

VEEGUM® Magnesium Aluminum Silicate

This presentation is available in three parts. This is Part 3.

Part 1:

What **VEEGUM** Magnesium Aluminum Silicate is

How it's made

How it works

- Clay structure

- Hydration Mechanism

- Colloidal structure in water

Part 2:

VEEGUM Magnesium Aluminum Silicate dispersion rheology

Effect of additives

Part 3:

Guidelines for best use

- Dispersion preparation**

- Hydration time guide**

Synergism with organic thickeners

VEEGUM Magnesium Aluminum Silicate grades

Guidelines For Best Use

Dispersion Preparation

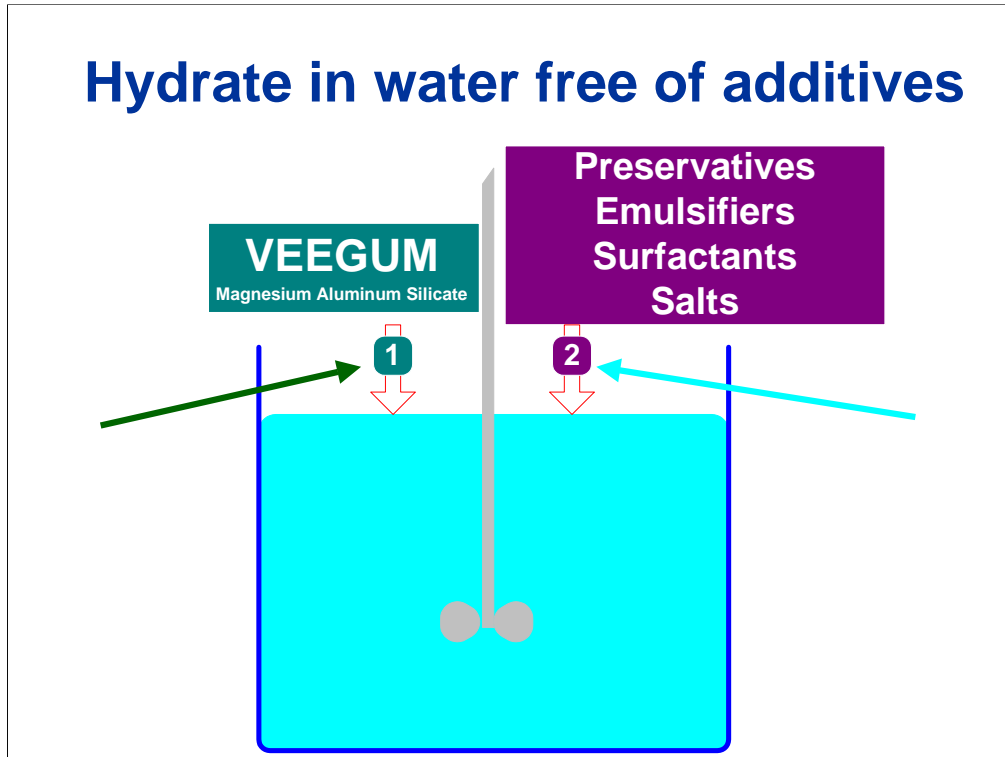
**THE BEST DISPERSIONS
ARE PREPARED IN WATER
FREE OF ADDITIVES.**

**MORE ENERGY INPUT GIVES
QUICKER HYDRATION.**

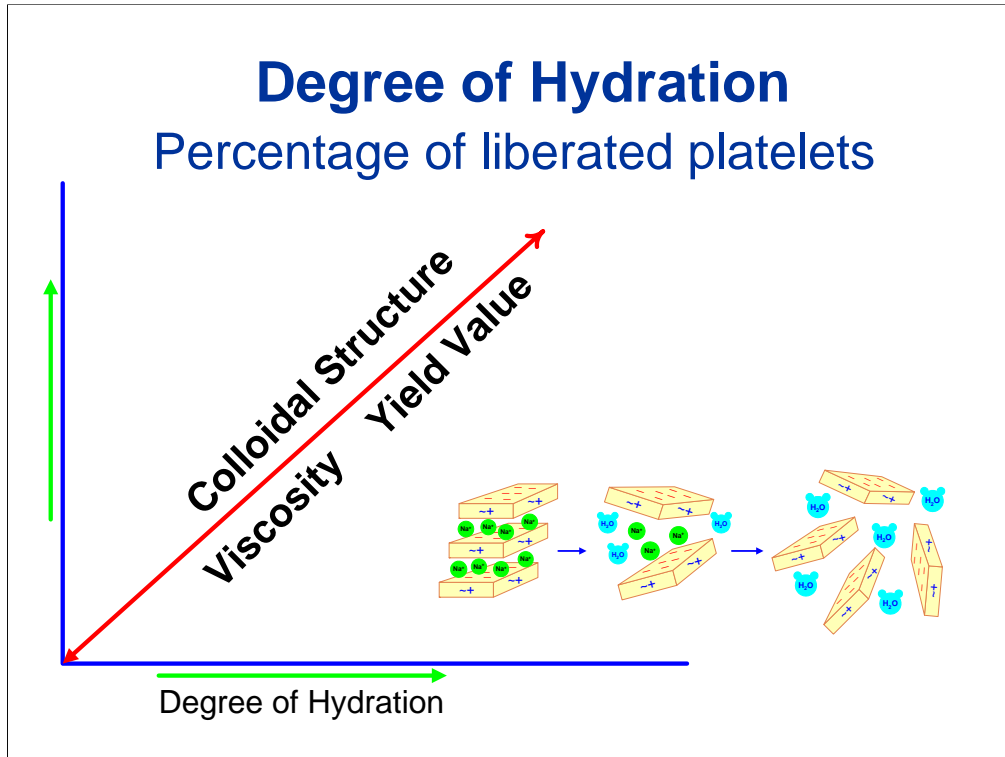
