Technical Data Sheet

ACRYSOL™ TT-935 ER Rheology Modifier

For water based coatings

Regional Product Availability

EMEA

Description

ACRYSOL™ TT-935 ER Rheology Modifier is a hydrophobically modified anionic thickener, designed to give medium shear rate viscosity in interior/exterior latex paints.

ACRYSOL™ TT-935 ER Rheology Modifier offers paints with enhanced resistance to roller spattering and very good film build and levelling.

Delivered as a low viscosity liquid, ACRYSOL™ TT-935 ER Rheology Modifier is very easy to handle and incorporate into the paint. It is resistant to microbiological degradation, thereby avoiding viscosity loss in the paint, a common problem encountered by paint manufacturers.

Characteristics of the Product

- High efficiency mid shear builder
- Better spatter resistance than cellulosics – improved application
- Resistant to microbial and enzyme attack
- Easy to incorporate into formulations
- Excellent film build – enabling better hiding
- Better levelling potential than most cellulosics

Typical Physical Properties

These are typical properties, not to be construed as specifications.	
Appearance	Off white, milky liquid
Solids content %	~30
Brookfield Viscosity (spindle 1 at 60 rpm)	~25cP
Specific gravity (wet polymer)	1.06
Solvent	Water
Chemistry	HASE*
pH	~3

* Hydrophobically modified Alkali Swellable Emulsion

Formulation Guidelines

Incorporation

ACRYSOL™ TT-935 ER Rheology Modifier offers the latex paint manufacturer easy handling and flexibility in both the order of addition and the method of incorporation compared to cellulosics and hydrophobically modified cellulosic thickeners. It can be added to the mill-base, to the letdown, or as a post addition without affecting performance properties, as long as the medium is sufficiently alkaline during the incorporation and sufficient mixing is available. Supplied as a low viscosity emulsion, ACRYSOL™ TT-935 ER Rheology Modifier is easy to pump or pour and therefore very suitable for bulk handling and/or automatic metering equipment.

Order of Addition

As stated above, ACRYSOL™ TT-935 ER Rheology Modifier can be incorporated at different stages of formulation, provided that enough base is available to neutralize the thickener and additional base is used to adjust pH. These stages are (1) as the final letdown ingredient, (2) after dispersion but prior to letdown or (3) prior to pigment dispersion. In all cases it is recommended to add ACRYSOL™ TT-935 ER Rheology Modifier diluted 1:1 with water.

Adding ACRYSOL™ TT-935 ER Rheology Modifier 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 of ACRYSOL™ TT-935 ER Rheology Modifier in this manner assumes reasonably good agitation in the vessel. Less than ideal mixing can be compensated for, in many cases, by adding the thickener emulsion more slowly. In any case, the addition of the appropriate amount of base prior to the ACRYSOL™ TT-935 ER Rheology Modifier is essential in order to avoid reduction in pH and subsequent pigment flocculation. ACRYSOL ™TT-935 ER Rheology Modifier can also be added during the let down stage in a pre-neutralized form:

Solution Preparation

	Weight (%)
Water	88.9
Ammonia 28%	1.1
ACRYSOL TT-935 ER Rheology Modifier	10.0
Total	**100.0**

This solution should be adjusted to a pH between 8.0 and 8.5.

Levels of Addition

Being partially an Associative Thickener, ACRYSOL™ TT-935 ER Rheology Modifier does not show its full thickening power until a critical associating concentration, somewhat like the critical micelle concentration of surfactants, is present, as shown in Figure 1. Even though ACRYSOL™ TT-935 ER Rheology Modifier (on a dry basis) is more efficient than medium and high viscosity hydroxyethyl cellulose (HEC), at the levels actually used in paint, it does not begin to thicken appreciably until a critical amount to begin associating has been added.

