



# Formulator Report:

## Emulsun<sup>®</sup> Improves Emulsions, Skin Hydration & Product Texture



**Emulsun increases skin hydration, reduces TEWL, and increases flexibility of product aesthetics.**

**Emulsun** [INCI: Hydrogenated Sunflower Seed Oil Polyglyceryl-3 Esters (and) Hydrogenated Sunflower Seed Oil Glyceryl Esters (and) Cetearyl Alcohol (and) Sodium Stearoyl Lactylate] is a sunflower-derived o/w emulsifier, in particle form, that can be utilized in skin and hair care applications. This versatile emulsifier helps create stable, aesthetically pleasing emulsions.

**Typical Usage Levels:** 3 - 8%

**Typical Oil Loading Levels:** 15 - 40%

### Compatibilities:

- Triglyceride oils, esters, silicones, sunscreens<sup>1</sup>, ethanol (up to 10%)
- A variety of rheology modifiers and thickeners, including xanthan gum, polymeric thickeners and stabilizers, and cellulose
- pH tolerance of 4 - 11

### How to Use Emulsun:

Add Emulsun to the oil phase. Heat both the oil and aqueous phases to 75-80°C. Combine the oil and aqueous phases with moderate to rapid mixing or homomixing. Reduce mixing speeds at temperatures below 60°C. When adding other ingredients (*e.g.*, fragrance, preservatives, *etc.*) below 40°C, disperse briefly with slow to moderate mixing, as over mixing may cause a loss of viscosity.

### Formulation Benefits:

- PEG-free
- HLB independent
- Preservative-free
- Biodegradable<sup>2</sup>
- Low cost
- Easy to handle particles
- Low odor and color
- Oxidatively stable
- Sensory appeal
- Liquid crystal structure

### Clinical Study Facts<sup>3</sup>:

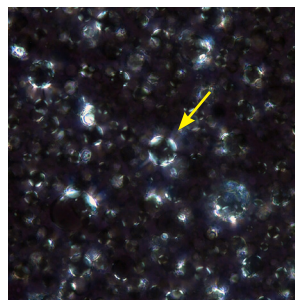
In double-blind, vehicle-controlled, randomized clinical studies, Emulsun produced the following benefits:

- **Increased skin hydration up to 1.2 times more** than other emulsifiers (**Figure 1**)
- **Reduced TEWL up to 6.4 times more** than other emulsifiers (**Figure 2**)
- **Allowed for a variety of product aesthetics** by changing the loading level (**Figure 3**)
- Allowed for the inclusion of **sunscreen actives with minimal effect on product aesthetics** (**Figure 4**)
- **Provided similar product aesthetics** as other emulsifiers (**Figures 5-7**)

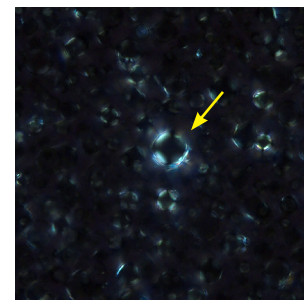
### Purpose:

The purpose of this investigation was to evaluate Emulsun in an o/w emulsion compared to other emulsifiers for its ability to increase skin hydration, reduce TEWL, and provide a variety of product aesthetics.

**Emulsun**



**Standard**



### Liquid Crystal Structure in an o/w Emulsion:

The specific combination of the hydrophilic and hydrophobic structures in Emulsun generates a self-assembling hexagonal liquid crystal phase (noted by yellow arrows above) with oil in water formulations that can be witnessed during cooling. (40x magnification / 90° cross polarization)<sup>4</sup>

1. Cargill has not tested Emulsun in final OTC drug formulations. Compliance with FDA regulations is the responsibility of the customer.

2. Biodegradable according to OECD 301B.

3. Final Reports available upon request. Figures can be found on the next two pages of this document.

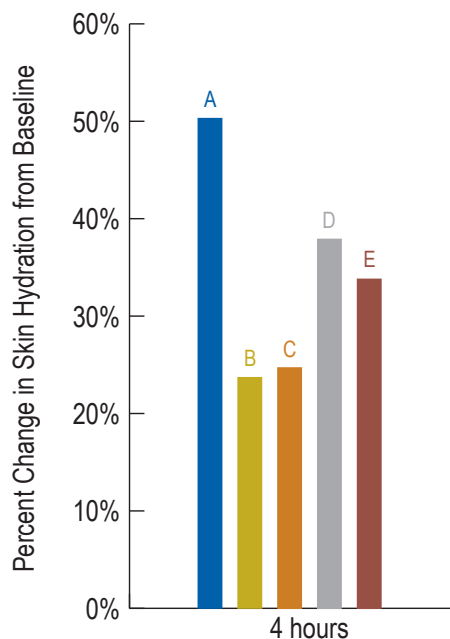
4. Images were captured using a Nikon Optiphot-Pol microscope. The following article was used as a reference for liquid crystal structure and the standard: [https://file.scirp.org/pdf/JCDSA\\_2013061315451746.pdf](https://file.scirp.org/pdf/JCDSA_2013061315451746.pdf).

