



**SOLVAY**

asking more from chemistry®

**Jaguar®**

Product Guide for  
Personal Care Solutions

Your Global  
Innovation  
Leader in Guar



## Jaguar® Line

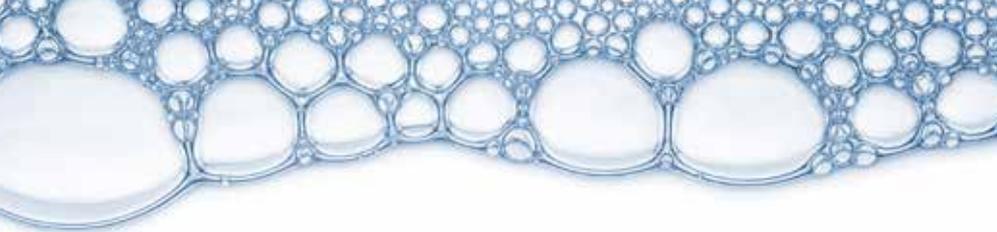
Superior performances from a natural, renewable resource

Solvay is the world leader in the development and production of derivatives from guar. These derivatives are widely used in personal care, food and pharmaceutical products. Guar Gum is a polysaccharide, more precisely, a polygalactomannan. It is extracted from the seeds of guar beans (*Cyamopsis tetragonoloba taub*), which Southern Asian farmers have been growing for centuries.

Solvay has been sourcing this unique raw material from this region for many years. The exceptional properties of this biocompatible and renewable plant are the basis for Solvay's proprietary Jaguar® line of modified natural polymers. To ensure consistent quality, Solvay has invested locally and is involved in each stage of the production, from extraction to processing. And with production sites in France, China and USA, Solvay has a global footprint for the transformation of guar gum into functional ingredients.

The result is Solvay's Jaguar® series, an ever evolving line of powdered natural derivatives covering functions as diverse as hair conditioning, active delivery, formulation thickening and skin feel.





# Jaguar® Line: General User Guide

## Hair Care

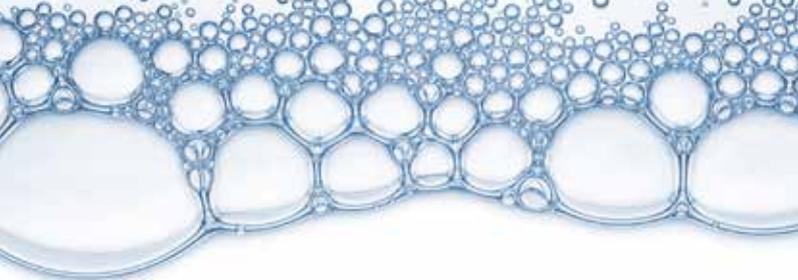
Product	INCI Name	Degree Of Modification	Molecular Weight	Shampoo	Conditioner, Mask & Treatment	Styling	Hair Colorants
<b>CATIONIC JAGUARS®</b>							
Jaguar® C-14S	Guar Hydroxypropyltrimonium Chloride	Medium	High	◆◆◆	◆		◆
Jaguar® C-13S	Guar Hydroxypropyltrimonium Chloride	Medium	high	◆◆◆	◆		◆
Jaguar® C-17	Guar Hydroxypropyltrimonium Chloride	High	High	◆◆◆	◆◆◆		◆
Jaguar® Excel	Guar Hydroxypropyltrimonium Chloride	Medium	Medium	◆◆◆	◆◆		◆
Jaguar® C-500 STD	Guar Hydroxypropyltrimonium Chloride	Medium	Low	◆◆◆	◆		◆
Jaguar® C-162	Hydroxypropyl Guar Hydroxypropyltrimonium Chloride	Medium	Medium	◆◆◆	◆	◆	◆
<b>NEW</b> Jaguar® Optima	Guar Hydroxypropyltrimonium Chloride	High	Low	◆◆◆	◆◆◆		◆
Jaguar® LS	Hydroxypropyl Guar Hydroxypropyltrimonium Chloride	Medium	Medium	◆◆◆	◆	◆	◆
<b>NATIVE JAGUAR®</b>							
Jaguar® S	Cyamopsis tetragonoloba (guar) gum	none	Very high	◆◆◆	◆◆	◆◆	◆◆
<b>HYDROXYPROPYL JAGUARS®</b>							
Jaguar® HP-8 COS	Hydroxypropyl Guar	Low	High	◆◆	◆	◆◆	◆
Jaguar® HP-60	Hydroxypropyl Guar	Low	High	◆◆	◆	◆◆	◆
Jaguar® HP-105	Hydroxypropyl Guar	Medium	High	◆◆	◆	◆	◆
Jaguar® HP-120	Hydroxypropyl Guar	High	High	◆◆	◆	◆	◆

