



ACRYSOL™ DR-72

Alternative to High Molecular Weight Cellulosic Thickeners

Description

ACRYSOL DR-72 associative thickener is a synthetic, liquid, anionic rheology modifier that provides a single, low-cost/ high performance alternative to cellulosic thickeners in interior flat, sheen, and satin latex paints. It can be used in structured paints and replace high molecular weight HEC in renders, plasters, et. It is part of the DESIGNED RHEOLOGY™ product line which provides a liquid alternative to HEC with customized rheology and end-point application performance.

This associative thickener provides application and “in-can feel” properties that are very similar to those of higher molecular weight cellulosic thickeners. It offers outstanding resistance to roller spattering, improved levelling, and better response to dilution in most formulations.

ACRYSOL DR-72 associative thickener is easy to handle and incorporate during the paint manufacturing process and is highly resistant to microbial attack.

Application

ACRYSOL DR-72 associative thickener is designed for use in a wide range of latex paint formulations for excellent performance. It is particularly well suited for low-sheen interior formulations, including above CPVC low volume solids paints. In these formulations, it can be used as a cost effective alternative to cellulose.

ACRYSOL DR-72 associative thickener is supplied as a low-viscosity liquid that is easy to pour and pump. It is especially attractive to use when bulk handling and automatic metering equipment are used.

Cellulosic thickeners are traditionally used in rendering systems, such as aggregate finishes, marble stone finishes and all other kinds of trowelable products.

In these textured paints applied in high thickness, the sag resistance is a key property, and formulators normally use high molecular weight HEC thickeners which deliver a high viscosity at low shear.

We recommend to evaluate ACRYSOL DR-72 in these types of formulations.

Typical Properties

These properties are typical but do not constitute specifications.

Appearance	Milky white liquid
Solids content %	30
pH (as supplied)	3.50-4.60
Brookfield Viscosity (as supplied)	1-20 CPO
Density at 25°C	1.05

Formulations

Manufacturing the Paint

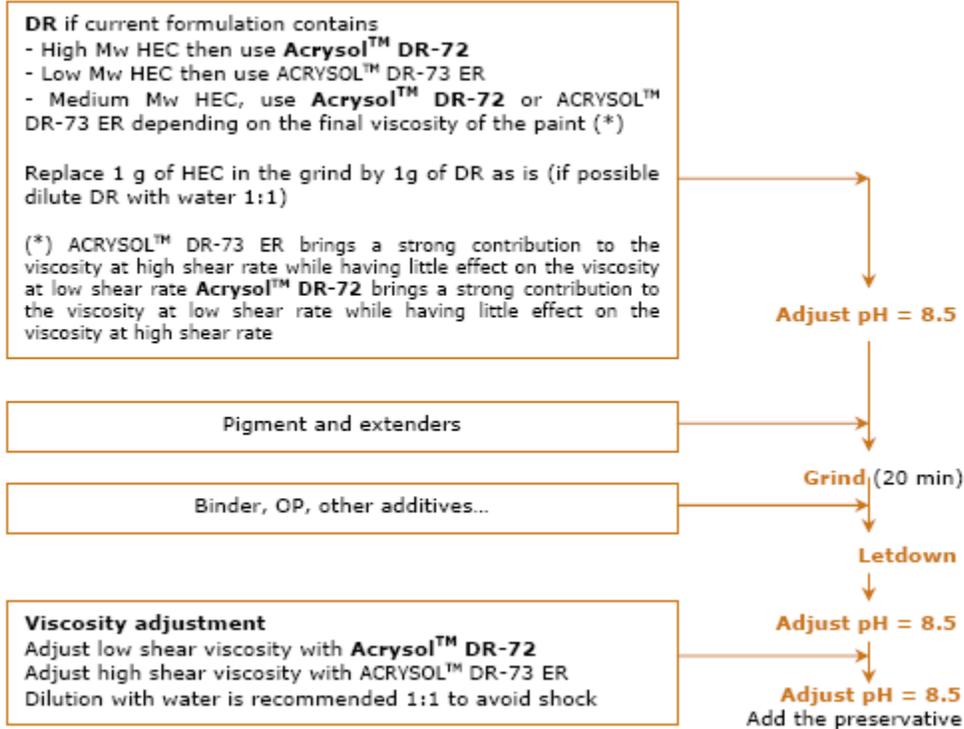
The liquid form of the ACRYSOL DR thickeners gives the paint manufacturer a broader series of formulating options than cellulosic thickeners. Generally speaking, if a manufacturer charges an HEC-type thickener to a paint in its powder form, he or she must add it to the grind or to the letdown at a relatively early stage to ensure that it is fully incorporated. Post-adding a cellulosic thickener in powder form to adjust final viscosity is virtually impossible; there is no way to make sure that it is mixed thoroughly.

The formulator has wider formulating latitude with a cellulosic thickener if he or she makes an aqueous solution of it before-hand, but that adds another step to the manufacturing process. In contrast, ACRYSOL DR thickeners are supplied as liquids and can be added during the grind or letdown, or after the entire production process.