VEEGUM Magnesium Aluminum Silicate products must be properly dispersed in water and hydrated to provide the desired performance properties. The two rules for proper hydration are:

- 1. THE BEST DISPERSIONS ARE PREPARED IN WATER FREE OF ADDITIVES.**
- 2. MORE ENERGY INPUT GIVES QUICKER HYDRATION.**

Hydrate in water free of additives

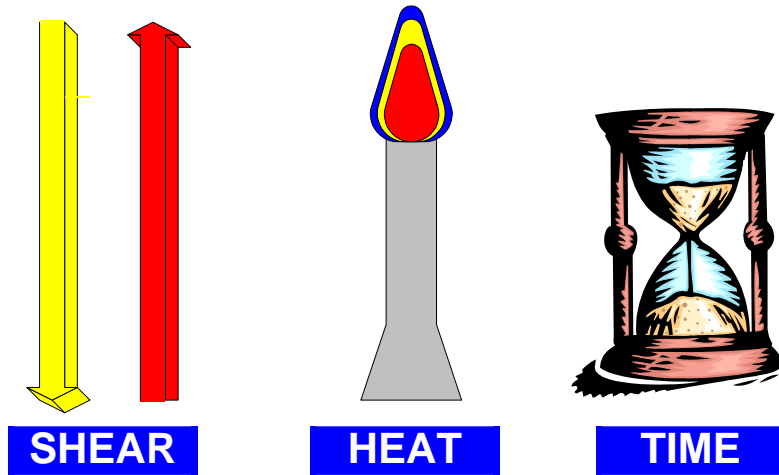


For best results, the **VEEGUM** Magnesium Aluminum Silicate should be hydrated before other formula ingredients are added. Any materials present in the water when the clay is added, including preservatives, chelating agents or other minor additives, will interfere with hydration and inhibit the formation of the desired colloidal structure.