- ◆ Suitable
- ◆◆ Recommended
- ◆◆◆ Highly recommended

Transparent

Opaque





## Health & Hygiene

Deodorants	Oral Care & Toothpaste	Personal Lubricant	Topical Products	Personal Insect Repellents	Air Freshener	Use Level %	Key Features/Benefits
◆		◆		◆		0.1% to 1.0%	Guar derivative providing high conditioning and significant deposition of water-insoluble actives onto hair. Suitable for everyday-use shampoos.
◆		◆		◆		0.1% to 1.0%	Self-hydrating version of Jaguar® C-14S
◆		◆		◆		0.1% to 1.0%	Guar derivative providing the highest deposition efficiency of actives (silicone, UV filters, anti-dandruff) on virgin hair.
◆				◆		0.1% to 1.0%	Purified guar derivative providing high conditioning benefits; Suitable for baby shampoo formulations; It is also suitable for clear, silicone-free solution.
◆		◆		◆		0.1% to 1.0%	Guar derivative suitable for volumizing and conditioning shampoos; Suitable for everyday use.
		◆		◆		0.1% to 2.0%	Purified guar derivative providing improved deposition of silicone on chemically-treated hair; Provides soft skin feel.
		◆		◆		0.1% to 1.0%	Guar derivative providing high deposition efficiency of actives (silicone, natural oil, UV filters, anti-dandruff) on severely damaged hair with no build-up side effect. Also suitable for silicone-free formulations.
				◆		0.1% to 1.0%	Purified guar derivative providing superior benefits in low surfactant/low sulfate silicone-free formulations; suitable for everyday use formulations.
◆◆	◆◆	◆		◆		0.1% to 2.0%	100% naturally derived thickening polymer; 100% vegetable origin from guar(% RMw); 100% renewable carbon (RCI); Readily biodegradable; Suitable for Whole Foods formulations.
◆	◆	◆◆	◆◆		◆	0.1% to 10%	Optimum thickening; Compatible with alcohol solution up to 30% ethanol; Good compatibility with electrolytes and stability over a wide range of pH. Smooth skin feel. Strong synergy with Xanthan gum.
◆	◆	◆	◆			0.1% to 20%	Good compatibility with electrolytes and stability over a wide range of pH. Smooth skin feel. Strong synergy with Xanthan gum.
◆	◆	◆	◆		◆◆◆	0.1% to 20%	Allows formulating transparent, pumpable/sprayable hydroalcoholic gels; Unique "fluid" smooth feel in wet applications, i.e. body washes, styling gels; Strong synergy with Xanthan gum.
◆	◆	◆	◆		◆◆◆	0.1% to 20%	Thickener with optimum/full compatibility with polar solvents and ethanol. Stable over a wide pH range. Film former in hand sanitizers for soft skin feel. Strong synergy with Xanthan gum.



To help create superior value-added products, such as repair of damaged hair, enhanced shine and improved conditioning, Solvay's Jaguar series of native, cationic and hydroxypropyl-modified natural guar polymers provides hair care formulators with a full range of conditioning and texturizing features. Key Hair Care attributes include:

- ▶ Increased deposition and substantivity to hair
- ▶ Controlled delivery of water-insoluble substances
- ▶ Exceptional conditioning properties at lower usage levels
- ▶ Excellent wet/dry hair combing and detangling
- ▶ Soft hold, improved shine
- ▶ Easier to manage, smooth hair feel
- ▶ Enhancement of foam sensorial attributes