ACRYSOL DR Use

Liquid Phase

- Water (need to remove a certain amount compared to HEC paint)
- Hard base (NH₄OH, AMP, NaOH or KOH to have pH=9)
- Polyacid dispersant OROTAN™ N-4045 (0.5–1% active on dry powders)
- Other additives...



Neutralization

When replacing a typical medium MW grade of HEC, an ACRY SOL DR dry kg usage level of about 60%-80% of the HEC usage level is a reasonable starting point. Since ACRY SOL DR associative thickeners are alkali-soluble, they cannot be added to a paint without first adding sufficient base. A minimum of approximately 0.1 kg of 28% aqueous ammonia or 0.15 kg of AMP-90 or 0.3 kg of NaOH at 20% is required to completely neutralize all of the acid groups in a wet kg of product supplied at 30% solids. Additional base may be required to achieve the required final pH.

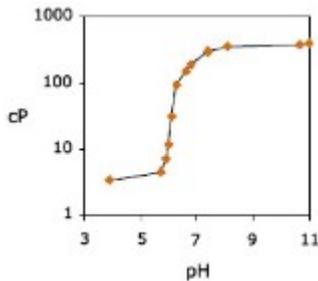


Figure 1: Viscosity Development of ACRY SOL DR-72 v. pH

Figure 1 shows the viscosity development of ACRY SOL DR-72 as it is neutralized with base. Thickening begins at about pH 6 and solubilization is essentially complete at pH 7. In order to provide a margin for error, especially in vinyl acrylic based paints, where hydrolysis may result in pH drift (decrease) on aging, the final pH of the paint should be adjusted to a range of 8.0 to 10.0. This pH range is also optimal in most cases for viscosity stability on aging.

Stability

A downward pH drift in PVA or vinyl acrylic based paints may cause stability problems if the pH goes below 7.5. ACRY SOL DR associative thickeners will thicken water at a pH as low as 7; at a lower pH, it loses its thickening efficiency. Data on paints, however, suggest that gelation, not viscosity loss, will result if pH drifts too low. Gelation in paints at low pH is probably a result of competition for available base between the thickener and the other paint components. A pH less than 7 should be avoided. A pH between 7.0 and 7.5 may also not be stable depending upon other formulation variables. Manufacturers should test their paints by heat aging for a minimum of 10 days at 60°C and checking pH and viscosity stability. Alkaline extenders such as calcium carbonate and Wollastonite are commonly used in the industry to buffer PVA based paints.

Order of Addition

ACRY SOL DR associative thickeners can be incorporated at different stages of formulation. The thickeners can be added (1) in the letdown to control final viscosity or (2) a portion of thickener can be added into the mill-base to control mill-base viscosity and aid incorporation.

(1) Adding the thickener as one of the final ingredients in the letdown is convenient in the laboratory to determine the approximate amount of thickener that will be needed to achieve the desired viscosity or in the plant to make final viscosity adjustments. Addition at this stage requires good mixing in the vessel. Less than ideal mixing can be compensated for by adding the thickener more slowly or pre-diluting the thickener with 50% water prior to addition. In any case, the addition of the appropriate amount of base (0.005 kg equivalents per kg of thickener solids) prior to addition is essential to avoid possible shocking of the paint.

(2) To ensure optimum pigment dispersion, a portion of the thickener (typically a quarter to a third of the total) can be added to the mill-base in order to control the viscosity of the pigment slurry. This is a common practice with cellulosic thickeners. The cellulosic thickener can be replaced in the mill-base provided that some basic rules are followed:

- Use the right dispersant: Polyacid type dispersants (OROTAN N-4045, OROTAN 850 ER) are the most compatible dispersant types with ACRY SOL DR thickeners. Hydrophobic copolymer type dispersants such as OROTAN 731 A ER may cause colorant compatibility problems, viscosity instability and syneresis.
- Enough dispersing agent should be added to fully stabilize the pigment dispersion: Paint formulations containing cellulosic thickeners are often understabilized for associative thickeners. ACRY SOL DR thickeners which have similar chemical composition to dispersants tend to compete with the dispersant to become adsorbed on the pigment surface. This adsorption could lead to particle bridging and flocculation. If adequate levels of dispersant are used, however, the pigment surface will be saturated with dispersant and thereby minimize thickener competition. As a starting point, a dispersant level of 1% on pigment solids should be used. This level can be subsequently reduced based on laboratory testing.
- **The mill-base pH must be kept on the alkaline side.** Because high temperatures are commonly attained in a high-speed disperser, less volatile bases such as AMP-90 are preferred over ammonia. Excessive loss of base due to evaporation during grinding could result in a pH drop that could destabilize the thickener or dispersant leading to a poor dispersion.

