

Specialties

Delivering Performance to the Industrial Specialties Market

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 Specialties Products

Aqualon, a business unit of Hercules Incorporated, offers a wide range of products to various industrial markets, including the manufacture of ceramics, electronic components and display panels, printing inks, lithographic printing fountain solutions, pigment and mineral slurries, paint removers, welding rods, fire-fighting suppressants, adhesives, industrial cleaners, lubricants, tobacco products, suspension polymerization, civil engineering (e.g., water-well drilling, directional horizontal drilling, tunneling, bentonite doping), communication cables, textiles, refractories, agricultural and horticultural products, pencils and crayons, batteries, and industrial gels, among many others. In addition to these specialties markets, we have products customized for a wide variety of applications in the paper and paper coatings industries and as production aids for a number of mining industry processes.

The key to providing performance to such a diverse array of end-use applications is a portfolio of products that provide unique properties including:

- **Rheology modification**
- **Thickening**
- **Water retention**
- **Water blocking**
- **Stabilization**
- **Suspension**
- **Adhesion**
- **Film formation**
- **Plasticization**
- **Lubrication**
- **Colloid protection**

Aqualon application specialists, working in our modern laboratories in Germany, the Netherlands, Russia, China, Singapore, Mexico and the United States, provide our customers expert technical assistance using state-of-the-art analytical, testing, and evaluation equipment. They support customers in finding solutions to performance and cost reduction issues, and in the development of new products and applications. Our products, which are often used at low levels in a complex formulation, nevertheless provide unique and highly functional performance. These ingredients have functionalities far beyond their levels in formulations and are often the key to getting the right behavior and performance from the overall formulation. Our applications experts' knowledge of how our products perform in customers' end-use applications is vital for providing results at the right cost.



Specialties Applications

Aqualon offers a wide spectrum of water- and organo-soluble polymers that are derived from both natural and synthetic resources. Our naturally-derived cellulosic and guar products provide effective functionalities in a broad range of applications and industries. In addition, we provide synthetic products for specialized applications.

We have a dedicated, ongoing effort to better understand the specialty applications in which our products are used. For these applications, we track market trends and drivers and, working with customers, translate them into the next generation high-performance products. Among Aqualon's varied specialties products, we have many options at our fingertips, such that we can provide customers with the best solutions today and develop better solutions for tomorrow.



Ceramics

Organic binders give ceramic formulations the plasticity required for shaping by improving the workability of the material and increasing its mechanical strength. We also provide additives that are used in glazes and engobes that help to prevent sedimentation of solids and to achieve the desired rheological properties. In addition, these binders improve the adhesion of the glaze or engobe and thus counteract any imperfections arising during the manufacturing process.

Electronic Components

The organo-soluble nature and clean burn-out performance of **Aqualon® ethylcellulose** makes it the first choice for thickening thick metal and specialty pastes, in products such as multi-layer ceramic capacitors and plasma display panels. Improvements in the manufacturing process quality control systems have resulted in high quality products with excellent solubility in low burnout temperatures.

Inks and Coatings

Some key requirements of flexographic packaging inks are scuff resistance, adhesion and viscosity control. **Aqualon® ethylcellulose** is a key ingredient that can provide these attributes. In gravure printing, our **Aqualon ethylcellulose** provides fast solvent release, better scuff resistance, outstanding viscosity control, improved gloss, and enhanced pigment dispersion. In screen printing inks, it is used as a film former and for viscosity control. In lithographic printing, our **Ambergum® polymers** product line is a cost-effective alternative to gum arabic to provide clean viscosity control and unique rheology in gumming and fountain solutions. It functions as a wetting agent and can replace isopropyl alcohol in some systems. **Ambergum polymers** come from a reliable raw material source, with stable sourcing and pricing.

Coatings based on **Aqualon ethylcellulose** are widely used to protect metal surfaces. They are especially appreciated by those who need an effective but economical means of shielding metal parts from corrosion during shipment and storage and for temporary protection of finely finished lacquer and enamel surfaces.