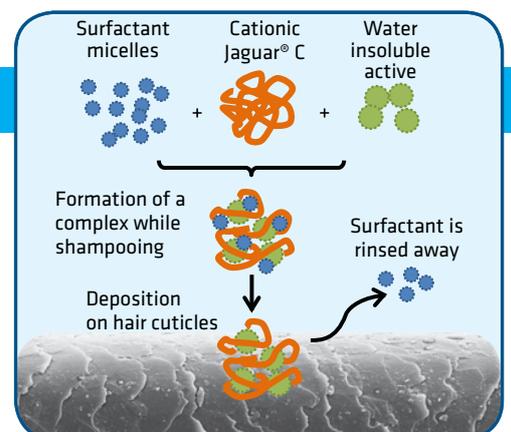
## Hair Care

Product	Texturing	Overall Hair Conditioning	Wet Combing & Detangling	Deposition of Actives	Colored Hair Protection	Damaged Hair Repair & Care	Dry Hair Moisturization	Daily Use	Sulfate-Free Solutions	Ethnic Hair	Baby Hair	Conditioners & Masks
Jaguar® C-14S	Medium	Medium			♦♦	♦♦	♦♦	♦	♦	♦♦		♦
Jaguar® C-13S	Medium	Medium			♦♦	♦♦	♦♦	♦	♦	♦♦		♦
Jaguar® C-17	High	Very high			♦♦♦	♦♦♦	♦♦♦		♦	♦♦♦		♦♦♦
Jaguar® Excel	Low	Medium			♦♦	♦	♦	♦♦	♦♦	♦	♦♦	♦♦
Jaguar® C-500 STD	Low	Low			♦	♦		♦♦			♦♦	♦
Jaguar® C-162	Medium	Medium			♦♦	♦♦		♦♦♦	♦♦	♦♦	♦♦♦	♦
<b>NEW</b> Jaguar® Optima	Low	High			♦♦♦	♦♦♦	♦♦♦	♦	♦♦♦	♦♦♦		♦♦♦
Jaguar® LS	Medium	Medium			♦♦♦	♦♦♦		♦♦♦	♦♦		♦♦♦	♦
Jaguar® S	Medium	Low			♦♦♦	♦♦	♦		♦♦♦	♦♦♦	♦♦	♦♦
Jaguar® HP-8 COS	Medium	Low			♦♦	♦	♦♦	♦♦	♦♦	♦♦		♦
Jaguar® HP-60	High	Low			♦♦	♦	♦♦	♦♦	♦♦	♦♦	♦	♦
Jaguar® HP-105	High	Low			♦♦	♦	♦♦	♦♦♦	♦♦♦	♦	♦♦	♦
Jaguar® HP-120	High	Low			♦♦	♦	♦		♦♦	♦	♦	♦



### THE SCIENCE CORNER

Conventional shampoos are usually made of anionic surfactants. With their high detergency and abundant airy foam, surfactants also often strip hair of its lipids, making detangling and combing difficult right after the shampoo. Upon lathering, cationic Jaguars® are designed to associate with anionic surfactants, forming complexes that can trap and efficiently deposit actives onto hair. While surfactants are washed away during the rinsing step, the cationic guar and the deposited actives stay and provide additional benefits.

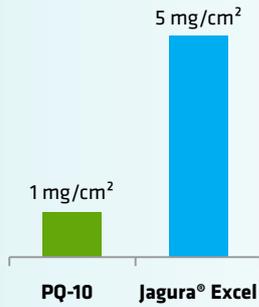




## Deposit on Hair

During shampooing, cationic Jaguars® deposit onto oppositely-charged anionic surfaces such as damaged hair. Their high substantivity makes them resist rinsing, thereby providing conditioning.

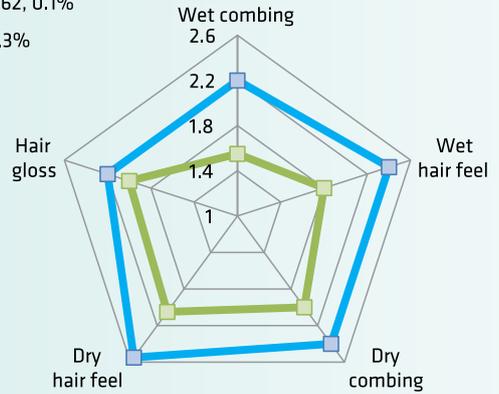
### Amount of polymer deposited, Surface force apparatus measurements



## Efficient at smaller doses

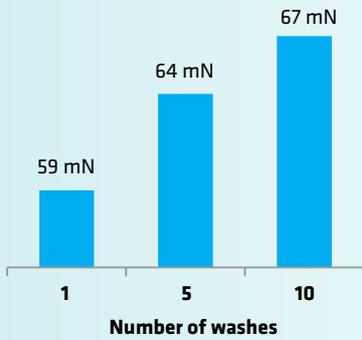
Cationic Jaguar® can help condition hair at smaller doses than competing technologies. In-vivo half-head tests by professional hairdressers on 20 subjects with damaged hair, 2 shampoos per week, for 3 weeks.

Legend:  
 Jaguar C162, 0.1% (Blue line)  
 PQ-10, 0.3% (Green line)



## Strengthen over time

Cationic guar strengthens hair damaged by chemical and mechanical treatments, contributing to reducing fiber breakage (Tensile strength measurements on hair fibers after shampooing).