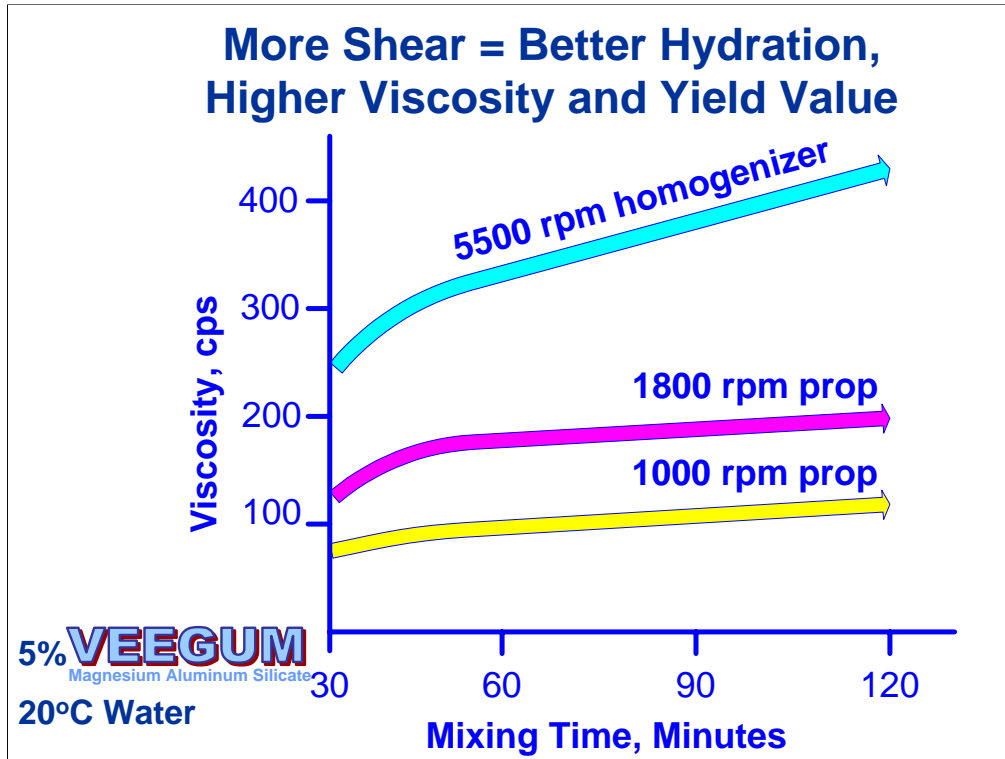
The extent to which the clay particles are delaminated into individual platelets is referred to as the degree of hydration. The greater the degree of hydration, the stronger the colloidal structure, and the greater the viscosity and yield value of the dispersion.