Pigment and Mineral Slurries Stabilization

Aqualon® polymers are in many cases significantly more effective for stabilizing minerals in concentrated aqueous slurries than traditional low molecular weight dispersants. In these cases the polymers adsorb to the mineral surface providing a dispersing effect and reducing or eliminating dense-pack settling phenomena. Some examples of pigment slurry applications where cellulosic polymers have become commercially established include titanium dioxide slurries, precipitated calcium carbonate slurries, Brazilian clay slurries, talc slurries, and calcined clay slurries.

Paint Removers

Aqualon® cellulose ethers can be used to thicken solvent-based paint removers and can provide easier application, enhanced vertical cling and, in some cases, can slow rapid solvent evaporation. These polymers can also improve the performance of the so called “flush off” paint removers. **Klucel® hydroxypropylcellulose (HPC)** is soluble in a wide range of moderate to highly active solvents and tolerates a significant quantity of non-polar solvent components. This makes **Klucel HPC** especially suitable as the primary thickener in many different flammable and non-flammable paint remover formulations. **Culminal® methylhydroxypropylcellulose (MHPC)** can also be used in certain chlorinated solvent/alcohol mixtures, with maximum thickening potential achieved via preliminary high shear dispersion of **Culminal MHPC** into the chlorinated solvent.

Welding Rods

During the welding rod extrusion process, cellulose ethers such as **Aqualon® CMC** and **Aqualon® HEC** will shear thin under pressure and behave as a lubricant. After the extrusion process, the cellulose ether components regain viscosity and prevent separation or inhomogeneity of the flux. Water-soluble polymers, such as **Natrosol® HEC**, help to bond the flux to the core electrode and provide a highly plastic, smooth coating that does not crack during drying. During the welding process these cellulose ethers provide a smooth silica flux and help to protect the metal surface from oxidation.

Fire Fighting

Guar derivatives are used to prevent misting of fire retardants during aerial drop applications. The product provides good rheology behavior and stability, even in the presence of high concentrations of salts.

Adhesives

Aqualon® cellulosic- and guar-based polymers are typically used as binders, rheology modifiers and tackifiers in synthetic water soluble adhesives to adjust the required viscosity and water resistance and to increase cohesion. In water-soluble adhesives, our new **Aquaflow® synthetic associative thickeners** are used to deliver superior rheology performance. In addition, polyterpene and rosin resin products, such as the **Piccolyte®** and **Foral® product lines**, are excellent tackifiers for a wide number of adhesive types and applications.

Industrial Cleaners

Aqualon® cellulose ethers find a wide range of utility for viscosity enhancement, stabilization, compatibilization, particle suspension, and rheology modification in the family of products known broadly as “industrial cleaners”. This includes hard surface cleaners, disinfectants, floor care, pest elimination, degreasers, deodorizers, warewashing, laundry care, and hand cleaning/skin care, in such diverse applications as foodservice, food and beverage processing, healthcare, hospitality, government, and educational, retail, commercial, vehicle care, and other endeavors. Recommendation of a specific polymer for an application will vary depending on the end physical properties desired as well as the other components in the formulation (e.g. surfactants and/or solvents).

Tobacco Products

Reconstituted tobacco sheets can be formed with **Aqualon® cellulose ether solutions**, where the product acts as a binder and serves to minimize cracks and lumps and shrinkage during drying. In addition, they provide a uniform appearance, high tenacity (tearing strength) and sheet elasticity.

Civil Engineering

In directional horizontal drilling and tunneling, drilling fluids are used to maintain wall stability, improve shale inhibition (fluid loss control) as well as to enhance the ability to suspend cuttings and to improve the ability to plug open formations (thixotropic properties). The addition of **Aqualon® water-soluble polymers** will boost the performance of bentonite through lower fluid loss, stabilized mud suspension and increased shear thinning (pumpability).

Paper Industry

Aqualon® CMC and **guar grades** are used for strengthening paper. These products can be added in the pulpers or in the thick stock where they enhance fiber strength. Furthermore, these products have been shown to improve refining and fibrillation through lubrication. They are also commonly used in combination with **Kymene® wet strength resin** to enhance the wet and dry strength of paper towel and currency grades. **Aqualon® CMC** and **HEC** products are also used at the calendar stacks for curl control and in a number of specialty grades, such as grease-proofing and carbonless papers.