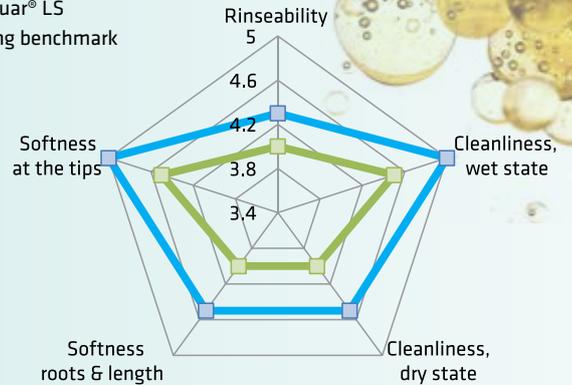


Fiber strength, mN  
 SLES/CAMA (2:1),  
 Jaguar® Excel 0.2% Salt 1% - pH = 7

## Nourish with oil infusion

Clear cationic Jaguar® LS helps create crystal-clear shampoos infused with natural oil to deeply nourish hair without impacting cleanliness. In vivo half-head tests, 3 women, moderately damaged hair. Scale: 1 very bad, 5 very good.

Legend:  
 Formulation based on Jaguar® LS (Blue line)  
 Leading benchmark (Green line)

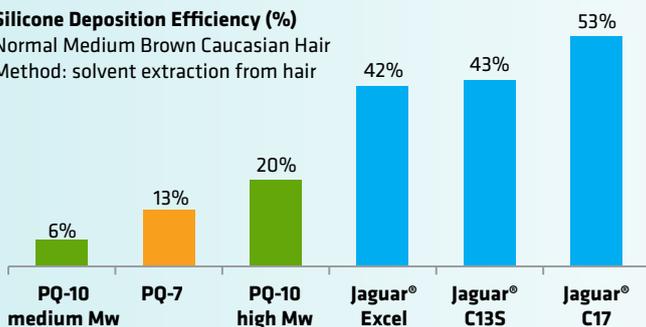


## Deliver active ingredients

Cationic Jaguars® are significantly more efficient than other cationic polymers, at delivering silicones to hair. This property also applies to other water-insoluble actives such as natural oils, anti-dandruffs, anti-UVs, etc.

### Silicone Deposition Efficiency (%)

Normal Medium Brown Caucasian Hair  
 Method: solvent extraction from hair

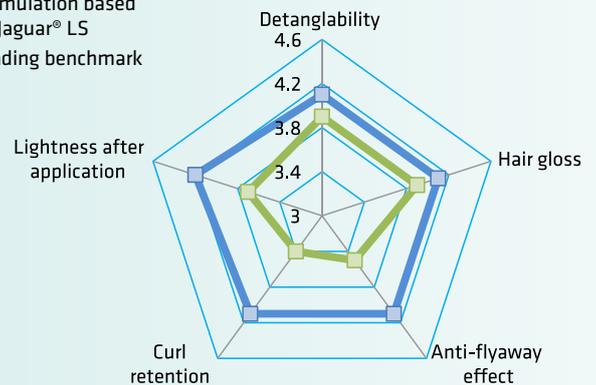


Shampoos based on 14% SLES, 2% CAPB, 1% silicone, 1.5% NaCl, 0.2% polymer, pH 6.0-6.5

## Repair heavy damage

New generation Cationic Jaguar® Optima helps caring for heavily damaged hair without impacting lightness and bounce. In vivo salon half-head tests, 20 women medium long hair dyed every 4-6 weeks. 2 applications. Scale: 1 very bad, 5 very good.

Legend:  
 Formulation based on Jaguar® LS (Blue line)  
 Leading benchmark (Green line)





To meet the demands of consumers who are constantly in of products that deliver better performances, formulators can turn to Solvay's Jaguar line of native, cationic and hydroxypropyl-modified natural guar polymers. Key body cleansing attributes are:

- ▶ Reduce skin stiffening caused by surfactants
- ▶ Restored skin's pH buffering effects are five times faster
- ▶ Reduce skin irritation and redness by 30% more than other cationic polymers
- ▶ Increased deposition and substantivity to skin
- ▶ Controlled delivery of water-insoluble substances, such as soothing oils, moisturizers and emollients
- ▶ Soft, silky skin after-feel
- ▶ Enhancement of foam sensorial attributes

