



# ECOSURF™ SA Surfactants

New High-Performance, Seed Oil-Based  
Nonionic Surfactants with Excellent  
Environmental and Handling Properties



Seed Oil-Based Surfactants



## ECOSURF™ SA Surfactants

### **New, high-performance nonionic surfactants that address your needs for more ecologically-friendly products that deliver excellent performance**

New ECOSURF™ SA Surfactants are a new generation of patented, biodegradable nonionic surfactants that meet most environmental and handling safety standards world-wide, while offering excellent performance and economics across a wide range of parameters. ECOSURF™ SA Surfactants offer significant advantages in handling, processing and formulation. And they are based on seed oil. They are ideal candidates for a broad range of applications. ECOSURF™ SA Surfactants are effective in paints and coatings, and household and industrial and institutional cleaners, especially hard surface cleaners and low-foaming laundry products.

In today's highly competitive environment, where a single surfactant must address myriad requirements across the globe, ECOSURF™ SA Surfactants are a natural choice.



### **Based on Seed Oil Hydrophobe Sources**

ECOSURF™ SA Surfactants are based on naturally occurring seed oil alcohols. These hydrophobe sources can help address your need to formulate with functional ingredients derived from plant sources.

### **Excellent Environmental Profile**

ECOSURF™ SA Surfactants are excellent candidates for use in "green" products such as environmentally friendly cleaners. They are readily biodegradable, per the OECD 301 test. They do not pose any requirement for environmental classification or special labeling for formulated products sold almost anywhere in the world. ECOSURF™ SA Surfactants have an aquatic toxicity range of >1 mg/L in the most sensitive species. And they are not a source of VOCs (Volatile Organic Compounds).

### **High Performance**

While other environmentally-friendly surfactants may fall short of some performance benchmarks, ECOSURF™ SA Surfactants come with a surprisingly powerful array of capabilities. According to Dow internal studies, they provide excellent surface tension reduction, no gel formation at any aqueous solution concentration, excellent wetting, and low foam. They provide excellent detergency. ECOSURF™ SA Surfactants also display very good solubility in a wide range of common formulation electrolytes and solvents.



## ECOSURF™ SA Surfactant

### Products



Table 1 – Typical Properties<sup>1</sup> of ECOSURF™ SA Surfactants

	ECOSURF™ SA-7	ECOSURF™ SA-9
Actives Content, wt%	100	100
Solvent	None	None
Appearance	Colorless, clear to slightly hazy	Colorless, clear to slightly hazy
Cloud Point, 1% aqueous solution, °C	37	57
HLB	10-12	11-13
Viscosity at 40°C (104°F), cSt	21.8	30.2
Density at 40°C (104°F), g/mL	0.9599	0.9831
Pour Point, °C (°F)	4 (39)	4 (39)

<sup>1</sup>Typical properties, not to be construed as specifications

## ECOSURF™ SA-9 Surfactant

ECOSURF™ SA-9 Surfactant is a water-soluble modified alcohol ethoxylate based on seed oil alcohol. Our studies show this surfactant is the right choice for laundry detergents, providing rapid wetting and detergency comparable to widely-used ethoxylated primary alcohols and nonylphenol ethoxylates. ECOSURF™ SA-9 Surfactant has an excellent aquatic toxicity profile and is readily biodegradable based on the OECD 301 test. Its lower foaming profile is ideal for front-loader fabric detergents. ECOSURF™ SA-9 is even more electrolyte-tolerant than ECOSURF™ SA-7, and offers the same excellent surface tension reduction and pourability. Relevant application areas include hard surface cleaners, detergents, prewash spotters, paper processing, textile processing, and paints and coatings.

The line of ECOSURF™ SA Surfactants currently includes two products, ECOSURF™ SA-7 Surfactant and ECOSURF™ SA-9 Surfactant.

## ECOSURF™ SA-7 Surfactant

ECOSURF™ SA-7 Surfactant is a water-soluble modified alcohol ethoxylate that offers excellent performance in a variety of applications and has good solubility in a wide range of electrolytes and solvents. This product, based on a seed oil alcohol, has an excellent aquatic toxicity profile and is readily biodegradable based on the OECD 301 test. Dow studies indicate that it provides exceptional wetting and detergency, excellent rinsability, exceptional handling properties, no aqueous gel range and low odor. ECOSURF™ SA-7 is used in cleaners and detergents, prewash spotters, paper and textile processing, and paints and coatings.



