SELECTION OF RHEOLOGICAL ADDITIVE MODIFIERS FOR BETTER PERFORMANCE OF COATINGS

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ABSTRACT

For coating materials it is crucial to execute rheological adjustment according to the coating method. Thickners also commonly known as rheology modifiers or rheology control additions control the rheological properties of the coating material to prevent sagging during application, adjust thickness, improve levelling and prevent sedimentation of the filler, among other functions.

Keywords: Rheology, Emulsion, Coatings

INTRODUCTION:

Rheology modifiers are vital additives used in almost every coating to achieve desired rheological characteristics for the particular application [1-2]. Apart from getting desired viscosity, these additives also help in controlling shelf stability, ease of application open time wet edge and sagging. But choosing the right rheology modifier for your formulation can be complex keeping in view the existing VOC regulations [3-5]. It is important to know some basic information about rheological additives.

What are the major type of rheology modifiers available for water borne and solvent borne coatings along with their key benefits and limitations. In coatings rheology examines the behaviour of flow and deformation. Properties during manufacturing, storage applications as well as film formation It influences key characteristics such as vertical flow, levelling, gloss adhesion, filling thickness, covering power, spattering tendency, brush and are roll Resistance, sedimentation tendency and pigment stabilisation of formulation. During the coating production rheology is useful to obtain optimal flow behaviour. Rheology is so crucial in a formulation that

you should be in control and ease to play with it further the following properties are also to be understood. Average sheer rate is water borne or solvent based of course you may have extra criteria to meet all your requirements.

For example try to limit VOC [6-8]. Additives such as VOC free hydrophobically ethoxylated urethanes (HEUR) and hydrophobically modified polyether (HMPE) provide a high level of efficiency in the mild sheer range [8-10]. Rheology modifiers chemistries: which one is right for your system.

Rheology modifier chemistry

1.Organic based on natural raw materials

Cellulose

Xanthum gum

2.Inorganic based on natural raw materials

Clays

Silicas

Speciality (modified) clays

Further Rheological additive technologies can also be divided into thickeners suitable for water borne and solvent based system

Coating system - Waterborne system

Rheology modifier chemistry –

Cellulose

Non associative (ASE/HASE)

Associative (HEUR, HMPE speciality days)

Organic rheology modifier

For waterborne coatings

Most organic rheology modifiers are surface active furthermore they may be part of the polymeric film matrix during film formation. This explains, for instance, the excellent coating layer properties like improved appearance, gloss and flow. The variations regarding the chemical composition of these rheology modifiers are extraordinarily versatile for water borne coatings different types of organic rheology modifiers are distinguished based on your thickening functionality.

Rheology modifier that just thicken the aqueous phase and products that thicken by interaction with other paint ingredients-associative thickens represent this group.

Inorganic rheology modifier organo clays and organically modified laminar silicates are among the widely used inorganic rheology modifier and are being applied for many purposes in coating industry.

Main representative of laminar or phyllo silicates are hectorite and bentonite.

Other important silica based rheology modifier are the fumed silica ,colloidal silica precipitated silica etc.

Undoubtedly finding the right rheology modifiers and achieving the optimum balance of properties is quite complex.

Let move on with overview of these chemistries and properties.

For water borne paints some chemistries will be better suited depending on your end application, as summarised below.

Type of coating

1. Architectural – Cellulose , acrylic, associative thickeners
2. Industrial motive- acrylics , associative thickeners, clays
3. Protective- acrylics, associative thickeners, clays

Cellulose Rheology modifier (non associative)

They are the oldest class of rheology additives used in waterborne coatings..

Cellulose modifier are naturally sourced and are majorly available in a powder form.

Strength

Offer a wide range Application sure thinning for easy application compatible with a number of colorants

Open time control and sag control

Biodegradibility, lack of toxicity

Limitations

Can cause problems with flow and levelling

Roller spattering

Negative effects on water and scrub resistance.

Cellulose modifier can be altered chemically too

Chemical modification is necessary in order to provide the cellulose water solubility and to control the thickening properties. Modification is usually achieved through esterification. The kind of modification largely affects the relative thickening properties and product features.

EXPERIMENTAL PROCEDURE:

Materials and method:

Emulsification type thickener or alkali thickening type is most versatile which may be produced as follows:

Table 1

Sr. No.	Materials	Amounts (gms)
1	DM Water	160.917
2	Sodium lauryl sulphate	1.761
3	DM Water	167.745
4	Sodium lauryl sulphate	5.563
5	Ethyl acrylate monomer	103.702
6	Di allyl phthalate	0.608
7	Glacial acrylic acid	51.858
8	Pottasium persulphate	0.229
9	DM Water	27.139
10	Preservative	0.973

A base SS cattle which is having circulation system of hot to cold water and for temperature control a thermostat has been applied.

Above this we have two feeding tank no 2 and no 3

1 no is for base SS cattle.

Premixed mixture of 1 and 2 added in base cattle no 1.

Then 3 ,4,5,6,7 are pre mixed and poured on above vessel no 2 which is having continuous stirring no 8 and no 9 is pre mixed and poured into vessel no 3.

Now we raise the temperature upto 85 degree by our heating system.

Then feeding from vessel no 2 is started very slowly addition from 2 and 3 is started simulataneously.

It should take min 2 hrs to complete the feeding process.

Now we will hold it in base cattle for 1 hr at the same temperature.

Then cooling will be started to achieve 40 degree Celsius temperature.

Now preservative added .

pH of final product will be 4-4.5 and active matter approx 25+/-1. Then we will do it's application test as thickener.

CONCLUSION:

Inorganic and organic thickeners are suitable for use in a variety of solvent borne, high build, and solvent less paint systems. They reduce much of the complexity associated with the incorporation of other organic thickeners by activation at lower processing temperature, less sensitivity to solvent chemistry, and less sensitivity to uncontrollable process variations. Due to their excellent sag resistance and structure stability storage, they are well suited for the protective coatings market where thicker coatings are dominant.

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