



ECOSURF™ LF SPECIALTY SURFACTANTS

Alkylphenol Ethoxylate (APEO)-Free, Low Foam Surfactants
Offering Excellent Wetting and Easy Handling

LF

ECOSURF™ LF SURFACTANTS

Readily Biodegradable* Low Foam Alternatives to Alkylphenol Ethoxylate (APEO)-based Surfactants

ECOSURF™ LF Surfactants are non-Alkylphenol Ethoxylate (APEO)-based nonionic materials that offer excellent wetting and a low foam profile in a readily biodegradable surfactant. They are an easy-to-handle alternative to APEO-based surfactants in applications including paints & coatings, textiles, pulp & paper, inks & adhesives, and other applications.

Included are three product grades—ECOSURF™ LF-20, ECOSURF™ LF-30 and ECOSURF™ LF-45—all offering similar or improved performance compared to APEO-based surfactants and other low foam surfactants. Unlike some low foam products, ECOSURF™ LF products have no gel range, which makes formulation and handling easier. ECOSURF™ LF-30 and ECOSURF™ LF-45 offer rapid dissolution for additional formulating and processing versatility.

Applications

ECOSURF™ LF Surfactants are excellent alternatives to APEO-based surfactants and other low foam materials in applications including:

- Paints & Coatings
- Textiles
- Pulp & Paper
- Inks & Adhesives
- Food & Dairy Cleaning
- Industrial Hard Surface Cleaning
- Rinse Aids
- Concentrate Formulations



ECOSURF™ LF Surfactants – Typical Physical Properties¹

	ECOSURF™ LF-20	ECOSURF™ LF-30	ECOSURF™ LF-45
Actives, wt %	100	100	100
Solvent	None	None	None
Appearance	Pale yellow Liquid	Pale yellow Liquid	Pale yellow Liquid
Cloud Point, 1% Aqueous (°C)	17-24	26-34	40-49
HLB	10-11	11-12	12-13
Viscosity at 40°C (104°F), cS	41	36	50
CMC, ppm	26	26	36
Pour Point, °C	-23	-7	6
Density at 25°C (77°F), g/mL	0.9931	0.995	1.0129

¹Typical properties, not to be construed as specifications

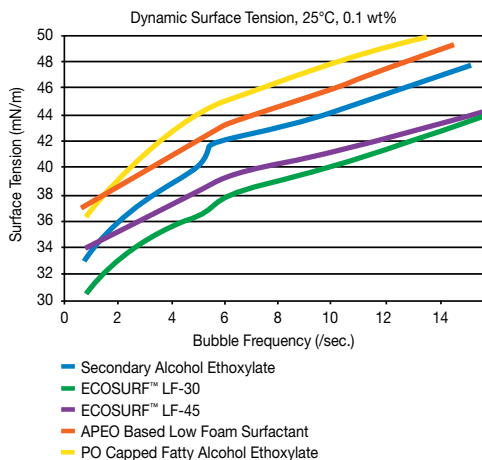
Performance Advantages**

As alternatives to APEO-based surfactants, ECOSURF™ LF Surfactants offer a number of favorable performance properties.

Dynamic Surface Tension Reduction

ECOSURF™ LF Surfactants exhibit low dynamic surface tension compared to APEO-based surfactants as well as Secondary Alcohol Ethoxylates (SAEs) as shown in Figure 1. Lower surface tension can help reduce surfactant requirements.

Figure 1 – Dynamic Surface Tension Reduction



ECOSURF™ Surfactants are marketed under the TERGITOL™ brand in Canada and Japan
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* > 60 percent biodegradable within 28 days per OECD 301F

**Tests referenced in Figures 1-8 were performed by Dow in a Dow Laboratory

Excellent Wetting

Wetting performance is also improved compared to common low foam surfactants as shown in Figure 2.

Low Foam/Defoamer

The low foam performance of ECOSURF™ LF Surfactants compares favorably with traditional low foam surfactants as demonstrated in the shake height comparison shown in Figure 3. In addition, ECOSURF™ LF Surfactants contribute to defoaming during pigment dispersion for additional foam control.

No Gel Range

Unlike other ethoxylates, ECOSURF™ LF Surfactants do not form gels when combined with water, which makes them easy to pump, pour and blend during formulation and processing. Concentrates are also easy to formulate. See Figure 4.

Rapid Dissolution

As shown in Figure 5, ECOSURF™ LF-30 and LF-45 dissolve more quickly in water than Nonylphenyl Ethoxylates (NPE) and Primary Alcohol Ethoxylates (PAE), which can mean faster processing and aid in the dissolution of concentrated formulations.

Caustic Stability

Unlike some low foaming surfactants, ECOSURF™ LF Surfactants are chemically stable in combination with caustic. Both cloud point and foam profiles remain constant in the presence of caustic.

Readily Biodegradable

ECOSURF™ LF Surfactants are readily biodegradable according to OECD 301F. All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30. This product contains a substance that will be subject to a TSCA Section 5 (a) (2) Significant New Use Rule (SNUR) and export notification under TSCA 12(b). Architectural coating formulation processes that operate under zero discharge of wastewater should not trigger the SNUR conditions but each user should assess their operations to assure compliance. The SNUR will limit release to water to no greater than 14 ppb as calculated after wastewater treatment. The total removal during wastewater treatment is estimated to be > 90% based on Episuite models and demonstrated ready biodegradability. In addition, the EPA does not expect significant adverse environmental effects during the uses stated in the PMN submission. These uses included formulation at less than 1% in industrial, commercial and consumer architectural coatings. TSCA 12(b) export notification is not needed when this substance is present in mixtures less than 1%.

