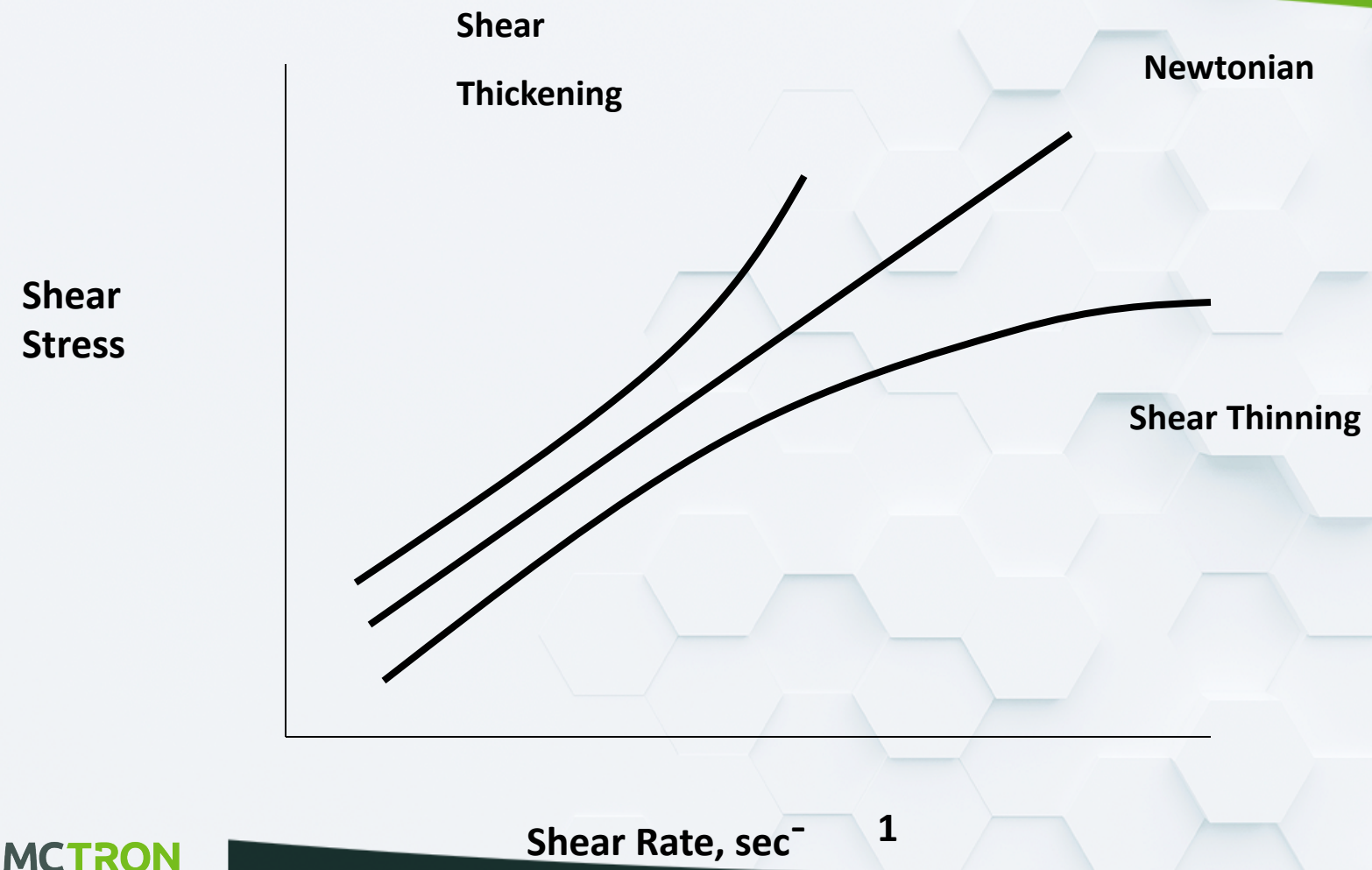
- ***Elasticity*** is a measure of a materials ability to recover and return to its original form (ie: a rubber band). Thickened materials generally exhibit both viscous and elastic behaviors. Thus, paints, coatings and adhesives are referred to as being **viscoelastic materials**.

- ***Yield Point*** is the initial resistance to flow that must be overcome before a material starts to move. The best example here is a bottle of ketchup. You can hold it upside down and it won't come out. It needs to be "stressed" before it flows.

Terms used to describe various Rheology Modifiers

- **Alkali Swellable Emulsions (ASE)** are family of polymeric thickeners. These materials are supplied as high solids dispersions at acidic pH. When these materials are neutralized with a base, they "swell" or expand in hydrodynamic volume (retain water). They are very easy to use in coatings and adhesives.
- **Associative Thickener (AT)** acts like it is much higher in molecular weight when at rest. It forms an associative bond (as compared to a true chemical bond) which is easily broken when the material is strained. Thus, this type of thickener flows well under the shear of a brush. It rapidly recovers when the shear is removed (doesn't sag). These products were first used in paints
- **Thixotropy or Shear-Thinning** is used to describe materials that become less viscous when subjected to an applied stress.
- **Shear Thickening or Dilatancy** is used to describe materials that become more viscous when subjected to an applied stress.

