



ACRYSOL™ RM-6000 Rheology Modifier

Description

ACRYSOL™ RM-6000 Rheology Modifier is a non-ionic urethane rheology modifier based on solvent-free* technology offering improved efficiency without sacrificing key performance properties. The efficiency in both the medium shear and high shear range results in good flow and leveling with high film build while maintaining good sag resistance. ACRYSOL RM-6000 Rheology Modifier has demonstrated utility in a broad range of emulsions, including the “newer generation”, low-VOC types such as RHOPLEX™ SG-30 Acrylic Emulsion and RHOPLEX ML-300 Acrylic Emulsion.

ACRYSOL RM-6000 offers a distinct rheology profile and can replace traditional combinations of medium- and high-shear urethane rheology modifiers. Depending on the formulation the rheology modifier dosage can be reduced up to 40%.

ACRYSOL RM-6000 is recommended in a wide range of sheen through high gloss paints. It can be used either alone or in combination with other thickeners, including ACRYSOL RM-5000, to help improve application properties such as sag resistance and brush-and roller-loading.

Benefits of ACRYSOL RM-6000

- Improved efficiency
- Excellent flow/sag balance
- Enhances gloss potential
- Solvent free & low odor
- Broad formulation latitude
- Use over a wide pH range
- Formulated to resist microbial contamination
- Ease of handling

Typical Physical Properties

(These properties are typical but do not constitute specifications).

Property	Typical Values
Appearance	Hazy white to off white liquid
Solids content %	17.5
Brookfield Viscosity	3000-5000 cps
Density; lbs/gal (U.S.)	8.7
Solvent	Water
Chemistry	HEUR

*manufactured without the use of solvent

Table 1. compares the thickening efficiency of ACRY SOL™ RM-6000 to RM-2020 NPR and RM-5000 Rheology Modifiers when each is utilized as a sole thickener in a representative high gloss formulation based on RHOPLEX™ HG-700 Acrylic Emulsion. These KU/ICI combinations should not be considered as typical viscosity targets.

Table 1. Viscosity Comparison at Equal Thickener Loadings

ACRY SOL	dry lbs/100 gal	Stormer (KU)	ICI (poise)
RM-2020NPR	6.0	89	1.70
RM-5000	6.0	98	2.40
RM-6000	6.0	125	3.45

ACRY SOL RM-6000 demonstrates efficiency advantages to most high-shear viscosity generators in many formulating spaces. Graph 2. compares the efficiency (total wet lbs) of ACRY SOL RM-6000 to ACRY SOL RM-2020NPR and ACRY SOL RM-5000 Rheology Modifiers in a 22PVC semi-gloss paint based on RHOPLEX SG-30 Emulsion across a volume solids range of 31% to 37%.

Graph 2. Efficiency Across Volume Solids Range

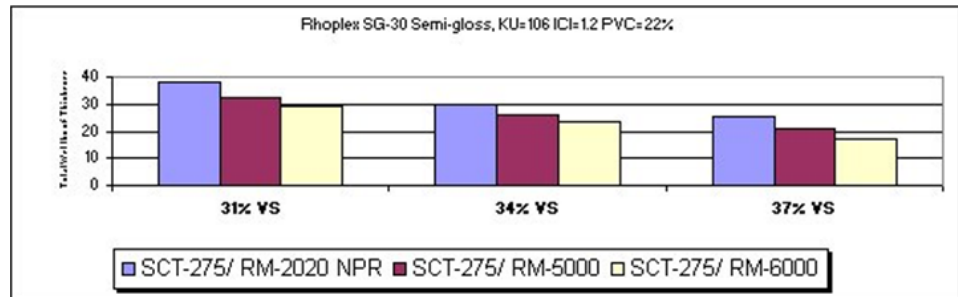


Table 3. Property Enhancement at Lower Total Rheology Modifier Levels

	Total wet lbs/ 100 gal	Stormer (KU)	ICI (poise)	Leneta Flow	Leneta AntiSag
36.6 lbs ACRY SOL RM-2020 NPR 3.6 lbs ACRY SOL RM-825	40.2	96.0	1.55	5.00	20
10.6 lbs ACRY SOL RM-5000 12.2 lbs ACRY SOL RM-6000	22.8	100.0	1.65	10.00	20

Applications

ACRYSOL™ RM-6000 Rheology Modifier can be applied in a wide range of paint formulations, especially lower-VOC types. It is particularly efficient in the following formulations:

- **Current Generation paints** based on solvent-free latex binders
- **Interior wall applications:** ACRYSOL RM-6000 is compatible with all types of emulsions, allowing formulations with outstanding application properties.
- **Gloss and semi-gloss:** ACRYSOL RM-6000 exhibits excellent thickening response with various types of binders; including small to large particle size, colloiddally-stabilized, acrylic to vinyl acrylic and styrene acrylic binders.
- **Waterborne industrial coatings** (e.g., wood coatings, furniture coatings, metal coatings): ACRYSOL RM-6000 Rheology Modifier offers excellent application and final coatings surface properties such as water resistance, exterior durability, excellent gloss potential, and a good flow/sag balance
- **Waterborne elastomeric wall coatings and masonry applications;** where excellent exterior durability is required. ACRYSOL RM-6000 offers the rheological profile necessary for these formulations (i.e., high shear viscosity for film build, and medium shear viscosity for better loading and thick film application).