## Figures<sup>5</sup>:

### Increased Skin Hydration and Reduced TEWL:

Emulsifiers were compared within an o/w emulsion with 20% oil for skin hydration and TEWL<sup>6</sup> (n=18). The results appear below in Figures 1 and 2.

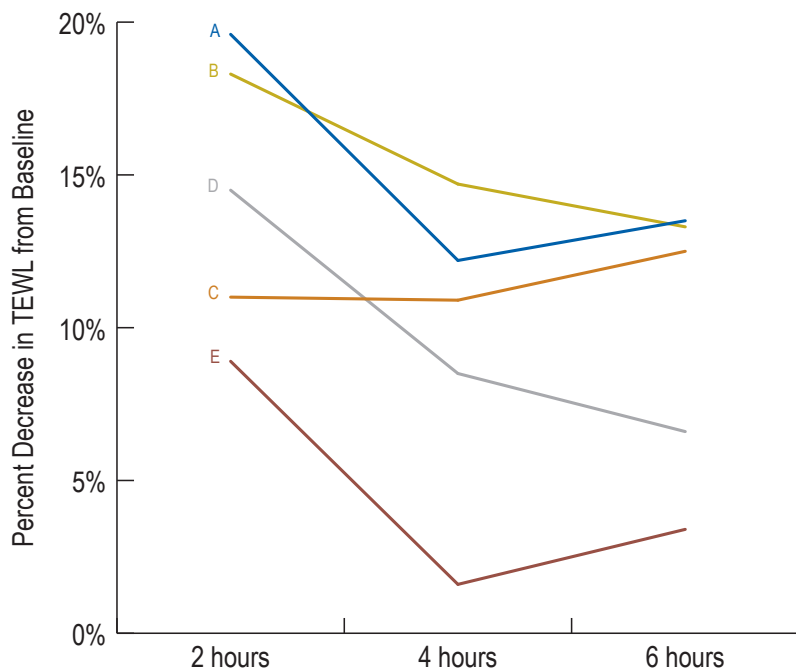
#### Emulsun Increased Skin Hydration



**Figure 1.** The inclusion of **6% Emulsun** increased skin hydration up to 1.2 times more than other emulsifiers.<sup>7</sup> (See Claim Sheet 18-115.)

■ A - 6% Emulsun  
■ B - 6% Cetearyl Alcohol / Ceteareth-20  
■ C - 6% Cetearyl Oliviate / Sorbitan Oliviate  
■ D - 6% Candellilla/Jojoba/Rice Bran Polyglyceryl-3 Esters / Glyceryl Stearate / Cetearyl Alcohol / Sodium Stearoyl Lactylate  
■ E - 6% Glyceryl Stearate / PEG-100 Stearate / Cetearyl Alcohol

#### Emulsun Reduced TEWL



**Figure 2.** The inclusion of **6% Emulsun** decreased TEWL up to 6.4 times more than other emulsifiers.<sup>8</sup> (See Claim Sheet 18-116.)

— A - 6% Emulsun  
— B - 6% Cetearyl Alcohol / Ceteareth-20  
— C - 6% Cetearyl Oliviate / Sorbitan Oliviate  
— D - 6% Candellilla/Jojoba/Rice Bran Polyglyceryl-3 Esters / Glyceryl Stearate / Cetearyl Alcohol / Sodium Stearoyl Lactylate  
— E - 6% Glyceryl Stearate / PEG-100 Stearate / Cetearyl Alcohol

5. All studies were conducted double-blind, vehicle-controlled, and randomized.

6. Skin hydration and TEWL measurements were captured using the Corneometer CM 825 and Tewameter TM 300, respectively; both instruments are products of Courage+Khazaka (Köln, Germany).

