

Who offers a full
spread of solutions?
We do.

**Food and beverage
ingredient solutions to
serve your market needs**



Solving challenges to create opportunity

At Ashland, we are **passionate, tenacious, solvers** who thrive on developing practical, innovative, and elegant solutions to complex problems, always pushing the boundaries of what's possible, and advancing the competitiveness of our customers in the food and beverage industry.

As solvers, we understand the challenges you face to bring new products to market, and offer a full range of cellulosic food ingredients and stabilizers to help enable healthier, tastier, and more convenient foods.

Our products are recognized throughout the world for quality, consistency and performance. These ingredients are derived from renewable, natural raw materials, and are produced in current Good Manufacturing Practices (cGMP) facilities in the U.S., Europe, and Asia.

We also do more than just manufacture — our products are supported by a global team of food scientists with exceptional product knowledge and industry insights. We offer technical support to help our customers amplify the **efficacy**, refine the **usability**, add to the **allure**, ensure the **integrity**, and improve the **profitability** of their products and applications.

The results are all around you:

- Enhanced mouthfeel in reduced sugar beverages
- Reduced saturated fat in your diet with meat substitutes
- Reduced milk fat with creamy mouthfeel in whipped toppings
- Reduced oil uptake in fried foods
- Gluten-free formulations for new-direction carbohydrates
- Economical protein stabilization in acidified dairy products
- Enhanced moisture and shelf-life in bakery products
- Mouthfeel and thickening with excellent clarity in beverages and syrups

	Application										Function							
	Alcoholic Beverages	Bakery	Beverage	Dairy	Desserts and Toppings	Meat	Meat Alternatives	Pet Food	Prepared Foods	Sauces and Savory Products	Foam Promotion	Mouthfeel Enhancement	Rheology Control	Stabilization	Structure Enhancement	Thermal Gelation	Thickening	Water Binding
AeroWhip™ stabilizers and emulsifiers and Klucel™ hydroxypropylcellulose (HPC)	✓			✓	✓						✓	✓	✓					
Benece™ methylcellulose (MC) and hydroxypropylmethylcellulose (HPMC)		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Aqualon™, Bondwell™ and Blanose™ carboxymethylcellulose (CMC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Aquasorb™ carboxymethylcellulose (CMC)		✓				✓	✓		✓				✓	✓				✓
Supercol™ guar gum		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓

AeroWhip™ stabilizers and emulsifiers and Klucel™ modified cellulose

AeroWhip stabilizers and emulsifiers and Klucel modified cellulose, also known as hydroxypropylcellulose (HPC), are unique hydrocolloids for food applications. They are extremely surface-active with low surface and interfacial tensions in solution, making them premier whipping aids. This property, combined with the “protective colloid” action, gives the outstanding dual functionality in oil-in-water emulsions (stabilizer and emulsifier) and in whipped products (stabilizer and whipping aid).

Several different viscosity grades are available.

Key Benefits

- Exceptional stiffness and stability
- Crisp, clean edges for decorators
- Fast air incorporation
- Resistant to melt and deformation
- Increased overrun
- Improved body and mouthfeel
- Prevents cracking and shrinking
- Reduced fat content and cost

Alcoholic Beverages

Klucel HPC products are both water- and alcohol-soluble and can be used to thicken ready-to-drink cocktails for the desired mouthfeel.

Dairy

AeroWhip HPC is a specialty grade optimized for stabilizing dairy and nondairy whipped toppings. For dairy whipping creams, the amount of milk fat can be reduced significantly, leading to a healthier and more cost-effective product with a creamy mouthfeel.

Desserts and Toppings

In nondairy whipped toppings, AeroWhip HPC creates stiff foams, increases overrun, and controls syneresis.

Klucel HPC makes strong, flexible films and is thermoplastic. The film forming property of HPC makes excellent protective coatings for candies and nuts.

Recommended Dosage Level by Application (wt%)

	Grade	Alcoholic Beverages	Dairy			Desserts and Toppings		
		Ready-to-Drink Cocktails	Ice Cream	Low-fat Cream	Whipping Cream	Candy and Nut Coating	Whipped Topping	Whipped Topping Powder
Klucel™ HPC	EF					1.0-3.0 ²		
	LF					1.0-3.0 ²		
	JF	0.2-1.0				1.0-3.0²		
	GF	0.2-1.0						
AeroWhip™ stabilizer and emulsifier	620 stabilizer						0.2-0.3	
	625EZ stabilizer						0.2-0.4	
	630 stabilizer		0.1-0.4	0.1-0.4	0.05-0.2			0.5-1.0¹
	816EMB stabilizer plus emulsifier						0.5-2.0	
	73EM emulsifier blend						1.0-2.0	
	72EM emulsifier blend						1.0-2.0	

Most recommended in **bold**.

