



# Flexisperse™ CT-100

Acid swellable associative thickener

## Overview

- Easy to mix water-soluble, acid swellable thickener/rheology modifier
- Flexible for use with cationic and nonionic surfactants
- Create clear viscous solutions and gels
- Shear-thinning rheology for precise application
- Activates with a broad range of acids for optimum end-product performance
- Associates to build viscosity with hydrophobic components, particles and surfaces
- Delivers differentiated product end-product performance with highly viscous solutions and gels for enhanced surface cling
- VOC-free, APEO-free, non-flammable and non-corrosive
- Manufactured under strictly controlled and optimized conditions for consistent performance

## Applications

- Peroxide and acid pH cleaning formulations
- Commercial and Retail carpet and upholstery cleaners
- Extraction, Pre-spray, Traffic Lane, Spotter, Low Moisture, and Bonnet Buff formulations
- Automotive carpet and upholstery cleaners

## Technical Information

Associative thickeners are broadly defined as water soluble polymers that contain hydrophobic groups pendant to a hydrophilic backbone. The hydrophobic groups associate with surfactant micelles or oleophilic particles creating a weak gel network as the mechanism for viscosity formation.

Flexisperse CT-100 is effective as a self-associating primary thickening agent in a wide range of mildly to strongly acidic formulations, and in formulations where viscosity may be enhanced associatively with hydrophobic components such as surfactants, or particles or surfaces such as in Oil Field applications.

Flexisperse CT-100 also finds application as a shear-thinning rheology modifier to extend the performance of complimentary thickening agents in an optimized formulation, and in formulations sensitive to alkaline hydrolysis.

## Typical Properties

PROPERTY	VALUE
Appearance	White-cream colored emulsion
Ionic character	Cationic
Composition	22% solids
pH	7-9
Residual monomer	<1000 ppm
Emulsion viscosity*	<2000 cps; LVT #2 @12 rpm
Solution appearance	Clear, water white
Density	1.02
Flash point	Does not ignite
Storage	Freeze/thaw stable
Shelf life	12 months

\* Emulsion viscosity increase over time is normal. This does not impact the thickening efficiency of Flexisperse CT-100. CT-100 may be used as long as it is flowable.

## Packaging and Handling

Flexisperse CT-100 is available in:  
275 gallon totes (Net Wt. 2250 lbs)  
55 gallon plastic drums (Net Wt. 450 lbs)  
5 gallon plastic pails (Net Wt. 40 lbs)

Refer to the Safety Data Sheet (SDS) for information on the safe use, handling, and disposal of this product.

All components in Flexisperse CT-100 are TSCA listed.

DOT Classification: Non-Regulated

Whether you're looking for a replacement product or an ingredient for a specific attribute, give us a call. We can provide assistance based upon your particular formulation requirements and composition; please feel free to contact us.

**Please refer to back page for important information**

## Mechanism of Associative Thickening

At alkaline pH as supplied, Flexisperse CT-100 is illustrated as being tightly bound, low viscosity polymer particles (Figure 1). The amino functional groups on the polymer backbone become activated, allowing the tightly bound particles to swell and become water soluble, with increasing acid concentration.

As water solubility increases with increasing acid concentration, the polymer particle dispersion disaggregates into polymer strands that interact and build viscosity in an expanding polymer network.

Hydrophobic interactions between the polymer strands, hydrophobic particles and surfaces, and hydrophobic surfactant micelles, stabilize the viscosified polymer network.

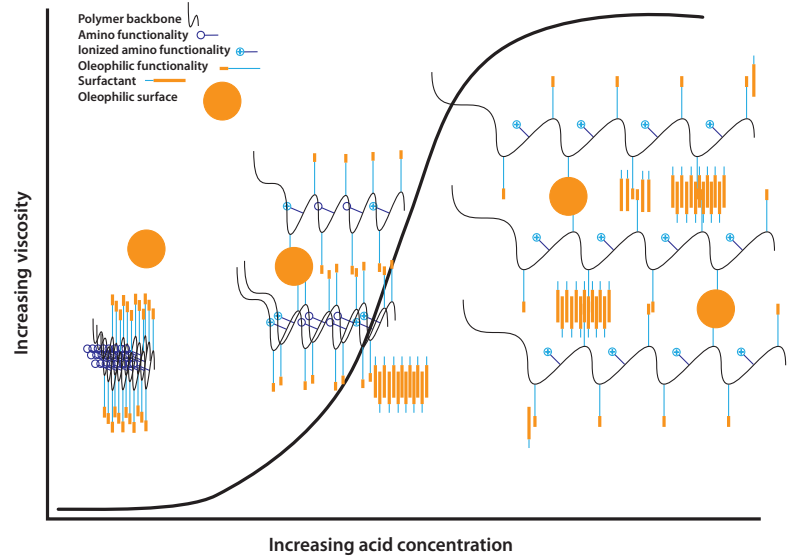


FIGURE 1 | pH dependant viscosity formation. Polymer aggregates swell and build a high viscosity polymer network with increasing acid concentration.