## Performance of ECOSURF™ SA Surfactants

ECOSURF™ SA Surfactants offer an extraordinarily well-rounded package of performance properties compared to many types of surfactants, including most linear and branched primary alcohol ethoxylates.

Dow internal studies show that ECOSURF™ SA Surfactants provide excellent surface tension reduction, excellent wetting, and rapid collapsing foam. These products do not form gels at any aqueous solution concentration, so they're easier to handle and formulate with across a broad range of processing conditions. ECOSURF™ SA Surfactants provide excellent detergency. They also display versatile solubility characteristics in a wide range of common formulation electrolytes, solvents and other surfactants, including anionic, cationic and nonionic. These surfactants are chemically stable in the presence of many non-oxidizing acids and dilute caustic solutions.



**Table 2 – Performance Properties<sup>1</sup> of ECOSURF™ SA Surfactants**

	ECOSURF™ SA-7	ECOSURF™ SA-9
Equilibrium Surface Tension, <sup>2</sup> dynes/cm	29	29
Critical Micelle Concentration, ppm	17	22
Draves 20 Sec Wetting Concentration, wt % at 25°C (77°F)	0.06	0.06
Ross-Miles Foam Test, Initial/5 min, 0.1 wt% at 25°C (77°F)	100/20	100/20

<sup>1</sup>Typical properties, not to be construed as specifications

<sup>2</sup>Measured at 0.1 wt% and 25°C (77°F)

**Table 3 – Electrolyte Solubility**

Maximum Electrolyte Concentration (weight %) in which ECOSURF™ SA-7 and SA-9 Surfactants are Soluble (1% Surfactant in Water)

	Na <sub>2</sub> CO <sub>3</sub>	NaOH	Na <sub>2</sub> SO <sub>4</sub>	TKPP	Na citrate	Na <sub>2</sub> SiO <sub>3</sub>	NaCl	H <sub>3</sub> PO <sub>4</sub>	Citric acid	CaCl <sub>2</sub>
ECOSURF™ SA-7	2	2	2	4	5	6	5	>20	>20	>20
ECOSURF™ SA-9	5	6	7	10	11	14	15	>20	>20	>20

TKPP - tetrapotassium pyrophosphate

## Fast Wetting Performance

Dow tests show that ECOSURF™ SA-9 Surfactant provides fast fabric wetting, as shown in Figure 1. ECOSURF™ SA-9 wets twice as fast as primary alcohol ethoxylate surfactants and 25% faster than nonylphenol ethoxylates with similar cloud points. This accelerated wetting can improve cleaning performance, reduce cycle times for manufacturing processes and reduce the amount and cost of surfactant used in a formulation.

This fast wetting time is affirmed by the greater spread index of ECOSURF™ SA-9 Surfactant versus the other surfactants shown in Figure 2 (Dow internal test data).

The dynamic surface tension data in Figure 3, generated by Dow internal studies, are further confirmation of the excellent wetting provided by ECOSURF™ SA Surfactants. In applications requiring fast diffusion of the surfactant to surfaces, ECOSURF™ SA Surfactants provide fast wetting relative to the detergency range PAEs and NPEs.

## Excellent Detergent Performance

Figure 4 compares detergency performance of ECOSURF™ SA-9 Surfactant and a number of other nonionic surfactants. In this Dow test, ECOSURF™ SA-9 Surfactant shows very good detergency in comparison to nonionics recognized for this capability, and significantly higher detergency levels than several other alternatives. The ECOSURF™ SA Surfactants offer excellent removal of soils at low concentrations.

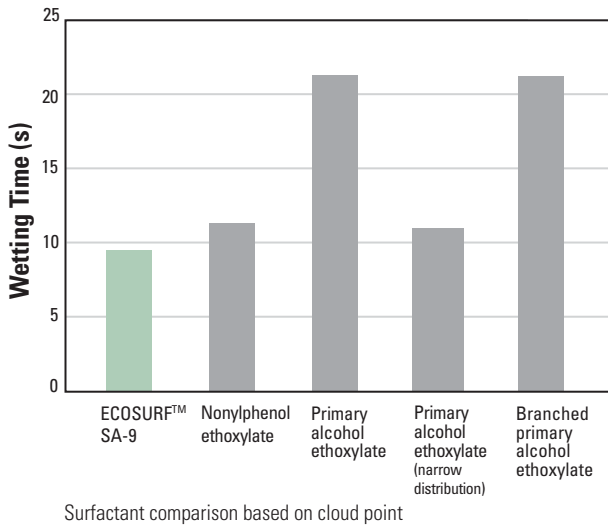
## Low Foaming Profile

ECOSURF™ SA Surfactants are moderate foaming materials that also feature very rapid foam collapse. Figure 5 displays Ross-Miles foam profiles obtained by Dow laboratory testing for ECOSURF™ SA-7 and SA-9 Surfactants as well as other products. This foaming property makes ECOSURF™ SA Surfactants excellent candidates for front-loading fabric detergents and hard surface cleaners that must minimize both foam generation and persistence. The rapid foam collapse can also improve rinsability. The foam profile is even lower with more rapid collapse at higher temperatures. They can help improve formulation efficiency and reduce or eliminate the need for foam control agents.