¹ As percentage of dry mix.

² Klucel hydroxypropylcellulose is used in either water- or alcohol-based spray coating.



Benecel™ modified cellulose

Benecel modified cellulose, which can be either methylcellulose (MC) or hydroxypropylmethylcellulose (HPMC), is a versatile, multifunctional food gum. The polymeric structure of these products, which is different from other cellulose, improves cohesion, texture and mouthfeel. They are unique hydrocolloids that reversibly gel at elevated temperatures. Benecel MC and HPMC perform many functions in foods, depending on type, grade, use level, and conditions. Among these functions are thermal gelation, film formation, thickening, binding, and water retention.

Several different viscosity grades are available.

Key Benefits

- Exceptional binding
- Reduces oil pick up in fried foods
- Stabilizes fillings while cooking
- Texturizes warm sauces

Bakery

In fillings, thermal gelation of Benecel MC and HPMC inhibits moisture migration into pie crusts and prevent boil-out while heating fruit bars and pocket dough products.

Benecel MC and HPMC stabilize dough and batter aeration to improve volume in cakes and gluten free applications.

Dairy

Benecel MC and HPMC improve and stabilize aeration in dairy desserts and sherbets along with creating a firm yet creamy structure to cream cheese.

Desserts and Toppings

Small amounts of Benecel MC and HPMC significantly enhance foam stability. This is particularly useful in stabilizing whipped toppings and desserts.

Meat Alternatives

Benecel MC and HPMC effectively bind ingredients in meat alternatives, to maintain shape integrity and provide a meat-like appearance, texture, and mouthfeel.

Prepared Foods

MC and HPMC aid in shape retention of prepared foods through various freeze, thaw and cooking processes.

For restructured fried foods, Benecel MC and HPMC reduce oil pick up, bind ingredients, and retain product integrity. The MC or HPMC becomes part of the restructured fried product matrix, binding all of the ingredients together during the frying process and reducing batter blow out.

Sauces and Savory Products

Benecel MC and HPMC add texture and viscosity to sauces through a wide range of temperatures and reduces skin formation caused by water evaporation.

Recommended Dosage Level by Application (wt%)

Benecel™ MC and HPMC Grades ¹	Bakery							Dairy		Desserts and Toppings		Meat				Meat Alternatives		Prepared Foods						Sauces and Savory Products					
	Bakery Cream	Cakes and Reduced-fat Cakes	Donut and Fried Pastry	Gluten-free Products	Pancake and Waffle Batter	Reduced Egg in Bakery Products	Pie and Pastry Filling	Cream Cheese	Frozen Dairy Products	Icings and Frostings	Mousses	Extruded Fried Meats and Seafood	Meat Balls and Patties	Meat Nuggets/ Snacks	Sausages	Meat Analogues	Vegetable Burgers	Batter for Deep-Fat Frying	Cheese Croquettes	Extruded Onion Rings	French Fries	Potato Croquettes	Barbecue Sauce	Cheese Sauce	Dry Mix Sauce or Soup	Meat Glaze	Soups	Tomato Pizza Sauce	
A4M			0.1-0.3					0.2-0.3							0.8-1.0	0.5-1.0	0.3-0.8	0.1-0.5	0.2-2.0		0.1-0.5	0.2-1.0				0.4-0.6		0.2-1.0	
A4C	0.2-0.6		0.2-0.6								0.5-1.0	0.3-0.6	0.2-1.0	0.3-0.6							0.5-1.0					0.4-0.6			
A15C						0.1-0.2	0.1-0.3				0.2-1.0							0.2-0.6				0.2-1.0							
E4M						0.1-0.2				0.3-0.5								0.3-0.8					0.2-1.0						
K4M		0.2-0.4		0.5-2.0		0.1-0.2		0.1-0.3	0.3-0.5	0.1-0.2							0.3-0.8				0.1-0.5				0.5-1.5 ²	0.2-0.8			
K15M				0.8-2.0																			0.2-1.0						
K35M		0.1-0.3						0.1-0.3																			0.1-0.5		
K100M								0.5-2.0																					
K200M							0.05-0.2												0.2-2.0			0.2-0.5	0.1-0.5			0.1-0.5	0.1-0.5		

Most recommended in **bold**.