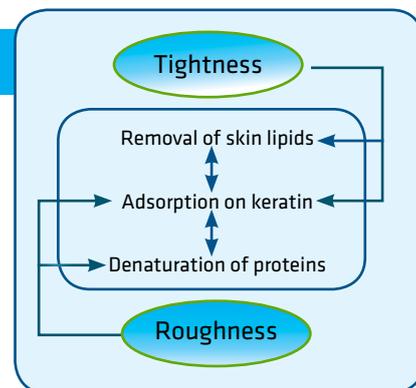
## Body Cleansing

Product	Texturing	Overall Hair Conditioning	Deposition of actives	Sensory & texture	Dry Skin Moisturization	BB Shower Gel & Anti-Blemish	Facial Wipes & Baby Wipes	Baby & Kids Shower Gels	Deep Nourish In-Shower Lotions	Liquid Hand Soaps	Extra Mildness For Sensitive Skin	Multifunctional Products For Men
Jaguar® C-14S	Medium	Medium			♦♦	♦			♦♦			♦
Jaguar® C-13S	Medium	Medium			♦♦	♦			♦♦			♦
Jaguar® C-17	High	Very high			♦♦♦♦	♦♦♦♦			♦♦♦♦			♦♦
Jaguar® Excel	Low	Medium			♦♦	♦♦	♦	♦	♦♦♦♦	♦♦	♦	♦♦
Jaguar® C-500 STD	Low	Low			♦♦		♦		♦	♦♦♦♦	♦	♦♦♦♦
Jaguar® C-162	Medium	Medium			♦	♦♦♦♦	♦♦♦♦	♦♦		♦♦♦♦	♦♦♦♦	♦♦♦♦
<b>NEW</b> Jaguar® Optima	Low	High			♦♦♦♦	♦♦			♦♦♦♦			♦♦♦♦
Jaguar® LS	Medium	Medium			♦	♦♦	♦♦♦♦	♦♦	♦♦♦♦	♦♦♦♦	♦♦♦♦	♦♦♦♦
Jaguar® S	Medium	Low			♦♦	♦	♦♦♦♦	♦♦♦♦	♦♦		♦♦♦♦	♦♦
Jaguar® HP-8 COS	Medium	Low			♦	♦	♦	♦♦	♦	♦	♦♦	♦
Jaguar® HP-60	High	Low			♦	♦	♦	♦♦	♦	♦	♦♦	♦
Jaguar® HP-105	High	Low			♦	♦	♦♦	♦♦	♦	♦♦	♦	♦♦
Jaguar® HP-120	High	Low			♦	♦	♦♦		♦	♦♦	♦	♦♦



### THE SCIENCE CORNER

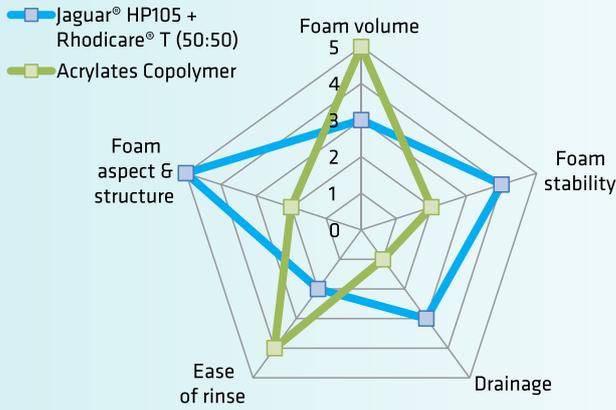
When a proteinaceous material, such as skin, is exposed to surfactants, the cells surface is denatured and ruptures, releasing hemoglobin. Anionic surfactants, in particular - which most cleansing products are usually made of - further destructure the  $\alpha$ -helix of hemoglobin, absorbs onto keratin and strips it of its lipids. Roughness, redness, tightness, blemish and eye irritation may all result from these mechanisms. Cationic Jaguars®, by directly binding to and/or competing with surfactants for adsorption onto the skin, can truly help mitigate irritancy.





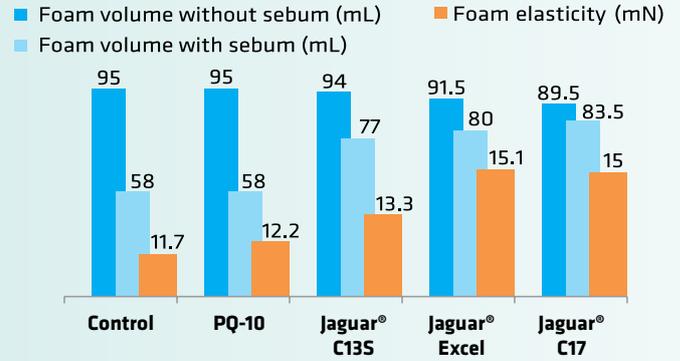
## Pleasing textures

Hydroxypropylated Jaguars®, synergistically combined with Xanthan gum, help create creamier, denser, more stable foams which do not quickly drain, contrary to synthetic rheological polymers.



