

Personal Care

Aqueous Systems Solutions for Personal Care

We provide our customers with differentiated solutions for their formulation needs through our leadership position in water-soluble polymers and our extensive industry knowledge.

Aqualon Products for Personal Care

As a personal care or home product manufacturer, you are faced with ever-changing global market conditions that push you to produce higher quality while demanding that you reduce overall cost to maintain profitability. You also need to meet the requirements and specifications of a host of industry associations and governmental regulatory agencies and as a producer of consumer products, safety is first and foremost.

Aqualon serves your industry with reach that extends throughout aqueous systems, providing a comprehensive array of functional properties including thickening and rheology control, conditioning, deposition, emulsification, film formation, and water binding and syneresis control. These properties enable Aqualon products to perform in a wide variety of products. In addition, we focus on targeted, market-oriented technology programs so we can offer you superior technical service.

Our technologies include solutions for hair care; skin care, oral care, cosmetics, wound care, and household and institutional products.

Hair Care

Aqualon polymers for hair care are derived from purified natural cellulose and guar sources. Functionally they provide hair conditioning, thickening, rheology control, suspension, emulsion stability, and film formation, enabling formulators to optimize the physical properties and performance of hair care products.

Aqualon polymers will provide a rich look and feel to hair care products. Aqualon polymers provide rich rheology even in reduced-surfactant systems. Aqualon's N-Hance® cationic guar provides improved wet and dry combability without build-up. Aqualon's Primaflo® water-soluble polymer suspension products are liquid forms of water-soluble polymers.



Skin Care

Aqualon polymers impart a rich, yet non-tacky feel, with shear thinning rheology for improved dispensing and lubricious feel on the skin. Proper polymer selection can also enable the design of clear systems as well as excellent tolerance to salt and pH extremes.

Oral Care

Today **Aqualon® sodium carboxymethylcellulose** (INCI: cellulose gum) is the most commonly used thickener in toothpastes. It is selected for rheology control, water binding, and prevention of syneresis. In addition to these essential properties, many other parameters can be tailored by selection of CMC grade, including the following:

- Stand-up
- Yield point
- Gloss
- Salt tolerance
- Stability in low-water content products
- Thixotropy
- Disaggregation



Natrosol® hydroxyethylcellulose

Natrosol 250 hydroxyethylcellulose (HEC), a nonionic, water-soluble polymer is a white, free-flowing granular powder. It is made by reacting ethylene oxide with alkali-cellulose under rigidly controlled conditions. Purified HEC for personal care and cosmetic applications is typically sold at 96.0% minimum purity (dry basis). Pharmaceutical (PHARM) grades are of higher purity.

Natrosol HEC is easily dissolved in cold or hot water to give crystal clear solutions of varying viscosities. Furthermore, low to medium MW types are fully soluble in glycerol and have good solubility in hydro-alcoholic systems containing up to 60% ethanol. Natrosol HEC is generally insoluble in anhydrous organic solvents.

Natrosol HEC is commonly used in a wide variety of applications in the personal care industry. Some typical applications follow:

- Hair conditioners
- Liquid soaps
- Shave gels and foams
- Toothpaste (high salt)
- Wipes (baby and adult)
- Color cosmetics
- Antiperspirants & deodorants
- Lubricant gels

Solutions of Natrosol HEC are pseudoplastic or shear-thinning. As a result, personal care products formulated with Natrosol HEC dispense rich and thick from the container, but spread easily on hair and skin. Natrosol can provide a thick rich feel to reduced-surfactant level cleansing products.

Aqualon® and Blanose® sodium carboxymethylcellulose

CMC is made by reacting sodium monochloroacetate with alkali-cellulose under rigidly controlled conditions. The resultant anionic polymer is purified and dried. Purified CMC for personal care and cosmetic applications is typically sold at 99.5% minimum purity and is available in both food and pharmaceutical grades.

CMC is commonly used in a wide variety of applications in the personal care and medical industries. Some of the more common applications are as follows:

- Toothpastes
- Hydrocolloid wound dressings
- Denture adhesives
- Ostomy products
- Liquid makeup and mascara
- Liquid suspensions
- Gels and ointments
- Hair dye powder

In addition to thickening aqueous systems, CMC is used in these products for water binding, syneresis control, and its ability to suspend pigments and active ingredients in solution.