Figure 1: Paint Viscosity Response To Thickener Addition

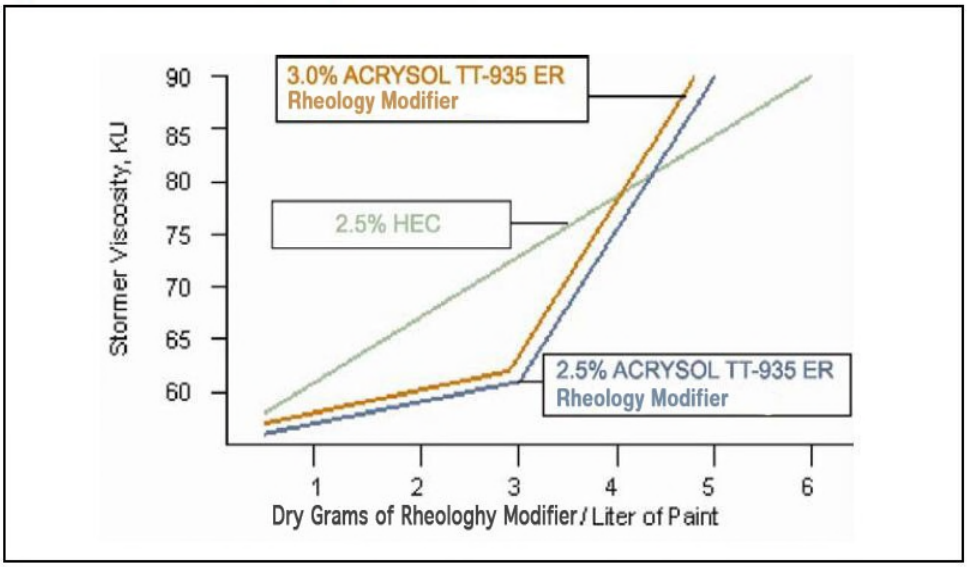


Table 1 contains the results of the comparative evaluations of two formulations, a vinyl acrylic copolymer based formulation and a high quality interior pure acrylic sheen formulation, utilizing ACRYSOL™ TT-935 ER Rheology Modifier, ACRYSOL™ TT-615 and a medium-high viscosity grade of HEC like CELLOSIZE™ QP-15000H. Note that the levels of ACRYSOL™ TT-935 ER Rheology Modifier required will vary, depending on the grade of latex used in the formulation.

Table 1: Relative Properties Of Interior Wall Paints

	ACRYSOL™ TT-935 ER Rheology Modifier	Med-High MW HEC	ACRYSOL™ TT-615 Rheology Modifier
Vinyl / Acrylic Formulation			
Efficiency			
Dry grams / ltr (to attain 90 KU)	3.9	6.0	3.0
ICI, P, Initial	0.7	0.6	0.4
KU / dry grams of thickener	23.1	15.0	30.0
ICI / dry grams of thickener	0.18	0.10	0.13
Application and Appearance			
Film build, NSR*, g/m^2	122.7	110.9	107.6
Flow (brushed)**	6	6	5
Roller spatter resistance	9	3	7
Colour acceptance (phthalo blue)	Equivalent	Equivalent	Equivalent
Resistance Properties			
Scrub resist. (mg loss/100 cycles)	14.3	12.2	14.7
Stain Removal	Equivalent	Equivalent	Equivalent
High Quality Pure Acrylic Interior			
Efficiency			
Dry grams / ltr. (to attain 85 KU)	4.68	6.48	—
ICI, P, Initial	1.3	1.0	—
KU / dry gram of thickener	18.2	13.1	—
ICI / dry gram of thickener	0.28	0.15	—
Application and Appearance			
Film build, NSR*, g/m^2	137.8	120.6	—
Flow (brushed)**	7+	6	—
Roller spatter resistance	9	3	—
Colour acceptance (phthalo blue)	Equivalent	Equivalent	—

* NSR = Natural Spreading Rate

**Rating: 1–10 with 10 being best.

Rheology Profile
ACRYSOL™ TT-935 ER Rheology Modifier develops a pseudoplastic rheology profile, but one that is less shear thinning than HEC or ACRYSOL™ TT-615 Rheology Modifier. When flat wall paints were thickened with ACRYSOL™ TT-935 ER Rheology Modifier or a medium high viscosity grade of HEC to the same Stormer consistency, the ACRYSOL™ TT-935 ER Rheology Modifier thickened paint provided the highest viscosity at high shear rates giving greater film build when applied by brush or roller.