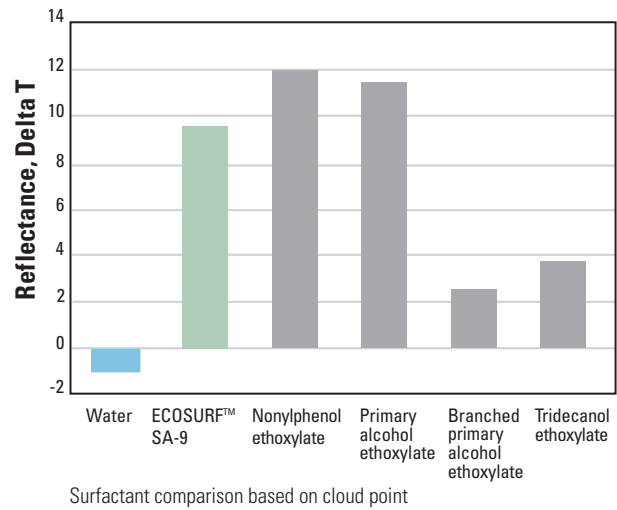
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**Figure 1 – Draves Wetting Performance, 0.05% Aqueous Surfactant at 25°C**

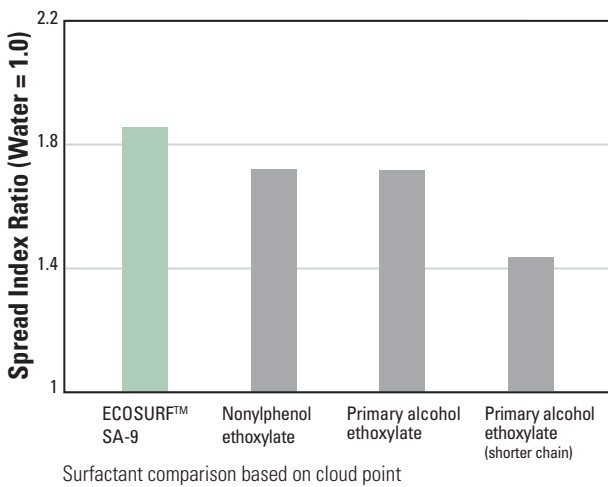


**Figure 4 – Detergency of Nonionic Surfactants in Model Laundry Evaluation**

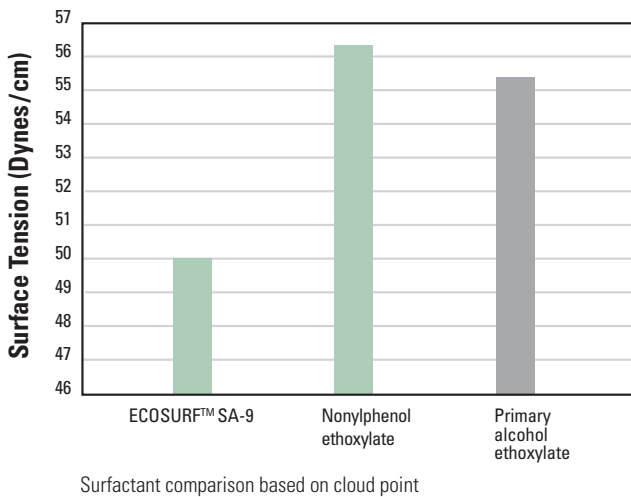
Tergotometer Delta Reflectance; Sebum/Pigment (STC EMPA 119)  
300 ppm actives, synthetic HDL Formula