Klucel® hydroxypropylcellulose

Klucel hydroxypropylcellulose (HPC), a nonionic polymer, is a white to off-white, free flowing, granular solid with a remarkable combination of properties. It is made by reacting alkali cellulose with propylene oxide. The resultant polymer is purified, dried and ground. Manufactured in Aqualon's GMP facility in Hopewell, Virginia, the high purity HPC (0.2% ash maximum) is offered in food (F), cosmetic (CS), and pharmaceutical (Pharm) grades.

Klucel HPC is unique in that it is soluble in the broadest range of solvent systems of all the cellulose ethers. It is readily soluble in cold water, alcohols, many polar organic solvents, PEG and PG. HPC is generally insoluble in water over 105°F (40°C)

Klucel is often used where advantage can be taken of its unique solubility in water, alcohol, or anhydrous systems. Klucel is an excellent film-forming polymer which yields flexible, clear, thermoplastic, non-tacky films. This combination of properties makes it useful in the applications listed below:

- Hair styling gels
- Antiperspirants and deodorants
- Sprayed fixatives
- Suncare gels
- Denture adhesive films
- Hand sanitizers
- Shave gels and foams
- Mousses

Klucel can be used to thicken aqueous and polar organic systems. Aqueous solutions of Klucel are water-white and are of high clarity. High molecular weight grades, known as high viscosity types (high viscosity grades), are effective thickeners and film formers, while lower molecular weight grades are often employed for their excellent film forming properties.

Natrosol® Plus and PolySurf® hydrophobically modified hydroxyethylcellulose

Hydrophobically modified hydroxyethylcellulose (HMHEC) is produced by the reaction of alkali-cellulose with both ethylene oxide and cetyl hydrophobes. The nonionic polymer is purified and dried. HMHEC for personal care and cosmetic applications is sold as **Natrosol Plus 330 CS** and **PolySurf 67 CS**. HMHEC polymers are unique in that they function as associative thickeners, meaning they not only thicken aqueous systems via chain entanglement, but also via hydrophobe interactions. In solution, hydrophobic groups seek out other hydrophobes, forming shear-labile physical crosslinks effectively creating a three-dimensional polymer network.

	Ionic Nature	Solubility						Compatibility		Strength, psi
		Room Temperature Water	Water >122°F (50°C)	Ethyl Alcohol	Polar Organic Solvents	PG/PEG	Glycerol	5% NaCl	15% NaCl	
		Te								
Natrosol® HEC	Nonionic	S	S	I	I	I	S	C	C	6,500
Aqualon® CMC	Anionic	S	S	I	I	I	I	C	C	15,000
Klucel® HPC	Nonionic	S	S	I	I	S	I	C	NC	5,000
Natrosol® Plus and PolySurf® HMHEC	Nonionic	S	S	PS*	I	PS	ND	C	C	3,000
BeneceI® MC and HPMC	Nonionic	S	I	I	I	I	I	C	NC	12,000
PrimaFlo® MP3295 FPS	Mildly Anionic	S	I	I	I	I	I	C	NC	ND
PrimaFlo® HP22 HPC	Nonionic	S	I	S	S	S	S	C	NC	ND
N-Hance® HP Series HP guar	Nonionic	S	S	I	I	I	I	ND	ND	ND
N-Hance® 3000 Series cationic guar	Cationic	S	S	I	I	I	I	NC	NC	ND
AquaCat® CG518 clear cationic solution	Cationic	S	S	ND	ND	ND	ND	ND	ND	ND

*Natrosol® Plus CS is partially soluble in propylene glycol and generally insoluble in polyethylene glycol.

S = Soluble I = Insoluble C = Compatible NC = Not compatible PS = Partially Soluble

The hydrophobic modification imparts many unique properties to HMHEC polymers including pseudoplastic shear thinning behavior, high salt tolerance and long term stability over a wide pH range. Furthermore, HMHEC also behaves as a polymeric co-emulsifier and can be used to stabilize O/W emulsions without the use of conventional high HLB, water-soluble surfactants, thus enabling the creation of a much milder finished product.