¹ Benecel A grades are methylcellulose. E and K grades are hydroxypropylmethylcellulose. Substitution rates of functional groups vary with type.

² As percentage of dry mix.

Aqualon™, Blanose™ and Bondwell™ cellulose gum

Cellulose gum, also known as sodium carboxymethylcellulose (CMC) is widely used as a cost-effective thickener and stabilizer in foods and beverages. Besides modifying the behavior of water, CMC is useful in modifying flow, adding texture, and enhancing mouthfeel.

Key Benefits

- Improved texture and mouthfeel
- Clear in solution
- Protein stabilization
- Water absorption and retention
- Pectin replacement

A wide range of CMC grades with different viscosities, molecular weights, degrees of substitution and particle sizes are available and products can be customized to meet specific applications. Our global manufacturing base is designed for your regional needs: Aqualon (US), Blanose (EU) and Bondwell (China).

Alcoholic Beverages

Ready-to-drink cocktails benefit from CMC's ability to control rheology in alcohol-based beverages and achieve the desired mouthfeel.

Bakery

CMC has the capability for high water absorption and retention in batters and doughs creating bakery products with improved texture, volume, and distribution of inclusions. The improved water retention means delayed staling, longer shelf-life and crumb stabilization.

CMC is also used in various bakery fillings to achieve a desired level of thickening ranging from fluid to creamy. CMC prevents phase separation and controls syneresis within the filling itself and reduces moisture migration into the dough.

Aquasorb A-500 CMC is a specialty grade designed for maximum water holding in bakery and other applications

Beverages

CMC adds crystal-clear, pleasant, clean mouthfeel as it thickens any beverages to the desired viscosity.

Recommended Dosage Level by Application (wt%)

CMC Grades ¹	Alcoholic Beverages	Bakery					Beverage					
	Ready-to-Drink Cocktails	Breads, Cakes and Cake Mixes	Muffins	Pie Fillings	Pita Bread, Pizza	Soft Tortillas/Dry Masa Flour	Chocolate Drinks	Coffees and Teas	Concentrates/Squashes	Fruit Flavored Drinks	Juice Beverages	Instant Powder Drinks
9H7F ³								0.03-0.1	0.1-0.3	0.05-0.2	0.05-0.2	
9H4F												
7H4F					0.5-1.0	0.4-0.6						
7H3SF				0.1-0.5								
7HF		0.5-1.0	0.3-0.8			0.4-0.6						
7HOF				0.1-0.5			0.05-0.15	0.05-0.15	0.2-0.4	0.05-0.4	0.05-0.4	0.4-0.6²
7LF												
7MF												
7M8SF									0.3-0.5			
9M31F	0.1-0.4			0.3-0.8			0.1-0.4	0.1-0.3	0.3-0.5	0.1-0.8	0.1-0.6	0.5-0.7 ²
12M31F	0.1-0.4						0.1-0.4	0.1-0.3		0.1-0.8		0.5-0.7 ²
Aquasorb™ A-500		0.5-1.0	0.3-0.8		0.5-1.0							

Most recommended in **bold**.

¹ The letters H, M, and L in the grade designation are an indication of viscosity, which also has an effect on the cellulose gum properties.

² As percentage of dry mix.

³ Aqualon brand available only.

Fine and coarse particle size products are also available in most product types. Particle size selections should be made based upon manufacturing process and final product requirements.

Aqualon™, Blanose™ and Bondwell™ cellulose gum

Dairy

Not only does CMC provide the desired mouthfeel, it also stabilizes low pH dairy beverages such as acidified milk drinks, milk, or juice blends. The stabilizing nature of CMC allows it to prevent separation of the dairy protein.

CMC is used in ice cream to control rheology of the continuous phase. This helps with melt down, adds texture and protects against heat shock and ice-crystal formation.

Desserts and Toppings

Frozen desserts like ice cream, benefit from the water binding properties of CMC improving mouthfeel and controlling ice-crystal formation. Toppings benefit from economic thickening and stabilization.

Meat

Emulsified and frozen meats have improved yield, less phase separation and less cracking as CMC binds the water in the product. The water binding also acts as a releasing agent when peeling off meat casings.

Pet Food

CMC thickens the gravy, retards the softening of pellets in dry pet food, improves extrusion and appearance of semi-moist pet food and stabilizes the fat in canned pet food.

Prepared Foods

CMC hydrates quickly making it an ideal stabilizer for thickening in dry mix preparations. For extruded snacks, it aids with extrusion and improves breaking strength.