Degree of Hydration Depends on Energy Input

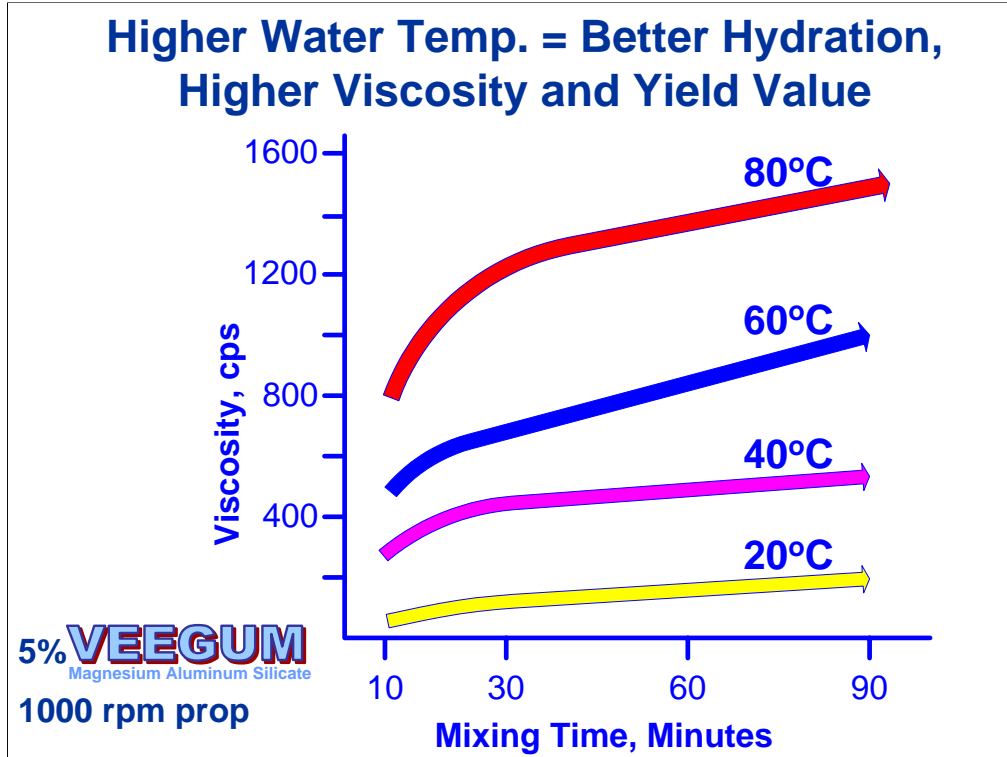


The degree of hydration is directly proportional to the amount of energy used to disperse the clay, and therefore increases in proportion to the following factors:

- Shear, or mixing intensity
- Heat input, or water temperature
- Mixing Time



Using greater shear, or mixing for a longer time, will provide better hydration, which is measured as higher viscosity and greater yield value.



Heat input in the form of heated water has an even more pronounced beneficial effect on hydration than does the mechanical energy contribution of shear.

BE CONSISTENT

Use the **same** water temperature, shear and mixing time to get the **same** viscosity and yield value every time.

Any change in water temperature or mixer intensity (such as speed, or propeller to vessel ratio) will affect the degree of hydration and the hydration time. When the preferred mixing conditions are determined, it is very important that they be consistently used to achieve reproducible results in the laboratory, during scale-up and in production.

Minimum Suggested Hydration Times



<u>Normal Hydrating Grades</u>	<u>Quick Hydrating Grades</u>	<u>Ultra Hydrating Grade</u>
VEEGUM	VEEGUM HS	VEEGUM <i>Ultra</i>
VEEGUM F	VEEGUM D	
VEEGUM K	VEEGUM Plus	
VEEGUM HV		
VEEGUM PRO		

Propeller Mixer:

800 rpm, 25°C	120 minutes	30 minutes	15 minutes
800 rpm, 75°C	45 minutes	20 minutes	10 minutes

Homogenizer:

3000 rpm, 25°C	30 minutes	20 minutes	10 minutes
3000 rpm, 75°C	15 minutes	10 minutes	10 minutes

All grades of **VEEGUM** Magnesium Aluminum Silicate do not hydrate at the same rate, due primarily to the nature of the particular clay ores used to produce each. This table provides guidelines for minimum suggested hydration times, illustrating the effect of shear rate and water temperature on hydration rate. The grades that have the slowest hydration rate benefit the most from additional energy input. The rapid hydration rate of **VEEGUM *Ultra*** is nearly independent of differences in energy input.