HMHEC is found in a variety of applications in personal care and cosmetics. Some of the more common applications are as follows:

- Liquid soaps and body washes
- Wipes (baby and adult)
- Shampoos and conditioners
- Hair styling products
- Liquid makeup and mascara
- Antiperspirants and deodorants

In addition to associative thickening of aqueous systems, HMHEC is chosen for its shear-thinning behavior providing an elegant and non-tacky feel to skin care products. The suspending properties are also chosen to provide yield and stability in heavy pigment suspensions.

BeneceI® methylcellulose and hydroxypropyl methylcellulose

BeneceI methylcellulose (MC) is made by reacting methyl chloride with alkali-cellulose under rigidly controlled conditions. The resultant nonionic polymer is purified, dried and ground to a fine white powder, which is readily soluble in cold water. It is also possible to graft a hydroxypropyl group onto the MC polymer backbone, creating BeneceI hydroxypropyl methylcellulose (HPMC). Also a nonionic, cold water-soluble polymer, HPMC is a good film-former and varies somewhat in physical and chemical properties from MC. BeneceI MC and HPMC are quite hydrophilic and are readily soluble in cold water. As the water temperature is raised, they pass through a thermal gelation phase, where solution viscosity rises rapidly, followed by flocculation and precipitation

of the polymer out of solution. This precipitation is thermally reversible and occurs at different temperatures, depending on type and degree of substitution (DS). BeneceI MC and HPMC are compatible with most personal care surfactant systems.

MC and HPMC is used in a variety of applications in personal care and cosmetics. Examples are as follows:

- Shampoo
- Hair styling products
- Liquid bubble bath concentrate
- Lotions and creams
- Liquid soap and body wash

In particular, BeneceI HPMC is chosen for its foam enhancing properties in surfactant systems. BeneceI HPMC also imparts a rich rheology to reduced surfactant level formulations. When used in a shampoo or body wash, the HPMC polymer helps with formation of bubble structure, leading to richer, longer lasting lather.

AquaCat® CG518 clear cationic solution

AquaCat CG518 clear cationic solution is an aqueous solution of cationic guar (guar hydroxypropyltrimonium chloride), developed specifically for use as a substantive polymeric conditioner for hair and skin care applications. It has been shown to be compatible, and to maintain unsurpassed finished product clarity with a wide variety of surfactant blends. Finished product clarity may be achieved even at relatively high use levels. AquaCat is supplied as a ready-to-use, 10% solids, clear, odor-free solution, requiring no heat or pH adjustment. AquaCat CG518 contains 0.5% Phenoxetol* and 0.18% of Nipasept* sodium. AquaCat solution, as preserved with Nipasept and Phenoxetol, has passed the CTFA M-3 (The Determination of Preservative Adequacy of Water-Miscible Cosmetic and Toiletry Formulations).

AquaCat CG518 clear cationic solution is recommended for use in a variety of hair and skin care applications. Its utility is best

*Phenoxetol and Nipasept are trademarks of Clariant UK Ltd.

Polymer Film Properties				
Mechanical Properties		Oxygen Transmission, cc/m ² /atm	24-Hour Water Vapor Transmission	
Elongation % Stick	Modulus, psi		g/m ² at 73°F (23°C) and 50% RH	g/m ² at 100°F (38°C) and 50% RH
25	185,000	25	300	9,000
7	1,000,000	10	300	9,000
45	95,000	700	150	3,500
45	30,000	25	175	7,500
15	30,000	1,600	400	4,500
ND	ND	ND	ND	ND
ND	ND	ND	ND	ND
ND	ND	ND	ND	ND
ND	ND	ND	ND	ND
ND	ND	ND	ND	ND

Partially Soluble ND = Not Determined

realized in clear, 2-in-1 shampoos, body washes, and liquid soap formulations. In 2-in-1 conditioning shampoo formulations, AquaCat® solution has been shown to provide excellent detangling benefits during wet combing, as well as enhancement of dry combing. In addition, AquaCat solution does not build-up on the hair with repeated usage. In skin care products, AquaCat provides great dry skin afterfeel; softer, smoother, moisturized skin feel. Recommended use levels are (0.2%-0.5% dry polymer basis, 2%-5% as received) in hair care applications. In skin care applications, such as body washes or liquid hand soaps, higher levels of AquaCat solution (up to 1.0% dry basis) may be appropriate and can be incorporated with a retention of finished product clarity. AquaCat solution enhances lather properties in cleansing systems.