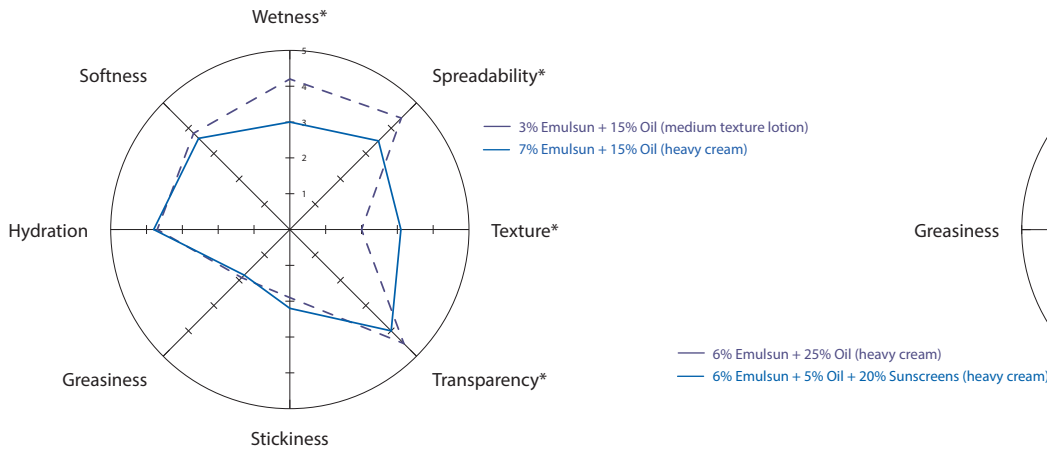
7. The test article with Emulsun resulted in a statistically significant ( $p < 0.05$ ) increase in skin hydration from baseline, as compared to Cetearyl Alcohol / Ceteareth-20, Glyceryl Stearate / PEG-100 Stearate / Cetearyl Alcohol, Cetearyl Oliviate / Sorbitan Oliviate, and Candellilla/Jojoba/Rice Bran Polyglyceryl-3 Esters / Glyceryl Stearate / Cetearyl Alcohol / Sodium Stearoyl Lactylate 4 hours post test article application.

8. The test article with Emulsun resulted in a statistically significant ( $p < 0.05$ ) decrease in TEWL from baseline, as compared to Glyceryl Stearate / PEG-100 Stearate / Cetearyl Alcohol at all evaluation points post test article application, and as compared to Cetearyl Oliviate / Sorbitan Oliviate at the 2 hour evaluation point post test article application.

## Consumer Perception:

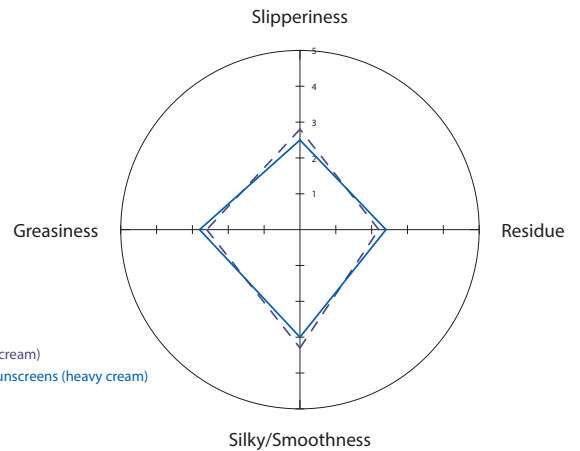
Emulsun was evaluated by female consumers (n=24-26) on a 1-5 scale for initial product observations and skin feel immediately after application. The higher the score, the more the listed attribute was perceived by consumers (e.g. a score of 5 for moisturization indicates moisturized skin, whereas a score of 1 indicates dry skin). For the texture attribute, a higher score indicates a thicker product. The results appear below in Figures 3-7.<sup>9</sup>

### Emulsun at 3% versus 7%



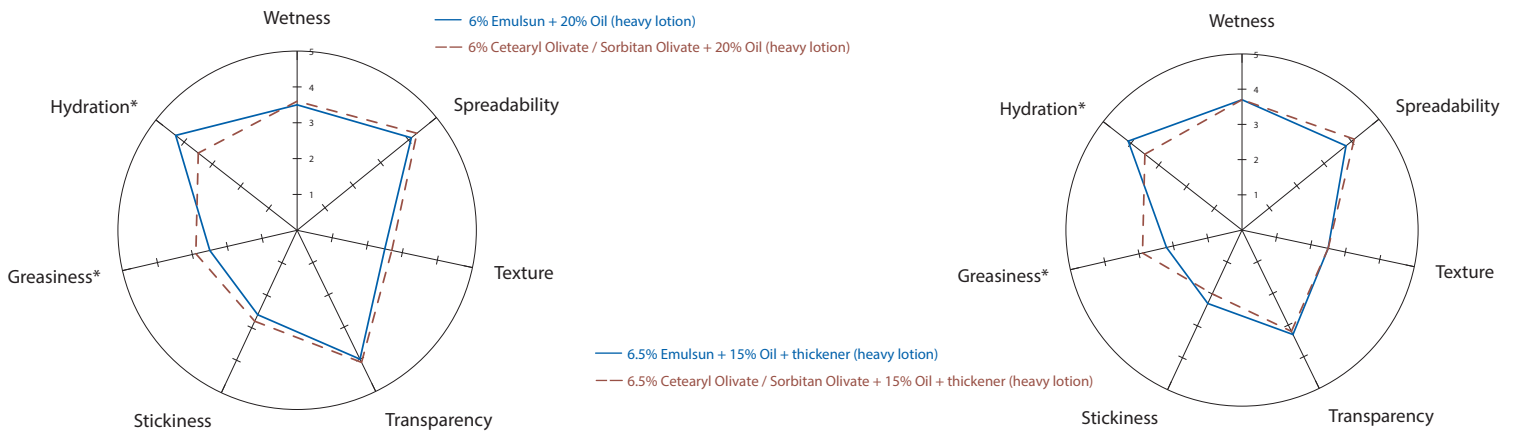
**Figure 3.** Emulsun allowed for the creation of a medium texture lotion to a heavy cream without affecting the stickiness or greasiness of the product.