ACRYSOL™ TT-935 ER Rheology Modifier also maintained the lowest viscosity at low shear rates, resulting in superior levelling. The magnitude of the film build, flow and levelling improvements demonstrated with ACRYSOL™ TT-935 ER Rheology Modifier will vary depending on formulation variables; some improvements in film build, however, will be shown consistently.

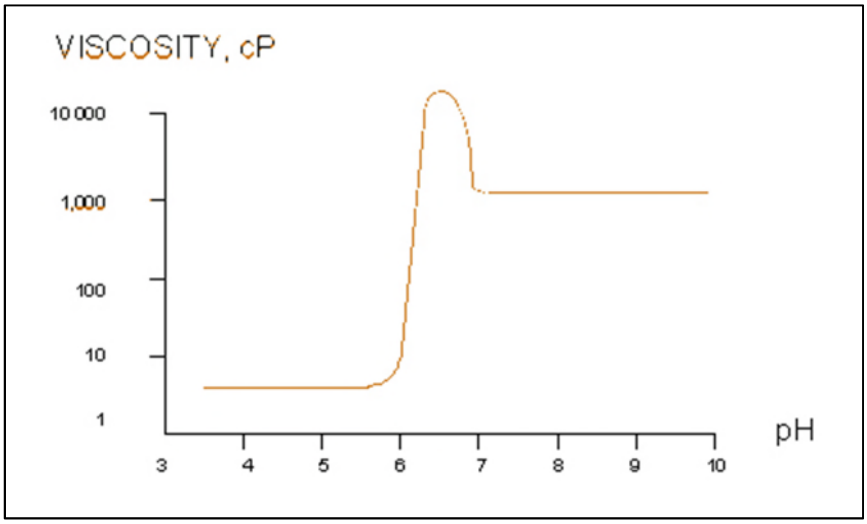
Dispersing Agents
Polyacid dispersing agents such as OROTAN™ 850 ER LO Pigment Dispersant and OROTAN™ N-4045 Pigment Dispersant have proven to work well with ACRYSOL™ TT-935 ER Rheology Modifier and OROTAN™ 1124 Pigment Dispersant can be suggested as well. All formulations should be heat aged in order to check stability. Care has to be taken that sufficient amount of dispersing agents is used, otherwise there is a risk of the thickener playing the role of the dispersing agent, resulting in high gel structure (livering effect).

Surfactants, Wetting Agents and Co-solvents
Surfactants, wetting agents and co-solvents will interact with the level of association of the thickener with the latex polymer and therefore could affect the viscosity development in the paint, depending on formulation.

Paint pH Control
A downward pH drift in PVA or vinyl acrylic paints thickened with ACRYSOL™ TT-935 ER Rheology Modifier may cause stability problems if the pH goes below 7.5. ACRYSOL™ TT-935 ER Rheology Modifier will thicken water at pH as low as 7.0; at lower pH it loses its thickening power. 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 ACRYSOL™ TT-935 ER Rheology Modifier and the other components.

The presence of ACRYSOL™ TT-935 ER Rheology Modifier in a partially swollen but not completely solubilized state may also be a factor. A pH less than 7.0 should be avoided. A pH between 7.0 and 7.5 may or may not be safe, depending upon other formulation variables. Alkaline extenders such as calcium carbonate are commonly used in the industry to buffer PVA-based paints and should be considered when using ACRYSOL™ TT-935 ER Rheology Modifier.

Figure 2: Viscosity Developments of ACRYSOL™ TT-935 ER Rheology Modifier Solutions



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 or national 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 or national regulations. Contact your Dow Coating Materials Technical Representative for more information.

Chemical Registration

Many countries within EMEAI 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.

Note on EMEAI Product Line

Product availability and grades vary throughout the countries in the EMEAI area. Please contact your local Dow Coating Materials representative for further information and samples.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

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