## Formulation Considerations

Flexisperse CT-100 acid neutralized solutions are characterized as clear, water-white pseudoplastic shear-thinning gels or highly viscous solutions, making mildly to strongly acidic gels that can be easily applied to a surface, yet remain viscous and clinging on standing.

As discussed in the previous section and illustrated in Figure 1, surfactant micelles can function as a viscosity stabilizer or an additional hydrophobic viscosifying component, such as in fabric softener formulations or coatings. However, at increased surfactant or solvent concentration, viscosity may be reduced, as illustrated in Figure 2. Surfactants and solvents, depending on composition and concentration, may compete for hydrophobic adsorption sites, reducing the stabilizing associations between within the polymer network that build viscosity.

Lactic acid is especially effective at producing highly viscous Flexisperse CT-100 solutions and gels, as are other monocarboxylic acids such as glycolic and acetic, dicarboxylic acids such as oxalic and succinic and to a lesser degree citric acid. Sulfamic acid is generally not recommended. Also effective are acid replacement products such as Flexisorb AN-668.

As with all ionic polymers, CT-100 is sensitive to high electrolyte concentrations of mineral acids and brine.

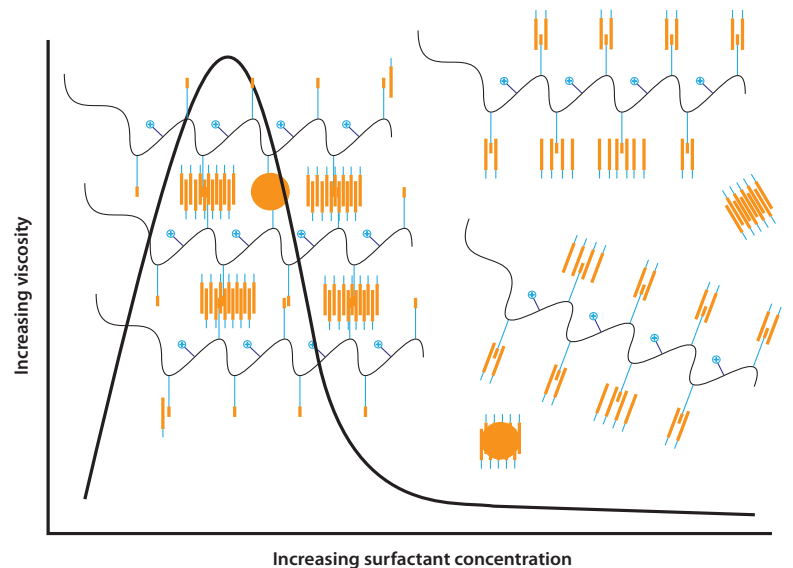


FIGURE 2 | Surfactant effect on viscosity. Surfactants may increase or decrease, depending on type and concentration, the associative interactions between polymer strands, and other hydrophobic components, increasing or decreasing viscosity.

## Range of formulating options

The following example formulations illustrate the range of applications possible with Flexisperse CT-100.

Slowly add Flexisperse CT-100 to the product solution with sufficient agitation as the last ingredient prior to neutralization. Viscosity builds rapidly below pH 6. For uniform activation and viscosity development, neutralization with dilute acid solutions is recommended with thorough agitation.

Thickened Fabric Softener	
Ingredient	Wt. %
Water, DI or soft	94.6
Di (Hydrogenated tallowalkyl) dimethyl ammonium chloride	3.75
Flexisperse CT-100	0.65
Lactic acid, 9% to pH 5	1.00
<b>Viscosity @25°C, cps</b>	
RVF, #3, 50 rpm	670
RVF, #3, 20 rpm	990
pH:	5.0
Appearance:	Off-white, viscous gel
<i>Use dilution:</i>	<i>1:10</i>

Clinging Wheel Cleaner	
Ingredient	Wt. %
Water, DI or soft	42.50
Flexisurf X-5	8.00
Glycol ether EB	4.00
Flexipel SR-80	0.50
Flexisperse CT-100	5.00
Glycolic acid, 20% to pH 2-3	40.0
<b>Viscosity @25°C, cps</b>	
RVF, #3, 50 rpm	60
RVF, #3, 20 rpm	60
pH:	2.4
Appearance:	Clear, colorless to pale yellow, slightly viscous liquid
<i>Use dilution:</i>	<i>Ready-to-Use</i>