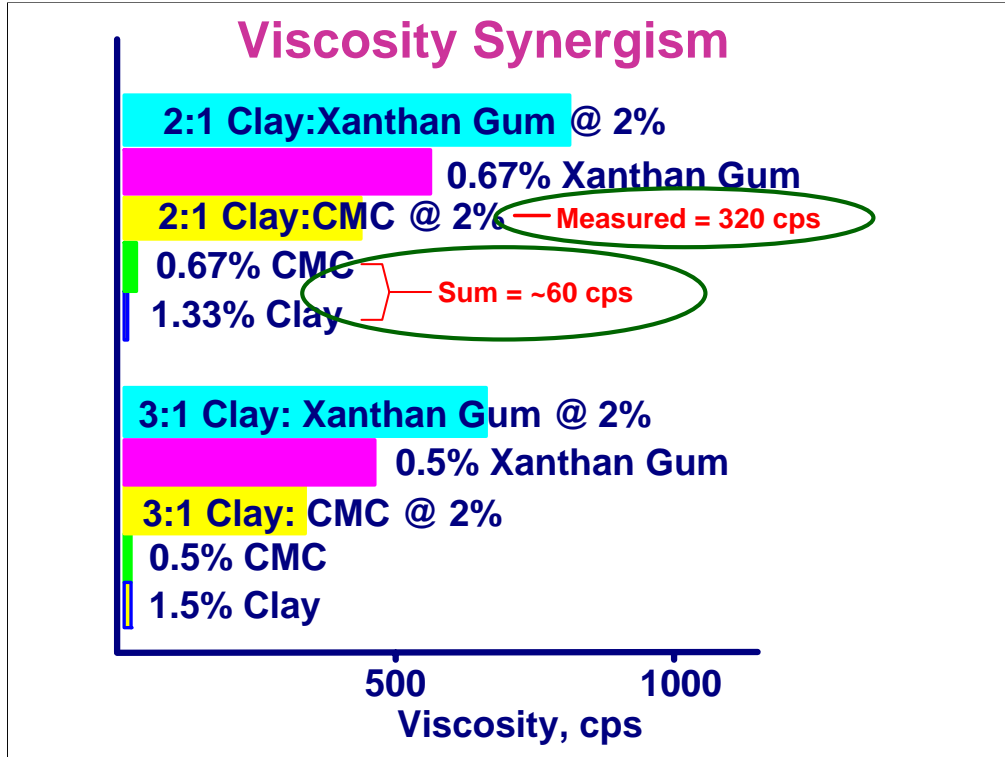
VEEGUM/Organic Gums

Magnesium Aluminum Silicate

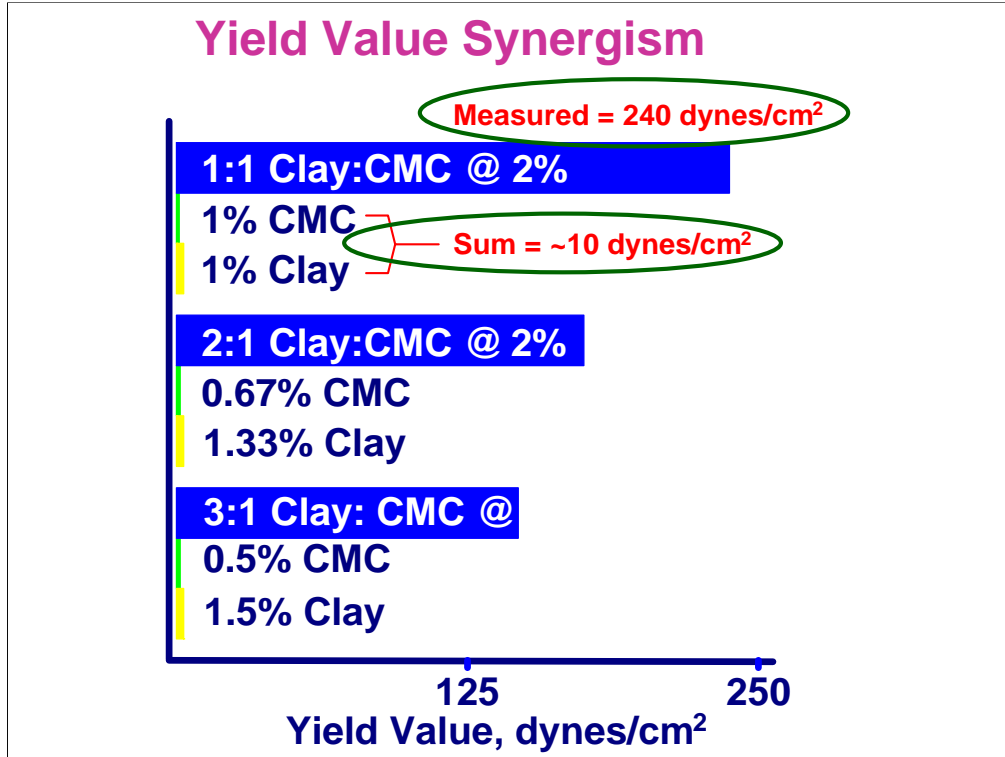
Synergism

The formulator can often fine-tune viscosity, yield value and flow properties beyond what is possible with the clay or organic thickener alone.