## Richer & stable foam

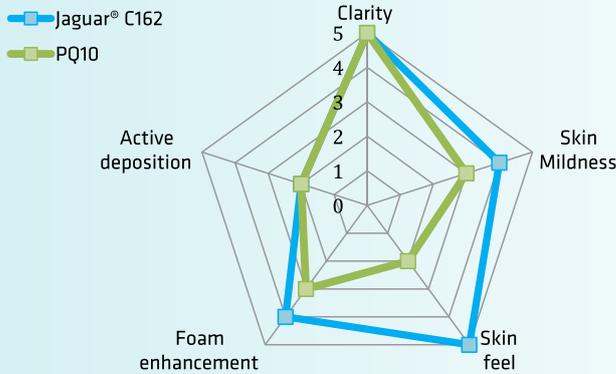
Cationic Jaguars® strengthen foam elasticity, making it more durable, even in presence of sebum. Each grade helps fine tune foam attributes, for a washing experience tailored to consumers needs.



Measurements made on a shower gel based on ALS/ALES/CAPB (7:7:2) 0,2% Cationic Polymer

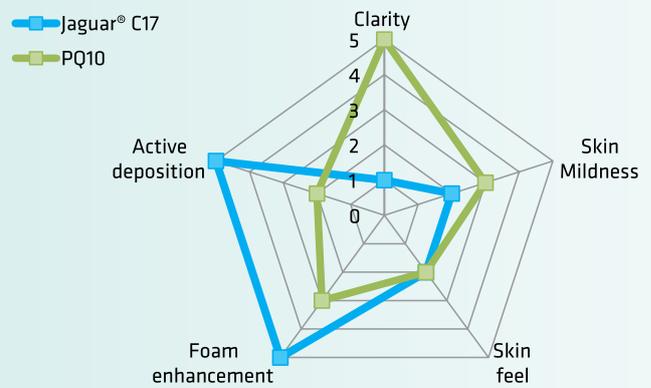
## Respect sensitive skin

To gently cleanse sensitive skin types (baby, acneic or comedogenic skin), clear grades Jaguar® C162 & Excel can help formulate transparent shower gels with a superior skin feel and stabilize a creamier foam.



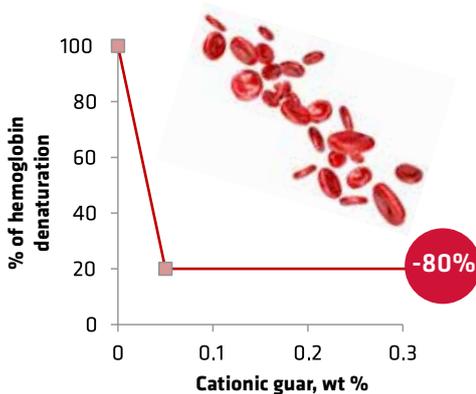
## Moisturize dry skin

To nourish the driest skin types, opaque grade Jaguar® C17 and Optima help delivering to the skin the highest levels of insoluble oils and actives, as well as help stabilizing the creamiest foam.



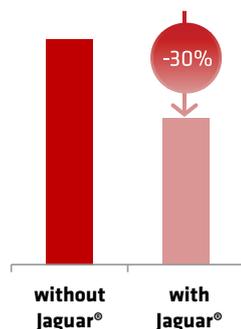
## Soothe damaged skin

Jaguars® help mitigate the irritation caused by surfactants: by both binding to anionic cleansing surfactants and depositing on the cells surface, they reduce protein denaturation occurring upon exposure of keratinous materials to such deterative agents. Capillary blood flow is shown to be reduced by 30% and skin redness is measurably reduced after 21 days.



Denaturation caused by Sodium cocoamphoacetate, 10% wt active, pH 6, added with Cationic guar.

Amount of blood flowing through capillaries of skin.



Thermal conductivity tests on 15 subjects, washed with 10% SLES solutions added with 2% cationic guar.