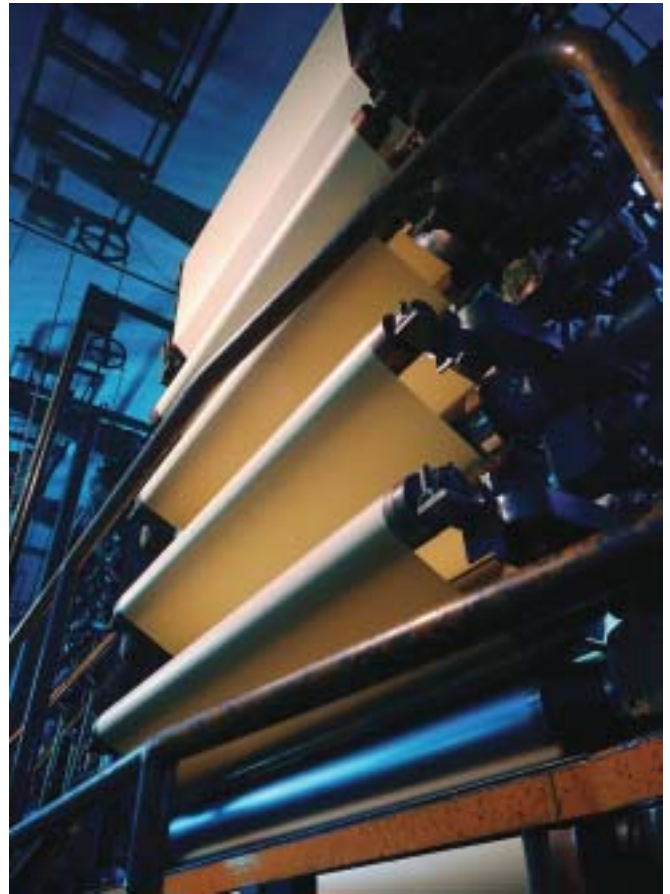
In addition to providing strength, **Galactosol® guar products** can provide improved paper web formation, improved drainage, and better retention. They are particularly effective in “dirty” systems, such as mills using recycled papers and mechanical pulps. Their ability to retain fibers and other species into the paper sheet results in cleaner water systems and lower BOD, COD, and TSS levels.

Aqualon also supplies a full line of rheology modifiers for paper coatings. This is a unique specialty application where these highly functional products provide outstanding runnability for a broad variety of pigment formulations, including carbonates, clays, and talc. These rheology modifiers can provide improvements in key performance properties, such as smoothness, brightness, opacity, gloss, and printing gloss, through superior water retention and unique structuring behavior with pigments.

Mining

Aqualon® water-soluble polymers have been employed in numerous mineral processing applications including froth flotation, iron ore pelletization, tailings flocculation, and electro-winning.

In the froth flotation application, water soluble polymers such as CMC, guar gum, and specialty products have been employed as gangue depressants in potash flotation operations and, to a lesser extent, in selected sulfide mineral applications. In gangue depressant applications, low dosages of water soluble polymers can provide an increase in both the quantity and quality of the valuable mineral component by “blinding” or de-activating the affinity of the flotation collector for the undesirable gangues.



Binder formulations based on Aqualon polymers are effective replacements for bentonite in the iron ore pelletization process. Use of water soluble polymers gives good ball formation and green ball properties and results in improvement in iron ore concentrate grade and improved reducibility of the pellets when used in the blast furnace.

Aqualon® specialties products go into many other applications. We have extensive experience across many markets and applications and can enhance the performance and cost-effectiveness of your formulations and processes. Many of these applications and processes are highly specialized and specific detailed information is available for most applications. Aqualon has offices, production facilities, laboratories, and specialized application representatives worldwide that are dedicated to our customers and to the specialties industries and markets.

Aqualon offers the broadest line of cellulose ethers of any company in the world. These purified products function over wide pH and temperature ranges. They form clear, residue-free solutions, and are used at low dosages. Higher dosages will often result in stable functional gels. Although most products are designed for water-based systems, Aqualon provides some products that provide unique performance in organic solvents. Many of our products form stable films, with varying flexibility, that are resistant to oils, greases, and organic solvents. Products are available that are fast-dissolving, non-dusting and easy to disperse. In addition, many Aqualon cellulose ethers are available in liquid forms or as high solids dispersions.

For more information or technical assistance, please contact your sales representative or visit us online at www.aqualon.com.



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