Leather Conditioning Emulsion	
Ingredient	Wt. %
Water, DI or soft	46.97
Flexicon LC-65	50.0
Flexisperse CT-100	1.73
Lactic acid, 9% to pH 7	1.30
<b>Viscosity @25°C, cps</b>	
RVF, #3, 50 rpm	140
RVF, #3, 20 rpm	220
pH:	7.0
Appearance:	Off-white, slightly viscous emulsion
<i>Use dilution:</i>	<i>1:10</i>

Leather Conditioning Gel	
Ingredient	Wt. %
Water, DI or soft	45.60
Flexicon LC-65	50.0
Flexisperse CT-100	2.20
Lactic acid, 9% to pH 6	2.20
<b>Viscosity @25°C, cps</b>	
RVF, #3, 5 rpm	15,600
pH:	6.0
Appearance:	Off-white, viscous gel
<i>Use dilution:</i>	<i>1:10</i>

## Viscosity data summary

### General Screening Procedure For Evaluating Flexisperse CT-100:

- Dilute Flexisperse CT-100 by a factor of 5-10 with water.
- Pre-dissolve any solid ingredients in most of the remaining water.
- Combine (1) and (2), adding the lesser volume to the greater volume.
- Add any neutral solvents
- Add acid if not already done as solid in step (2)
- Add any remaining ingredients and allow 15-30 minutes of mixing to reach full viscosity. When using mineral acids and multi-protic carboxylic acids such as oxalic acid, Flexisperse CT-100 may produce a hazy, low viscosity dispersion if surfactants are not present. This is caused by electrolyte content or crosslinking of the polymer by the carboxylic acids. At this point carefully titrating the polymer with certain alkyl ethoxylate surfactants such as Tomadol 1-5 can frequently bring about solubility, improved clarity, immediate thickening, and with the right surfactant a very strong gel response. Higher HLB surfactants like Tomadol 91-6 will alter the rheology from pseudoplastic towards Newtonian, so may be added in small amounts to reduce the gel strength if necessary. The amount of these surfactants necessary for optimum viscosity development is about 5-10% of the Flexisperse CT-100 in the formulation. Beyond this amount the associative gel network is disrupted and higher amounts of thickener are needed.
- If additional thickener is required, Flexisperse CT-100 should be diluted with at least 5 parts water to prevent gelling when the dispersion contacts the acidified mixture. Allow about 30 minutes for thickening to occur if Flexisperse CT-100 is added in this manner.

Ingredient	AN-557	AN-557	AN-668	AN-668	HCl	HCl	H <sub>3</sub> PO <sub>4</sub>	Oxalic	Glycolic	Glycolic	Lactic
Water	89.1	88.3	89.21	75.67	89.25	74.05	83.9	88.18	87.35	64.6	89.69
Flexisperse CT-100	2.5	3.25	3.05	4.0	3.49	3.5	2.5	3.16	1.13	2.75	1.13
Flexisorb AN-557	8	8									
Flexisorb AN-668			7.51	20							
Hydrochloric Acid, 36%					6.94	22.2					
Phosphoric Acid, 75%							13.4				
Oxalic Acid Dihydrate								8.44			
Glycolic Acid, 70%									11.43	28.6	
Lactic Acid, 88%											9.1
Tomadol 91-6	0.07	0.12			0.07		0.2	0.05			
Tomadol 1-5	0.33	0.33	0.23	0.33	0.25	0.25		0.17	0.09	0.25	0.08
CETAC, 30%										3.8	
Viscosity, (RVF, #3, 50 rpm)	61	226	460	1182	340	194	290	534	288	600	412
Viscosity, (RVF, #3, 20 rpm)	62	238	980	1535	360	225	328	575	450	500	680

Ingredient	Tomadols, pH 6.5	Tomadols, pH 5.2	Tomadols, pH 3.8	3% active H <sub>2</sub> O <sub>2</sub> w/Tomadols, pH 3.8
Water	97.14	97.03	96.35	86.72
Flexisperse CT-100	2.0	2.0	2.5	2.25
Lactic Acid, 88%	0.11	0.22	0.4	0.36
Tomadol 91-6	0.5	0.5	0.5	0.45
Tomadol 1-5	0.25	0.25	0.25	0.22
Hydrogen peroxide, 30%				10.0
Viscosity, (RVF, #3, 50 rpm)	58	88	132	102
Viscosity, (RVF, #3, 20 rpm)	62	88	135	105

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