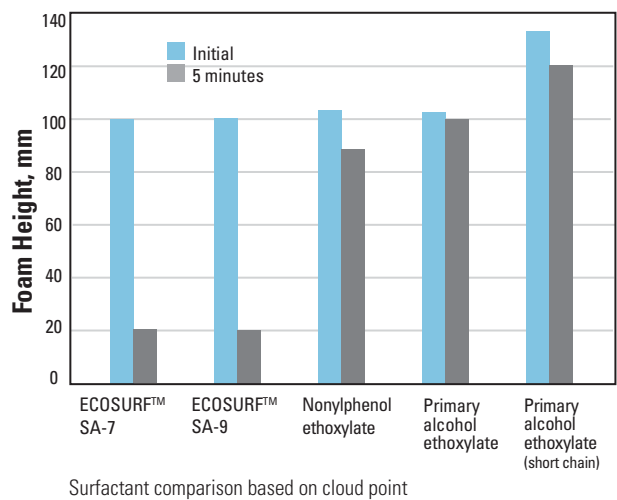
**Figure 2 – Spread Indices of Nonionic Surfactants, 0.1% Surfactant at 25°C**



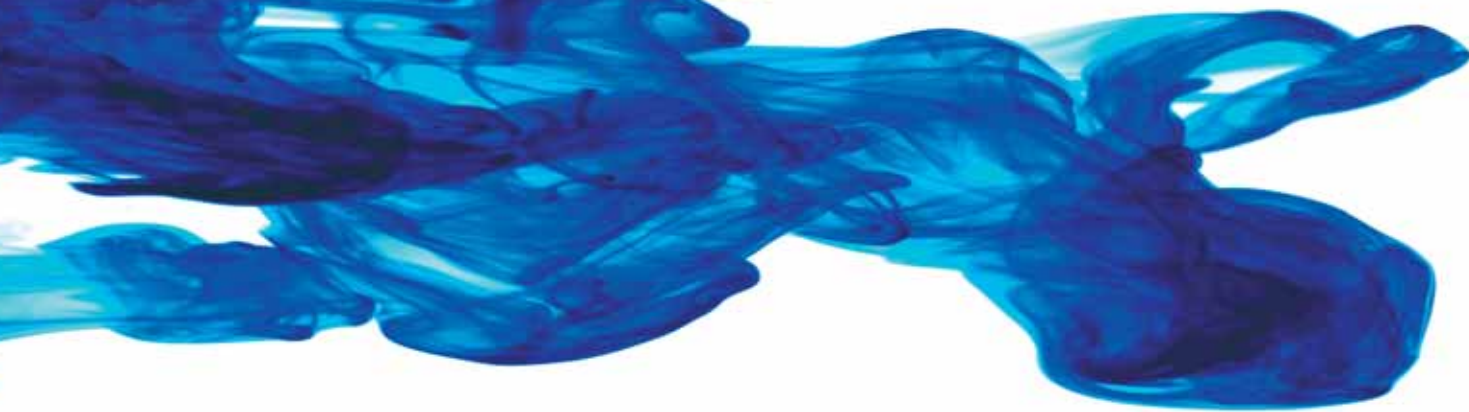
**Figure 3 – Dynamic Surface Tension at 10 mSec Surface Age, 1000 ppm Aqueous Surfactant at 25°C**



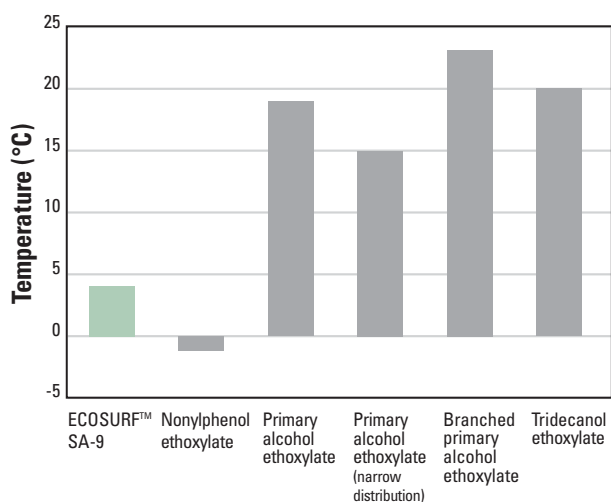
**Figure 5 – Comparative Ross-Miles Foam Profiles, 0.1% Surfactant at 25°C**