VEEGUM Magnesium Aluminum Silicate products are often used synergistically with organic thickeners. These combinations allow the formulator to fine-tune viscosity, yield value, and flow properties beyond what is possible with either the clay or organic thickener alone.



This is an example of the viscosity synergism obtained from combinations of **VEEGUM** Magnesium Aluminum Silicate with xanthan gum and CMC. In each case, the viscosity obtained from the blend is considerably greater than that which would be expected based on the viscosity of each component alone.



This same type of synergism is obtained for yield value. Here is an example of the particularly strong synergistic combination of **VEEGUM** Magnesium Aluminum Silicate with carboxymethylcellulose.

VEEGUM/Organic Gums

Magnesium Aluminum Silicate

MORE SYNERGY BENEFITS:

- **Improved economy**
- **Improved stability**
- **Yield value + thickening efficiency**
- **Stable high temperature viscosity**
- **Improved esthetics**

Other advantages of combining **VEEGUM** Magnesium Aluminum Silicate with an organic thickener are that

- The combination may be more economical than the use of either component alone.
- The gum can improve the stability of the clay.
- The clay can impart yield value to systems thickened with high efficiency organic polymers or gums.
- The clay can compensate for the loss of viscosity at elevated temperatures, which is common to many organic thickeners, because its colloidal structure is not sensitive to heat.
- The clay can reduce the tacky, gummy or stringy nature of organic thickener solutions.

VEEGUM Grades

Magnesium Aluminum Silicate

**VEEGUM products tailored
to the formulator's needs.**

R.T. Vanderbilt Company's diversified smectite resources and expertise in mineral processing result in **VEEGUM** Magnesium Aluminum Silicate products tailored to the formulator's needs. Nine grades are available to the cosmetics and pharmaceutical industries.

VEEGUM

Magnesium Aluminum Silicate

Pharmaceutical/Cosmetic Grades

VEEGUM*	MAS NF Type IA
VEEGUM F*	MAS NF Type IB
VEEGUM HV*	MAS NF Type IC
VEEGUM K*	MAS NF Type IIA
VEEGUM HS*	Purified Bentonite NF

*INCI NAME: Magnesium Aluminum Silicate

VEEGUM, VEEGUM F, VEEGUM HV and **VEEGUM K** Magnesium Aluminum Silicate are sold for cosmetic and pharmaceutical applications, and conform to the USP/NF monograph for Magnesium Aluminum Silicate. **VEEGUM HS**, also a cosmetic and pharmaceutical grade, conforms to the USP/NF monograph for Purified Bentonite. These five grades, and the four cosmetic grades, are also used in household, institutional, agricultural and industrial formulations, where they provide similar benefits.

VEEGUM

Magnesium Aluminum Silicate

Pharmaceutical/Cosmetic Grades

VEEGUM - for general use

VEEGUM F - micronized powder

VEEGUM HV - higher viscosity at lower solids

VEEGUM K - high electrolyte, acid compatibility

VEEGUM HS - highest electrolyte, acid compatibility; least acid pH drift

VEEGUM is the most useful, economical grade for a wide range of applications: pharmaceutical, cosmetic, personal care, veterinary, agricultural, household and industrial products.

VEEGUM F, a micronized powder, is indicated for use where a dry material is required. It is used primarily in pressed powders and in direct compression tablets.

VEEGUM HV is indicated when higher viscosity at low solids is desired. Excellent emulsion and suspension stabilization is obtained at low use levels.

VEEGUM K is widely used in pharmaceutical oral suspensions at acid pH. It has low acid demand and high acid and electrolyte compatibility. It is used to provide good suspension at low viscosity.

VEEGUM HS offers maximum electrolyte stability and minimum acid demand. In cosmetics, it is the preferred grade for hair and face masks.

VEEGUM

Magnesium Aluminum Silicate

Cosmetic Grades

INCI NAME

VEEGUM <i>Ultra</i>	Magnesium Aluminum Silicate
VEEGUM D	Magnesium Aluminum Silicate
VEEGUM PRO	Tromethamine Magnesium Aluminum Silicate
VEEGUM Plus	Magnesium Aluminum Silicate (and) Cellulose Gum

The cosmetic grades – **VEEGUM *Ultra***, **VEEGUM D**, **VEEGUM PRO** and **VEEGUM Plus** - are produced to the same standards of quality and purity as the pharmaceutical grades.