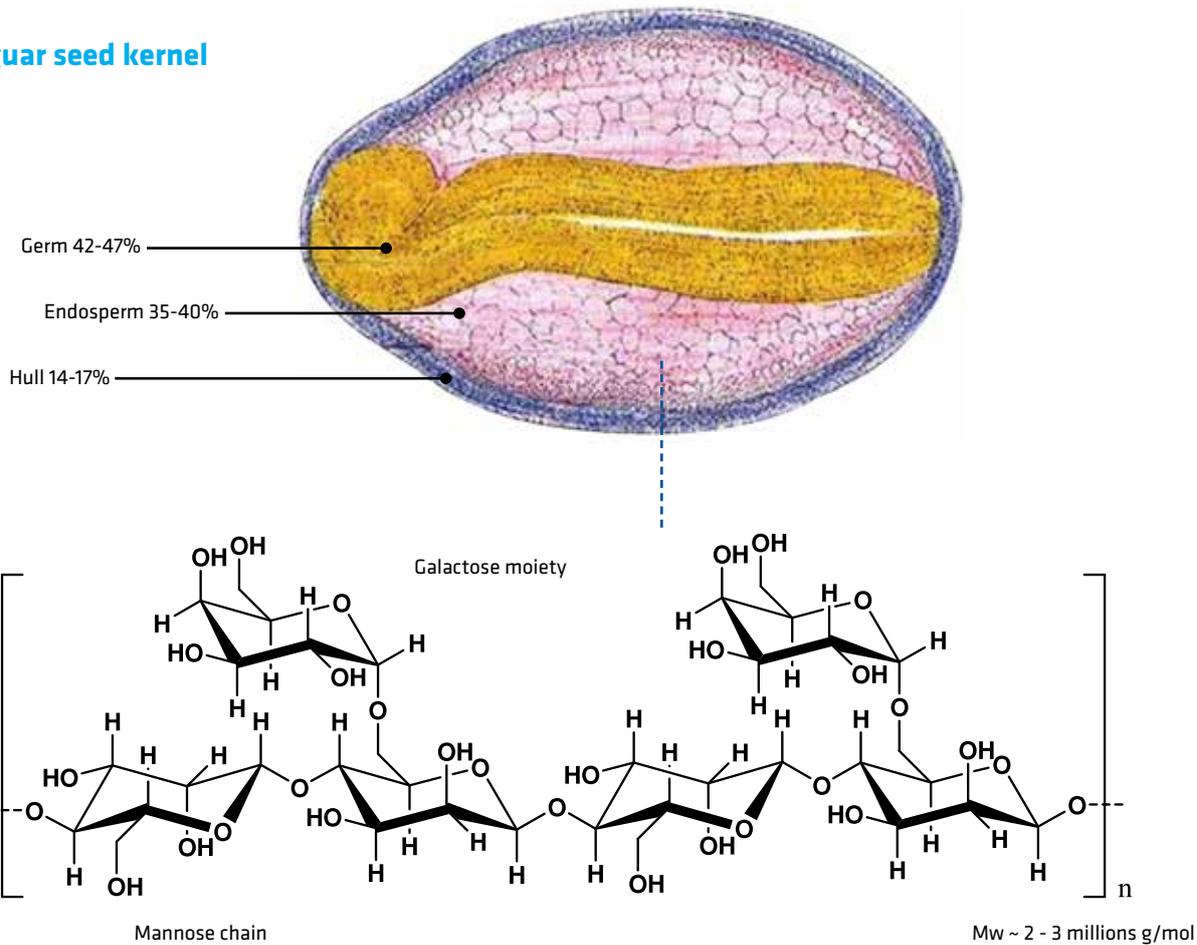
Shower gels based on Jaguar® C162 shown via occlusive in vivo patch tests DermScan, 10 subjects.



- ▶ The guar plant (*Cyamopsis Tetragonoloba* Taub) is an abundant & renewable resource. It mainly grows in dry & arid environment, in India, Pakistan and in SW USA
- ▶ The inner part of the seeds of the plant, called the endosperm, is extracted to provide a galactomannan, large polymeric molecule of high molecular weight, of order 2-3 million g/mol
- ▶ With its numerous reactive -OH functions, the galactomannan can be reacted with different molecules to modify it, functionalize it in a controlled way, so to create new molecules: the Jaguar®

## What is guar?

### A guar seed kernel



Guar is a galactomannan, made of a poly (b-1,4-linked D-mannopyranosyl) backbone, partially substituted with a-1,6-linked D-galactopyranosyl side-chains





## Sustainable Selector

A guide to help you design Eco-Friendly Personal Care Formulations. Always striving for more sustainable solutions, SOLVAY offers grades safe for the environment: the newest cationic grades Jaguar® 500 STD, C162, Optima and LS; the native guar Jaguar® S and the entire series of Jaguar® HPs, all non-ecotoxic.

Product	INCI Name	% Renewable Mw	% Renewable Carbon Index	Cosmos	Ecocert	Whole Foods	Natural Products Association	EFfCI GMP certified
Jaguar® C-14S	Guar Hydroxypropyltrimonium Chloride	91%	91%	◆				◆
Jaguar® C-13S	Guar Hydroxypropyltrimonium Chloride	91%	91%	◆				◆
Jaguar® C-17	Guar Hydroxypropyltrimonium Chloride	84%	83%	◆				◆
Jaguar® Excel	Guar Hydroxypropyltrimonium Chloride	91%	91%	◆				◆
Jaguar® C-500 STD	Guar Hydroxypropyltrimonium Chloride	92%	92%	◆		◆		◆
Jaguar® C-162	Hydroxypropyl Guar Hydroxypropyltrimonium Chloride	76%	71%			◆		◆
<b>NEW</b> Jaguar® Optima	Guar Hydroxypropyltrimonium Chloride	79%	78%	◆				◆
Jaguar® LS	Hydroxypropyl Guar Hydroxypropyltrimonium Chloride	79%	78%	◆				◆
Jaguar® S	Cyamopsis tetragonoloba (guar) gum	100%	100%	◆	◆	◆	◆	
Jaguar® HP-8 COS	Hydroxypropyl Guar	87%	83%					
Jaguar® HP-60	Hydroxypropyl Guar	82%	77%			◆		
Jaguar® HP-105	Hydroxypropyl Guar	82%	63%			◆		▲
Jaguar® HP-120	Hydroxypropyl Guar	70%	63%			◆		