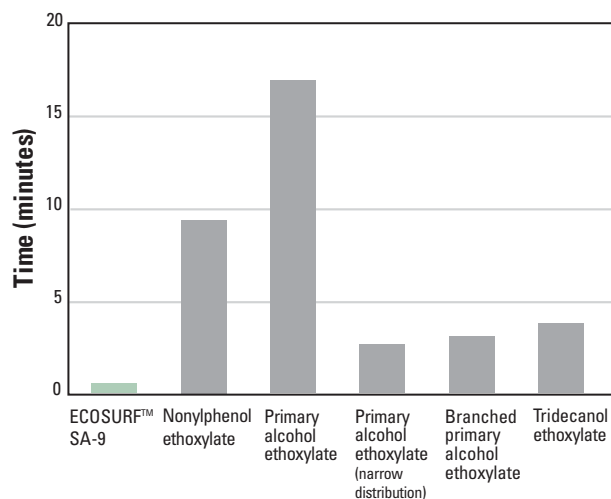


**Figure 6 – Pour Points of Nonionics**



Surfactant comparison based on cloud point

**Figure 7 – Dissolution Times**



## Easy Handling: Low Pour Point, Non-Gelling, and Fast-Dissolving

Among nonionic surfactants, ECOSURF™ SA Surfactants stand out as easy to store, handle, and incorporate into formulations. These products have improved handling due to their lower viscosity profiles, making them easier to pump, pour and blend. They are ideal choices for concentrates and systems designed for use with cold water or in cold environments.

ECOSURF™ SA Surfactants have very low pour points and require less heated storage than many alternatives. See the Dow test data in Figure 6. In addition, ECOSURF™ SA-7 and SA-9 Surfactants do not form gels at any mix ratio of surfactant and water.

The Dow test results seen in Figure 7 show that ECOSURF™ SA Surfactants dissolve very rapidly. This property speeds processing and reduces mixing energy requirements. These surfactants yield excellent performance in bucket-dilutable products.

## Hard Surface Cleaning Performance

Figure 8 provides comparisons of the hard surface cleaning performance of ECOSURF™ SA Surfactants to other nonionic surfactants. This test, conducted by Dow, evaluates the effectiveness of a surfactant solution on vinyl tiles coated with canola oil crosslinked with carbon black. As shown, the ECOSURF™ SA-7 Surfactant provides cleaning performance equal or superior to the alternatives including the tridecanol ethoxylates and the primary alcohol ethoxylates.

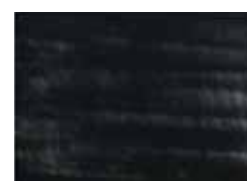
**Figure 8 – Cleaning Performance of Surfactants on Vinyl Tile Coated with Canola Oil Crosslinked with Carbon Black**



ECOSURF™ SA-7



Primary alcohol ethoxylate

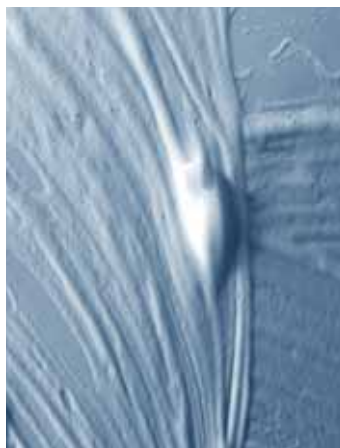


Tridecanol ethoxylate

60 strokes, Gardner Scrubber  
Surfactant comparison based on cloud point



## Starting Cleaning Formulations



### Formulations for ECOSURF™ SA-7 Surfactant

#### Hard Surface Cleaner

Ingredients	Percent by Weight
DOWANOL™ PnP Glycol Ether	5.0
ECOSURF™ SA-7 Surfactant	5.0
VERSENE™ 100 Chelating Agent	4.0
Monoethanolamine	4.0
Water	balance

**Preparation:** Add ingredients in order listed to water. Add fragrance and dye as desired.

#### Car Wash Detergent

Ingredients	Percent by Weight
ECOSURF™ SA-7 Surfactant	4.7
TRITON™ H-66 Surfactant	7.7
K or Na silicate	4.7
Water	balance

**Preparation:** Dissolve silicate in water. Add TRITON™ H-66 Surfactant and ECOSURF™ SA-7 Surfactant with gentle agitation. Dye and fragrance may be added as desired.

#### Carpet Cleaner

Ingredients	Percent by Weight
ECOSURF™ SA-7 Surfactant	10.0
Acetic Acid	5.0
DOWANOL™ PnP Glycol Ether	10.0
Water	balance

**Preparation:** Add ingredients in order listed to water. Add fragrance and dye as desired.

### Formulations for ECOSURF™ SA-9 Surfactant

#### Hard Surface Cleaner

Ingredients	Percent by Weight
DOWANOL™ PnP Glycol Ether	5.0
ECOSURF™ SA-9 Surfactant	5.0
VERSENE™ 100 Chelating Agent	4.0
Monoethanolamine	4.0
Water	balance

**Preparation:** Add ingredients in order listed to water. Add fragrance and dye as desired.

#### Car Wash Detergent

Ingredients	Percent by Weight
ECOSURF™ SA-9 Surfactant	4.7
TRITON™ H-66 Surfactant	7.7
K or Na silicate	4.7
Water	balance

**Preparation:** Dissolve silicate in water. Add TRITON™ H-66 Surfactant and ECOSURF™ SA-9 Surfactant with gentle agitation. Dye and fragrance may be added as desired.