Sauces and Savory Products

CMC is a cost-effective thickener and stabilizer in a wide variety of sauces and savories that controls and reduces syneresis.

Recommended Dosage Level by Application (wt%)

CMC Grade ¹	Dairy							Desserts and Toppings							Meat			Pet Food		Prepared Foods			Sauces and Savory Products									
	Acidified Milk Drink	Cottage Cheese	Ice Cream and Ice Milk	Puddings	Soft Serve	Spreadable Cheese	Yogurt and Butter Milk Drinks	Chocolate Topping	Icings	Marshmallow Topping	Marzipan	Meringues	Sherbet	Water Ice/Ice Pops	Emulsified Meat and Fish	Frozen Fish	Meat Casings	Dry Pet Food	Soft, Semi-moist or Canned Pet Food	Extruded Snacks	Instant Fried Noodles	Instant Hot Cereal	Instant Spice Mixes/Dips	Barbecue Sauce	Cheese Sauce	Fruit Preps and Jams	Ketchup	Mayonnaise	Pickle Relish	Salad Dressings	Table/Pancake Syrup	
9H7F ³			0.1-0.25		0.1-0.5			0.1-0.3										0.1-0.3					0.1-0.5	0.2-0.6	0.05-0.3	0.1-0.5		0.05-0.3				
9H4F					0.1-0.5																											
7H4F														0.3-0.5			0.4-0.6	0.2-0.5														
7H3SF		0.1-0.3		0.1-0.3		0.1-0.2		0.2-0.4	0.1-0.3	0.05-0.1	0.1-0.5											0.1-0.5 ²	0.5-1.0 ²									
7HF			0.1-0.25		0.1-0.5										0.5-1.0			0.3-0.6				0.1-0.5 ²										
7HOF	0.2-0.4					0.1-0.2	0.2-0.4						0.1-0.5	0.1-0.5									0.2-0.6	0.3-0.8	0.1-0.4	0.2-0.6	0.5-1.0	0.1-0.5	0.5-0.8			
7LF	0.5-0.8								0.3-0.6		0.3-0.5					1.0-2.0				0.1-0.5												
7MF											0.1-0.5											0.4-0.8										
7M8SF									0.2-0.5													0.3-0.5									0.5-1.0	
9M31F	0.3-0.6						0.3-0.6		0.1-0.3		0.3-0.6					1.0-2.0						0.3-0.5	0.8-1.5 ¹	0.5-1.0	0.2-0.5	0.5-1.0					0.4-0.8	
12M31P																													0.5-1.0	0.4-0.8		
Aquasorb™ A-500		0.1-0.3												0.3-0.5	0.5-1.0																0.5-1.0	

Most recommended in **bold**.

¹ The letters H, M, and L in the grade designation are an indication of viscosity, which also has an effect on the cellulose gum properties.

² As percentage of dry mix.

³ Aqualon brand available only.

Fine and coarse particle size products are also available in most product types.

Particle size selections should be made based upon manufacturing process and final product requirements.

Supercol™ U2 guar gum

When it comes to guar gum, Ashland supplies the highest quality guar gum available for viscosity build. Our Supercol guar gum is processed in the United States for high purity, low odor, and low flavor. Broadly used in bakery, dairy, and pet food applications, Supercol guar gum is the choice for companies that want to control costs while increasing quality.

Key Benefits

- Very low odor
- Very low flavor
- Economical
- Quick viscosity build

Bakery

For fruit fillings, guar gum provides texture, body and thickening and is stable with good visual appeal.

For tortilla manufacturing, guar gum reduces dough stickiness to improve machinability. It also reduces cracking in the finished product.

Beverages

Guar gum improves mouthfeel and prolongs suspension time of fruit particles all with minimal flavor contribution.

Dairy

In ice cream, guar gum enables rapid dispersion, along with good uniformity and body. In cheese products guar gum prevents syneresis, improves shelf life, and enables better distribution of particles.

Desserts and Toppings

Guar gum enables rapid cold-water hydration and easy of incorporation of overrun for icings and frosting.

Meat

For canned meat, guar gum immobilizes the free water to reduce syneresis. It also helps improve casing filling rate, the viscosity of fillings and finished product firmness.

Pet Food

Guar gum stabilizes meat and vegetable chunks in pet food.

Prepared Foods

Guar gum eliminates the need for boiling in instant mixes, adds viscosity, increases moisture retention and improves shelf-life. For noodles it enables more elastic properties and aids in dough handling. In soups it improves mouthfeel and suspension of meat and vegetable pieces.