VEEGUM

Magnesium Aluminum Silicate

Cosmetic Grades

VEEGUM *Ultra* – unique white acidic smectite;
easiest to hydrate

VEEGUM D - rapid hydration; higher solids

VEEGUM PRO - chemically modified; high
thickening efficiency

VEEGUM Plus - synergistic clay + CMC;
easy to hydrate

VEEGUM *Ultra* is a unique acidic smectite clay. It produces dispersions in the pH 4.2 to 5.2 range, making it particularly suitable for topicals. It is especially easy to hydrate, and it is whiter and brighter than other clays.

VEEGUM D was designed for rapid hydration in water, even at high concentrations. It is used in dentifrice pastes and gels, and is generally suitable for stabilizing suspensions and emulsions.

VEEGUM PRO is chemically modified to offer the highest thickening efficiency of the cosmetic grades. It is widely used in sunscreen emulsions, dandruff shampoos, skin cleansers, and liquid soaps with abrasives.

VEEGUM Plus is a blend of purified smectite clay and CMC. Easy to hydrate, it has superior thickening efficiency, suspending power, and whiteness.

VEEGUM Benefits

Magnesium Aluminum Silicate

- **STABILIZE EMULSIONS**
- **STABILIZE SUSPENSIONS**
- **MODIFY RHEOLOGY**
- **ENHANCE SKIN FEEL**
- **MODIFY ORGANIC THICKENERS**
- **PERFORM AT HIGH & LOW pH**
- **FUNCTION WITH MOST ADDITIVES**
- **RESIST DEGRADATION**
- **ACT AS BINDER & DISINTEGRANT**

VEEGUM Magnesium Aluminum Silicate products are valued by formulators worldwide for their ability to:

Stabilize Emulsions and Suspensions – The colloidal structure formed by these clays segregates and traps dispersed phases, whether solid, liquid or gas, and regardless of temperature.

Modify Rheology - Shear-thinning products with controlled thixotropy can be formulated. Rich creams spread smoothly. Suspensions pour freely without losing stability.

Enhance Skin Feel – **VEEGUM** products contribute spreadability and cosmetic elegance to topical products. They are also used to reduce or eliminate the tacky, gummy or stringy nature of organic gums and polymers.

Modify Organic Thickeners - The clay contributes to synergistic viscosity and yield value, while the gum's and polymer's protective colloidal action improves the clay's stability in the presence of water-solubles.

VEEGUM Benefits

Magnesium Aluminum Silicate

- STABILIZE EMULSIONS
- STABILIZE SUSPENSIONS
- MODIFY RHEOLOGY
- ENHANCE SKIN FEEL
- MODIFY ORGANIC THICKENERS
- PERFORM AT HIGH & LOW pH
- FUNCTION WITH MOST ADDITIVES
- RESIST DEGRADATION
- ACT AS BINDER & DISINTEGRANT

Perform at High and Low pH - **VEEGUM** products are routinely used in the pH 2 to pH 13 range. Certain grades are particularly effective at pH extremes, where their pH stability is further extended by protective colloids such as xanthan gum.

Function with Most Additives - As anionic clays, **VEEGUM** products are compatible with most anionics and nonionics; they are incompatible with most cationics.

Resist Degradation – As clay minerals, **VEEGUM** products are not decomposed by bacteria, heat or excess mechanical shear.

Act as Binders and Disintegrants - **VEEGUM** products are used as a nonmigratory binders in tablets, sticks, and pressed cakes. They does not migrate to the product surface during drying, thereby ensuring uniformity and the desired level of hardness, rub-off, and color value. It also functions as a low-bulk disintegrant in tablets.

**A library of technical literature on the
properties and uses of VEEGUM
Magnesium Aluminum Silicate products
is available for download at**

www.rtvanderbilt.com