Shear Stress vs. Sheer Rate Curve



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Types of Thickeners

Natural

- Xanthan gum is the most commonly used natural product. Xanthan's have excellent salt, low/high pH tolerance, good suspending properties and provides dependable product stability. Maintains viscosity at elevated temperatures.
- Guar gums are also a highly used natural product. Derivatized versions are also widely used.
- Starch is a volume thickener used in many applications including food.

Synthetic Water Based Thickeners

- Carbomers and acrylate co-polymers - Commonly used due to efficiency and excellent shear thinning. Sensitivity to electrolytes which reduce their viscosity due to a loss of water binding through loss of charge repulsion.

- Alkali Swellable Emulsions - Acrylic polymer dispersions are insoluble in water and have a high percentage of acid groups distributed through the polymer chain. When neutralized, the salt that is formed is hydrated. As the concentration of neutralized polymer in an aqueous formulation increases it causes the viscosity to increase.

- Other water-based thickeners include Cellulosic (HEC, Methacel), Polyacrylamides, Polyvinyl Alcohol, and urethane based.

Why use a certain type of Thickener?

- Thickening Efficiency / Cost
- Desired curve shape
- Temperature Effects
- Ionic Effects (Hard Water / Salt)
- pH (cationic vs. anionic)
- Yield Point
- Ease of Handling

Application Specifics

- Paints & Coatings
- Fabric Back-coatings
- Inks
- Pigment Dispersions

Application Specifics

- **Paints & Coatings (MaxxThix MT-1; MT-2; AT-17)**

  … MaxxThix MT-1 and/orAT-17 to suspend dense fillers (yield point)

  … MaxxThix AT-17 for No drip or sag (high viscosity at low shear)

  … MaxxThix AT-25 is an associative non-ionic urethane rheology modifier, designed for formulating a wide range of interior and exterior paints and coatings

- Fabric Back-coatings
- Inks
- Pigment Dispersions

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Application Specifics

- Paints & Coatings
- **Fabric Back-coatings (MaxxThix MT-1 & MT-2)**
  - **… MaxxThix MT-1 for long stringy flow to sit up on back**
  - **… MaxxThix MT-2 for more penetration**
- Inks
- Pigment Dispersions

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Application Specifics

- Paints & Coatings
- Fabric Back-coatings
- **Inks**

  Gravure, flexographic and offset inks are different.

  All generally want optimum color strength (Pigment Efficiency).

  Smooth flow, some penetration and good adhesion are generally a plus.

Non re-wet Protective Colloid Thickeners are preferred here.

- Pigment Dispersions

Application Specifics

- Paints & Coatings
- Fabric Back-coatings
- Inks
- **Pigment Dispersions (MaxxThix MT-1)**

  Coating fillers are high density materials

  They are use at high solids content (70%)

  A Yield Point helps suspend dense fillers

  ASE type materials are easy to use and efficient

A high efficiency ASE thickener like MaxxThix MT-1 or an Associative ASE thickener like MaxxThix AT-17 are great for filler dispersions.

MCTRON Products

MaxxThix Alkali Swellable Products

	MT-1	MT-2	MT-4	AT-17	MT-107	AC-1007	AC-1004	AT-25
Type	ASE	ASE	ASE	Associative	Gum	Guar Gum	Acid Thickener	Associative Urethane
Solids, %	35	20	35	32	14	100 Powder	100 Yellowish Liquid	25
pH	3.0	3.0	3.0	2.0	8.5	9.0	5.5	
Viscosity, cP	50	20	50					1500 - 2500
Viscosity, 1%/H2O, cP	2000 - 3500	1000 - 2000	2000 - 3500	18,000				

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MCTRON is a *"service-oriented"* **specialty chemical company** with a broad range of products. We support these products in our customers' mills with our experienced technical support team.

MCTRON Technologies values the opportunity to serve our customers.

We believe that offering the most competitive, innovative and flexible solutions create our value in the market.

MCTRON Technologies' adhesive products are designed to meet the specific requirements of our customers.

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Safety & Environment

- McTron is focused on “Green” chemistries development
- New Thermosets Resin Technology
- Low VOC alternatives
- Strong Safety Programs

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Why Choose MCTRON Technologies?

- We offer **customized solutions** to our customers.
- We are committed to creating **sustainable value**.
- We strive to **exceed customer expectations**.
- We provide solutions and service that offers **competitive advantage** for our customers.
- Our people offer **market knowledge** and understand customer needs.
- We are **open, flexible and collaborative** and provide the best products and service possible.