Figure 2 – Draves Wetting Comparison of Common Low Foam Surfactants

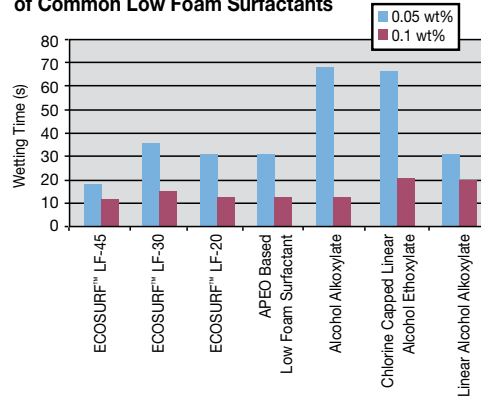


Figure 3 – Shake Foam Height Comparison of Common Low Foam Surfactants

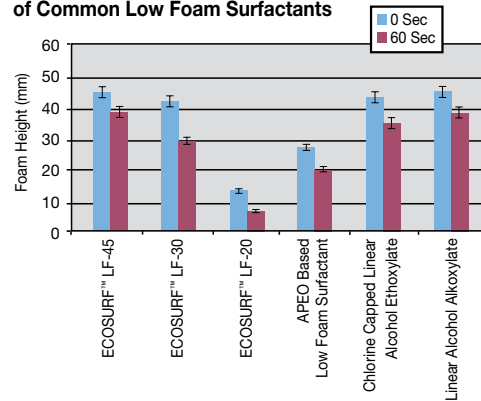


Figure 4 – Gel Formation of Common Surfactants vs ECOSURF™ LF Surfactants

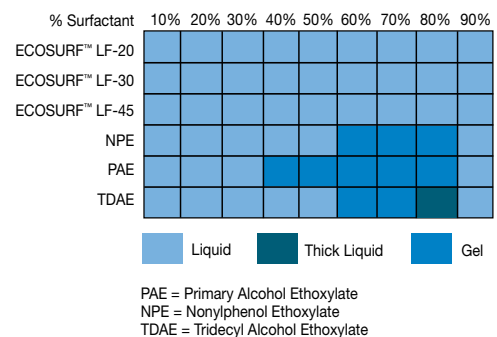
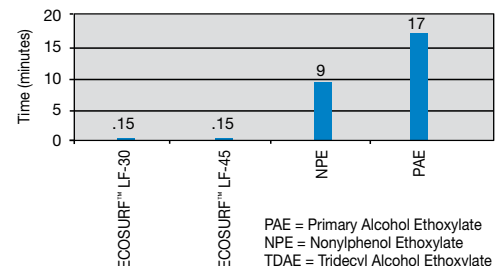


Figure 5 – Dissolution Time



Application Performance

Paints & Coatings Performance

ECOSURF™ LF Surfactants can provide excellent pigment wetting, improved color acceptance and improved flow in paint and coating formulations. Figure 6 illustrates rub up color acceptance for a blend of phthalo blue and yellow oxide universal colorant.

Delta E shows the color difference between the rubbed area and Drawdown. (Lower numbers indicate improved color acceptance.) ECOSURF™ LF surfactants give color acceptance that is similar or improved as compared to the Alkylphenol Ethoxylate (APEO) low foam surfactant.

ECOSURF™ LF Surfactants effectively minimize foam during pigment addition and dispersion. When matched with the correct

dispersant, ECOSURF™ LF Surfactants further enhance low foam performance during pigment dispersion through cloud point defoaming. As shown in Figure 7, when vials of surfactants in a solution of TAMOL™ 731A dispersant were shaken and photographed to measure foam height, ECOSURF™ LF-30 had low initial foam after shaking and even lower foam above its cloud point.

Hard Surface Cleaning Comparison

ECOSURF™ LF Surfactants compare favorably to APEO-based low foam surfactants as well as other surfactant materials as shown in Figure 8.

Figure 6 – Color Acceptance of Low Foam Surfactants

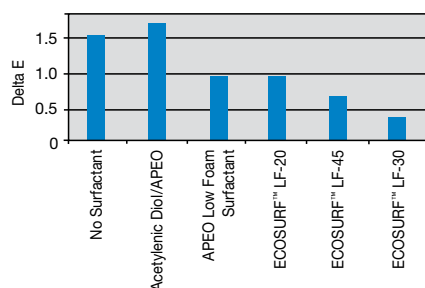


Figure 7 – Surfactant Foam Test

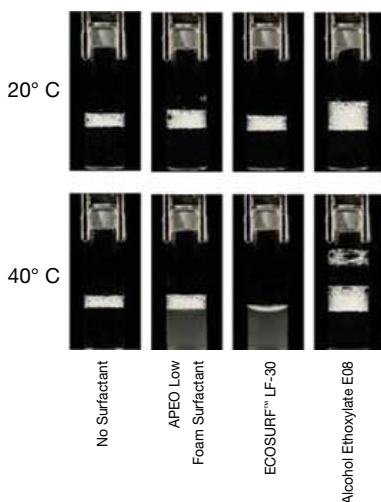
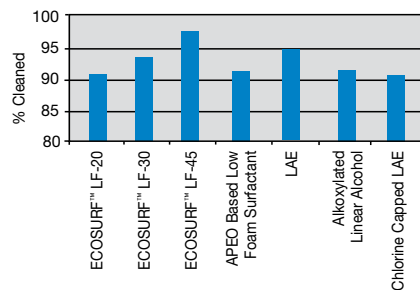


Figure 8 – Hard Surface Cleaning Comparison



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