During Letdown Process:

The suggested order of addition with adequate agitation:

1. Combine mill-base with letdown ingredients (latex, coalescents, solvents, defoamers, water, etc.)
Heat is generated during the agitation of pigment grinds. Temperatures may exceed 60°C. When added to pigment grinds at this high temperature, some latices can be partially coagulated which may result in abnormally high grind viscosity.
2. Adjustment pH to 8.5
3. Add ACRY SOL DR thickeners full strength (if possible dilute with water 1:1)
4. Adjustment pH to 8.5
5. Add in-can preservative

During Pigment Grind Process:

When high mill-base viscosity is preferred:

Method #1:

1. Place initial charge of water in tank
2. Add mill-base ingredients including OROTAN dispersant, surfactant, etc.
3. Add sufficient amount of neutralizing base (e.g., NH_4OH , 2-amino-2-methyl-1-propanol, KOH, NaOH) to raise mill-base pH to 8.5–9
4. Add pigments and extenders
5. Grind for 10-15 minutes
6. Add ACRY SOL DR thickeners full strength or diluted 50:50 with water
7. Grind additional 5-10 minutes
Occasionally a mill-base grind will partially adsorb the thickener or latex and form agglomerates. The cause could be the addition of thickener or latex too soon after addition of extenders with high water demand or insufficient surfactant.

Method #2:

1. Place initial charge of water in tank
2. Add mill-base ingredients including OROTAN dispersant, surfactant, etc., under adequate agitation
3. Add sufficient amount of neutralizing base (e.g., NH_4OH , 2-amino-2-methyl-1-propanol, KOH, NaOH) to raise mill-base pH to 8.5–9
4. Add ACRY SOL DR thickeners full strength
5. Add pigments and extenders
6. Grind for 15-25 minutes

Caution

When using ammonium hydroxide for base neutralization, the following safety and health recommendations should be observed:

- Wear safety glasses as the minimum eye protection
- Wear elastomeric gloves, such as neoprene or nitrile, as splash protection
- Local exhaust ventilation should be used to control ammonia inhalation potential

For more information, please consult the MSDS for ammonia.

Semi-Gloss Paints

Although ACRY SOL DR associative thickeners were developed for use in interior flat paints, they can also be used in higher sheen paints. ACRY SOL DR thickeners will provide good gloss, similar to ACRY SOL RM-55, in higher sheen paints. However, its rheology will be closer to that of HEC, and will not provide the outstanding film build and levelling of ACRY SOL RM-55. By using higher than normal levels of ACRY SOL HASE Designed Rheology associative thickeners and suppressing the KU viscosity with a surfactant or solvent such as butyl carbitol better film build and levelling can be obtained.

This approach, however, may significantly decrease gloss (due to excessive solvent levels) and wet adhesion (due to excessive levels of thickener) and the cost may be higher than that of an ACRY SOL RM-55 thickened formulation which does not require the higher solvent or surfactant levels. The paint manufacturer may find, however, that levels of performance intermediate between these extremes are attractive in some formulations.

ACRYSOL DR Thickeners: Formulating Guidelines

Task	Resolution
<ul style="list-style-type: none">● Low Stormer (KU) viscosity	<ul style="list-style-type: none">● Add ACRY SOL DR-72 or use blends which have higher blended levels of ACRY SOL DR-72
<ul style="list-style-type: none">● Low high shear (Cone & Plate) viscosity	<ul style="list-style-type: none">● Add ACRY SOL DR-73 ER or use blends which have higher blended levels of ACRY SOL DR-73 ER
<ul style="list-style-type: none">● Grit or seeding when products are added to the paint	<ul style="list-style-type: none">● Use polyacid dispersants such as OROTAN N-4045 or OROTAN 850 ER● Add base to provide pH > 8.5 prior to addition● Add thickener slowly, pre-dilute product at 50% with water● Increase mixing in letdown tank, have good vortex for final addition● Change addition point (add portion to grind)
<ul style="list-style-type: none">● Stability	<ul style="list-style-type: none">● Use correct dispersant choice and level● Check pH which is critical and binder dependent● Wetting agent can be necessary in the grind● Understabilized binders: post add surfactants (HLB > 16)
<ul style="list-style-type: none">● Scrub resistance improvement	<ul style="list-style-type: none">● Increase dispersant level● Slight binder increase● Introduce OP● Increase slightly coalescent level for coalesced paint

Safe Handling Information

The Dow Chemical Company Material Safety Data Sheets (MSDS) contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products. Under the OSHA Hazard Communication Standard, workers must have access to and understand MSDS on all hazardous substances to which they are exposed. Thus, it is important that you provide appropriate training and information to your employees and make sure they have available to them MSDS on any hazardous products in their workplace.

The Dow Chemical Company sends MSDS on non-OSHA-hazardous as well as OSHA-hazardous products to its customers upon initial shipment, including samples. If you do not have access to one of these MSDS, please contact your local Dow representative for a copy.

Updated MSDS are sent upon revision to all customers of record. In addition, MSDS are sent annually to all customers receiving products deemed hazardous under the Superfund Amendments and Reauthorization Act.

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