▲ Certification of Jaguar® HPs pending

### Eco-labels: Ecocert, Whole Foods, NPA

Ecocert is a control and certification organisation, which “establishes the link between cosmetic ingredients and the respect for the environment” by validation, inspection and certification, standards set-up and training. National Product Association has defined “a set of guidelines that will dictate whether a product can be deemed truly natural”. Whole Foods, USA- and UK-based stores, have developed a list of approved chemical ingredients to be used in formulations sold within the Whole Foods stores network.

### EFfCI GMP certified

A document which states that the plant where the ingredient was produced, meets the requirements of the European Federation for Cosmetic Ingredients (EFfCI) Guide for Good Manufacturing Processes (GMP).

### RCI

Renewable Carbon Index represents the % of carbon coming from vegetable and renewable raw material compared to petrochemical origin.

### RMw

Renewable Molecular Weight represents the % of vegetable renewable raw material out of the total molecular weight.



## Formulation

### Key formulation take-aways:

- ▶ Allow guar powders to fully swell in water.
- ▶ Decreasing pH down to 5-5.5 helps accelerate hydration.
- ▶ When adding surfactants to cationic Jaguars®, start with amphoteric, nonionics and end with anionics. Avoid adding anionics first: it could lead to the formation of flocculates. Cationic guar powders can also be introduced after dissolution into solvents (propylene glycol), perfumes or natural oils (sunflower seed oil, etc).
- ▶ If the formulation also contains an anionic rheology modifier, avoid adding it directly on top of a cationic guar (or vice versa), as this could lead to the formation of lumps or flocculates. Amphoteric and simple salts may first be added to the cationic guar to help screen this interaction and prevent flocculation.

**Specific handling is associated with cationic Jaguar® for appropriate incorporation in rinse-off formulations. As hydrocolloid derivatives, a good Jaguar® powder dispersion is required to allow optimum polymer hydration and thus guarantee performance.**



### Recommendation for best Jaguar® processing in formulation

- ▶ With moderate agitation, slowly add the Jaguar® powder to the water.
- ▶ Once well dispersed, hydrate Jaguar by adjusting the pH to 3.5 - 5 with citric acid.
- ▶ Clarity of the solution should improve.
- ▶ Continue to mix an additional 15 to 20 minutes with moderate agitation to ensure proper hydration.
- ▶ Add amphoteric or non-ionic surfactants while mixing.
- ▶ Once homogeneous, add anionic surfactants with mixing. It is important to first add the amphoteric and nonionics, in then, the anionic to avoid compatibility issues.
- ▶ Add remaining ingredients (preservatives, perfume...).
- ▶ Adjust pH.
- ▶ Add salt.

### Alternative formulation procedure for Jaguar dispersion

- ▶ Disperse cationic Jaguar powder into a solvent (i.e.: Propylene Glycol...) or perfume of the formulation as a pre-mix.
- ▶ This pre-mix is added to main tank containing all the surfactants.





# SOLVAY way

The way we do business

Solvay puts into practice a sustainable development policy called **Solvay Way** because we are convinced our future is dependent upon the responsible way in which we conduct our current activities — a way that reflects our commitment to each of our stakeholders. **Solvay Way** encompasses three interlinked, equally important spheres: the Environment Sphere, the People Sphere and the Economic Sphere.

Based on a framework of responsibilities, **Solvay Way** allows Solvay sites and businesses to conduct self-assessments of their practices and establish action plans that promote continuous progress. At Solvay, the way we do business creates sustainable value for all our stakeholders through innovation and partnership.



> Responsible Care is the chemical industry's voluntary continuous improvement initiative to promote safe handling of products. (1987)



> The UN's Global Compact aims to ensure that heads of companies promote and uphold 10 universal principles concerning human rights, working conditions, respect for the environment and anti-corruption. (2003)



> The International Federation of Chemical, Energy, Mine and General Workers' Unions. (2005)



> Solvay Novecare has achieved world-wide ISO-9001 Quality Management System Multi-Site Certification. (2008)



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## Asia Pacific

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