#### Carpet Cleaner

Ingredients	Percent by Weight
ECOSURF™ SA-9 Surfactant	10.0
Acetic Acid	5.0
DOWANOL™ PnP Glycol Ether	10.0
Water	balance

**Preparation:** Add ingredients in order listed to water. Add fragrance and dye as desired.

## Performance in Paints and Coatings

ECOSURF™ SA Surfactants offer a distinct combination of dispersing and wetting properties with excellent handling performance in a product based on seed oil. ECOSURF™ SA Surfactants have excellent wetting properties, with low equilibrium surface tension and rapid dynamic surface tension reduction. These surfactants feature no aqueous gelling, rapid dissolution even in cold water, fast foam collapse and favorable formulating and handling properties, making them ideal for many paint, coating and ink systems. They are especially suited to pigment wetting and stabilization.

ECOSURF™ SA Surfactants were utilized in a gloss (Acrylic UCAR™ LATEX Formulation E-2251C), semigloss (Acrylic UCAR™ LATEX Formulation E-2467), and flat (Vinyl Acrylic UCAR™ LATEX Formulation E-2284) paint formulation replacing conventional nonionic surfactants.

**Table 4 – Ecosurf™ SA Surfactant Performance in Formulated Paints**

	Nonionic Surfactant	ECOSURF™ SA-7	ECOSURF™ SA-9
<b>Gloss Film</b>			
Gloss, 60°	79.4	80.2	79.2
Gloss, 20°	33.2	34.1	36
Flow & Leveling	Excellent	Excellent	Excellent
Tint Strength %	54.63/55.09	55.10/55.76	54.90/54.99
Contrast Ratio, %	99.09	99.05	99.47
<b>Semigloss Film</b>			
Gloss, 60°	43.3	40.3	47.8
Gloss, 20°	9.5	13.2	16.7
Flow & Leveling	Excellent	Excellent	Excellent
Tint Strength %	52.76/52.76	52.48/52.43	52.47/52.21
Contrast Ratio, %	99.14	99.2	98.89
<b>Flat Film</b>			
Gloss, 60°	2.6	2.5	2.6
Gloss, 20°	1.4	1.4	1.4
Flow & Leveling	Excellent	Excellent	Excellent
Tint Strength %	33.25/34.44	33.18/33.31	33.10/33.51
Contrast Ratio, %	85.85	86.18	85.68

Gloss - ASTM D-523-85  
 Flow & Leveling - ASTM D4062-88  
 Tint Strength - Y Value / Y Rub-up  
 Contrast Ratio - ASTM D-2805-96A

The ECOSURF™ SA Surfactants, based on seed oil hydrophobes, show no loss in performance compared to conventional nonionic surfactants used in paints and coatings. In fact, they have a positive impact on minimum film formation temperature. At the same time, they reduce costs through faster dissolution and reduced cycle times. Since they are based on seed oil alcohols and create no VOC emissions, ECOSURF™ SA Surfactants also give paint systems an improved overall environmental profile.



## Applications

ECOSURF™ SA-7 and SA-9 Surfactants are candidates for use in a variety of applications including:

### Agrochemicals

- Emulsification and dispersion in agricultural insecticides and herbicides

### Cleaning Products

- Hard Surface Cleaners
  - All purpose cleaners
  - Bucket dilutable cleaners
  - Concentrates
  - Disinfectants
  - Janitorial products
- Transportation cleaners
- Metal Cleaners
- Laundry Products
  - Pre-wash spotters
  - Front loader laundry detergents
  - Concentrates

### Paints and Coatings

- Wetting agent
- Dispersant

### Paper Processing

### Textile Processing

- Emulsifier for fiber lubricants
- Wetting agent

### Oil and Gas



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# ECOSURF™ SA Surfactants



## To Learn More...

To learn more about ECOSURF™ SA Surfactants, and the full line of anionic and nonionic surfactants from Dow—or to receive product samples—contact the Dow location for your region, listed below.

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