PrimaFlo® HP22 polymer solution

PrimaFlo HP22 polymer solution is an aqueous solution of hydroxypropylcellulose (HPC) developed specifically for use as a film-former in personal care formulations. It is fully compatible with hydro-alcoholic systems.

PrimaFlo HP22 Polymer Solution is recommended for use in hair and skin care formulations requiring flexible film-forming and solution clarity. Typical applications include soft-hold hair fixative products such as gels, spritzes and mousses. PrimaFlo HP22 can be used alone, for soft hold and anti-frizz benefits or in combination with firm hold fixatives, where it acts as a plasticizer. In skin care, such as bath splashes, spritzes, and aftershave, the film properties of HPC supplement fragrance longevity. Typical use levels are 2-5% (as received).

PrimaFlo® MP3295A fluidized polymer suspension

PrimaFlo MP3295A fluidized polymer suspension (FPS) is a liquid thickener and foam stabilizer, based on hydroxypropyl methylcellulose (HPMC) suspended in an aqueous base. This liquid product has been developed specifically for use in personal care formulations and is fully compatible with virtually all surfactant systems. Due to the proprietary FPS system, hydration time in aqueous systems occurs in minutes with no heat, or pH adjustment

required to produce crystal clear, water-white solutions. This often serves to dramatically reduce batch processing time. Since PrimaFlo MP3295A is pre-swollen and supplied in fluidized form, it can typically be added to personal care formulations anytime in the production process. Post-addition of PrimaFlo MP3295A gives the manufacturer the ability to adjust completed batches for more precise viscosity control.

PrimaFlo MP3295A fluidized polymer suspension is recommended for use in hair and skin care formulations requiring viscosity build and/or finished product clarity. In O/W emulsions, PrimaFlo FPS is used to thicken the continuous phase, thus adding stability. In surfactant-based systems, such as shampoos, liquid soaps and body wash, PrimaFlo MP3295A functions as both a thickener and lather enhancer. It serves to enhance foam stability and bubble density, which is typically perceived as an improvement in lather richness. In recent years, the move away from alkanolamines, and the desire to reduce surfactant levels has created a need for polymers which can serve to restore foam stability and density. PrimaFlo FPS has proven to be a viable replacement. It also imparts a rich rheology to reduced surfactant level formulations.

N-Hance® HP Series hydroxypropyl guar

N-Hance hydroxypropyl (HP) guar is a nonionic polymeric thickener and film former. It is often specified in personal care formulations to take advantage of its characteristic high level of lubricity as well as excellent salt and alcohol tolerance. Aqualon offers HP guar in a buffered self-hydrating grade (HP-40S) as well as a non-buffered grade (HP-40). Solutions of HP guar will be slightly hazy.

N-Hance HP guar is used in numerous applications for skin and hair care products. In particular, it is used for lubrication and film properties. Some of the more common applications are as follows:

- Anti-frizz hair styling products
- Wipes (baby and adult)
- Shave gels (especially women's)
- Shampoos and body washes (pearlescent)
- Hand and body lotions

N-Hance® 3000 Series cationic guar

N-Hance 3000-series cationic guar is found in a variety of applications in hair and skin care. Though cationic, it is compatible with most anionic and amphoteric surfactants used in shampoos, body wash and liquid hand soaps. Some of the more common applications are:

- Shampoo and conditioner
- Hair styling products
- Shaving gels and foams
- Liquid soap and body wash
- Moisturizing lotions and creams
- Wipes (baby and adult)
- Bar soaps

As a conditioning agent to hair, cationic guar offers excellent detangling properties and enhances the feel of dry hair. As such, it is often specified as a conditioning polymer in 2-in-1 shampoos at typical use levels of 0.2-0.5%. In body wash, liquid hand soap and shave preps, cationic guar lubricates and leaves a soft, luxurious afterfeel, typically perceived by consumers as a moisturizing effect. Typical use levels in body wash are 0.4-0.75%.

To learn more about Aqualon, contact your sales representative or visit us online at www.aqualon.com.



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