Sauces and Savory Products

For sauces and savory products, guar gum helps with maintaining a uniform body, water retention and heat-cold resistance.

Recommended Dosage Level by Application (wt%)

Guar Gum Grade	Bakery		Beverages		Dairy						Desserts and Toppings			Meat	Pet Food	Prepared Foods			Sauces and Savory Products			
	Fruit Fillings	Soft Tortillas/Dry Masa Flour	Beverages	Instant Powder Drinks	Cheese Sauce	Cheese Spread	Cold-Pack Cheese	Cottage Cheese	Cream Cheese	Ice Cream	Doughnut Manufacturing	Frostings	Icings	Canned Meat	Canned Pet Food	Instant Dressings and Dips	Instant Noodles	Instant Soup Mixes	Barbecue Sauce	Gravies	Mustard	Soups
U2	0.1-0.4	0.4-0.6	0.01-0.1	0.4-0.6 ¹	0.2-0.6	0.2-0.5	0.1-0.3	0.2-0.4	0.3-0.4	0.1-0.4	0.3-0.6	0.1-0.5	0.1-0.3	0.3-0.6	0.2-0.5	0.4-1.0 ¹	0.2-0.4	0.5-0.8 ¹	0.2-0.4	0.2-0.4	0.3-0.6	0.1-0.2

¹ As percentage of dry mix.

Regulatory Information

Klucel HPC and AeroWhip Stabilizers and Emulsifiers

Labeling

Common label declarations include hydroxypropylcellulose, modified cellulose and E463.

Regulatory

Klucel and AeroWhip HPC comply with the requirements of the U.S. Food and Drug Administration for direct additives to food for human consumption, as specified in the Code of Federal Regulations, Title 21, Part 172.870 and the monograph requirements for hydroxypropylcellulose in the current edition of the Food Chemicals Codex. Klucel and AeroWhip HPC also conform to the purity criteria of E463 as mentioned in the Annex of EU Regulation 2012/231/EC and amendments.

Benecel MC and HPMC

Labeling

Common label declarations include methylcellulose, E461, hydroxypropylmethylcellulose, E464 and modified cellulose. "Modified cellulose", accepted as a common label or usual name for methylcellulose or hydroxypropylmethylcellulose, may be used in food label ingredient statements.

Regulatory

Benecel MC complies with the requirements of the U.S. Food and Drug Administration for use in foods as specified in the U.S. Code of Federal Regulations, Title 21, Part 182.1480, "Substances Generally Recognized as Safe" (GRAS). Benecel HPMC complies with the requirements of the U.S. Food and Drug Administration for direct addition to foods as specified in the U.S. Code of Federal Regulations, Title 21, Part 172.874. Benecel MC and HPMC comply with the monograph requirements set forth in the Food Chemicals Codex and JECFA, current editions. Benecel MC and HPMC also comply with the purity criteria of E461 and E464, respectively, as mentioned in the Annex of EU Regulation 2012/231/EC and amendments.

Aqualon, Blanose and Bondwell CMC Labeling

Common label declarations include sodium carboxymethylcellulose, cellulose gum, CMC and E466. "Cellulose Gum", accepted as a common or usual name for purified sodium carboxymethylcellulose, may be used in food label ingredient statements

Regulatory

Aqualon, and Blanose and Bondwell CMC F-suffix and A-type CMCs comply with the requirements of the U.S. Code of Federal Regulations, Title 21 section 182.1745, "Substances Generally Recognized as Safe" (GRAS) for use in foods and meets the monograph requirements set forth in the Food Chemicals Codex and JECFA, current editions. CMC also conforms to the purity criteria of E466 as mentioned in the Annex of EU Regulation 2012/231/EC and amendments. An ADI (acceptable daily intake) of "not specified" has been allocated by the Scientific Committee of the EU and the Joint FAO/WHO Expert Committee on Food Additives.

Guar Gum Labeling

Common label declarations include guar gum.

Regulatory

Supercol guar gum complies with the monograph requirements for guar gum in the Food Chemicals Codex and JECFA, current editions. Supercol guar gum also conforms to the purity criteria of E412 as mentioned in the Annex of EC directive 98/86/EC and amendments. It is affirmed as Generally Recognized as Safe (GRAS) for direct addition to human food and is in compliance with the requirements of the U.S. Food and Drug Administration as specified in the Code of Federal Regulations, Title 21, Section 184.1339, subject to the limitations and requirements therein.



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always solving