Formulating Guidelines

Incorporation

ACRYSOL™ RM-6000 Rheology Modifier is supplied as a low-odor, solvent-free*, pourable liquid being manufactured without added solvent. It can be added to the mill-base or during letdown.

Rheology Profile

ACRYSOL RM-6000 Rheology Modifier imparts a unique rheology profile. This is especially evident in gloss and semi-gloss paints where good flow and levelling properties are required for brush application and sag resistance cannot be sacrificed.

ACRYSOL RM-6000 can be combined with other ACRYSOL products, such as ACRYSOL RM-5000 Rheology Modifier, to achieve a desirable balance of Stormer (KU) and ICI viscosities.

Dispersing Agents

In most formulations TAMOL™ 731A and TAMOL 1124 Dispersants provide excellent results in combination with ACRYSOL RM-6000 Rheology Modifier.

For high-gloss paints, enamels or industrial coatings, TAMOL 681 and TAMOL 165A Dispersants are recommended. They have excellent overall performance and facilitate a greater degree of gloss reproducibility.

Paint pH

ACRYSOL RM-6000 Rheology Modifier can be used at paint pH's from 2 to 12. Over this range, the efficiency and other rheological parameters may change significantly because of changes to other formulation ingredients.

*manufactured without the use of solvents.

Interactive Effects of The Paint System

The thickening mechanism of ACRYSQL™ RM-6000 Rheology Modifier is associative. Its hydrophobic components associate with other hydrophobic elements in the paint. These hydrophobic elements include latex binder and opaque polymers. Association with inorganic pigments is less frequent, but can exist. The resulting network of associations modifies the rheological profile of the paint and provides the desired properties.

Due to the associative mechanism the rheology of the paint is influenced by a range of elements other than the thickener itself. The following factors have a direct impact on the efficiency of ACRYSQL RM-6000 in paints:

- Polymer particle size and distribution
- Polymer composition
- Polymer stabilization
- Surfactants and co-solvents

Polymer Particle Size and Distribution

The primary site for the associative characteristics of a rheology modifier is the surface of the binder particles. As a consequence, a greater surface area will lead to stronger association. Greater association leads to an increased efficiency. Due to the greater total surface area of a small particle size binder, the rheology modifier will work more efficiently with it than with a large particle size binder.

When a binder contains a distribution of particle sizes, the answer is not as clear. Here the distribution of particle sizes from large to small will determine the associative conditions more realistically than average particle size.

Polymer Composition

ACRYSQL RM-6000 Rheology Modifier is highly efficient with hydrophobic polymers. This hydrophobicity may vary with the polymer composition or the stabilising system.

Surfactants

The hydrophobic nature of surfactants helps them to compete with the rheology modifier for the polymer (binder) surface. If the surfactant is able to displace the rheology modifier, the viscosity that is inherent to the rheology modifier-polymer interaction can be reduced considerably. This means that special attention is needed for the type and amount of surfactant that is used, and for the combination with the binder.

In addition, consideration must be given to the surfactants introduced with the colorant system. Predispersed colorants generally contain surfactants for stability and to facilitate colour acceptance. Each colorant may have a different type and level of surfactant.

Co-solvents

Water insoluble co-solvents have little or no effect on the medium shear viscosity of a paint thickened with an associative thickener. Water soluble co-solvents, however, may reduce the low shear viscosity.

Products such as ethylene glycol and propylene glycol will have the least effect, while Butyl Carbitol will have the greatest effect among the co-solvents tested to date. As in the case of surfactants, the level of co-solvent that is introduced with a pre-dispersed colorant must be accounted for. One outcome of this co-solvent interaction is the potential to use these products for low shear viscosity adjustments.

**Handling
Precautions**

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

Storage

Store products in tightly closed original containers at temperatures recommended on the product label.

**Disposal
Considerations**

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Coating Materials Technical Representative for more information.

**Chemical
Registration**

Many countries require the registration of chemicals, either imported or produced locally, prior to their commercial use. Violation of these regulations may lead to substantial penalties imposed upon the user, the importer or manufacturer, and/or cessation of supply. It is in your interests to ensure that all chemicals used by you are registered. Dow does not supply unregistered products unless permitted under limited sampling procedures as a precursor to registration.

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Stewardship**

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Contact:

North America: 1-800-447-4369
Latin America: (+55)-11-5188-9000
Europe: (+800)-3-694-6367
Asia-Pacific: (+800)-7776-7776
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