### Emulsun with and without sunscreens



**Figure 4.** Emulsun allowed for the inclusion of sunscreens without noticeably affecting product aesthetics.

### Emulsun versus Cetearyl Oliviate / Sorbitan Oliviate



**Figures 5 and 6.** Emulsun allowed for the creation of similar product aesthetics, with less greasiness and more hydration, than Cetearyl Oliviate / Sorbitan Oliviate.

### Emulsun versus Blended Emulsifier

**Figure 7.** Emulsun allowed for the creation of a thicker product with similar product aesthetics and less odor than Candelilla/Jojoba/Rice Bran Polyglyceryl-3 Esters / Glyceryl Stearate / Cetearyl Alcohol / Sodium Stearoyl Lactylate (blended emulsifier).



9. p<0.05 between test articles where indicated (\*)

## Formula: PEG-Free, Silicone-Free Day Cream with L22 and Emulsun<sup>10</sup>

This light weight, hydrating facial cream is delicate enough for daytime wear under makeup and powerful enough to provide all day moisturization. Emulsun, a versatile naturally-derived PEG-free emulsifier, allows for viscosity and product feel customization, while also adding skin hydration and barrier function benefits. The use of Floramac 10 in this formulation imparts the skin with radiance, while L22 delivers its patented lipid profile of a healthy 22 year old. Additionally, the Floratech emollients (Florasun 90, Floraesters 15, and Floraesters 60) provide the moisturization and emolliency benefits to this superb formulation.

| Phase | Trade/Common Name               | INCI Name  | Manufacturer               | % wt./wt.     |
|-------|---------------------------------|--|----------------------------|---------------|
| A     | Deionized Water                 | Water  | -----                      | q.s.          |
|       | Glycerine 99.7% USP Kosher      | Glycerin   | Acme-Hardesty Co.          | 1.50          |
|       | Keltrol <sup>®</sup> CG-SFT     | Xanthan Gum  | CP Kelco                   | 0.20          |
| B     | Floramac <sup>®</sup> 10        | Ethyl Macadamiate  | Floratech                  | 5.30          |
|       | Florasun <sup>®</sup> 90        | Helianthus Annuus (Sunflower) Seed Oil   | Floratech                  | 3.00          |
|       | Floraesters <sup>®</sup> 15     | Jjoba Esters   | Floratech                  | 1.80          |
|       | L22 <sup>®</sup>                | Jjoba Oil/Macadamia Seed Oil Esters (and) Squalene (and) Phytosteryl Macadamiate (and) Phytosterols (and) Tocopherol   | Floratech                  | 3.50          |
|       | Floraesters 60                  | Jjoba Esters   | Floratech                  | 1.40          |
| C     | Emulsun                         | Hydrogenated Sunflower Seed Oil Polyglyceryl-3 Esters (and) Hydrogenated Sunflower Seed Oil Glyceryl Esters (and) Cetearyl Alcohol (and) Sodium Stearoyl Lactylate | Floratech                  | 6.50          |
| D     | Citric Acid, USP (10% Solution) | Citric Acid (and) Water  | Archer Daniels Midland Co. | q.s.          |
| E     | Fragrance <sup>11</sup>         | -----  | -----                      | q.s.          |
|       | Preservative <sup>12</sup>      | -----  | -----                      | q.s.          |
|       |                                 |  | <b>Total</b>               | <b>100.00</b> |

### Procedure:

1. Combine ingredients of Phase A at room temperature with rapid mixing. Once completely dispersed, heat to 75-80°C.
2. Combine all ingredients of Phase B in a separate vessel, start heating to 55-60°C, and slowly mix when the ingredients start melting.
3. Add the ingredients of Phase C to Phase B with moderate mixing and continue heating to 75-80°C.
4. Add Phase BC to Phase A at 75-80°C with moderate to slow mixing. When the mixture becomes smooth and uniform, begin cooling to 60-65°C.
5. Add Phase D to Phase ABC at 60-65°C with rapid to moderate mixing. When the mixture becomes uniform, shift the mixing speed to moderate to slow to avoid over mixing, and cool to 50-55°C.
6. At 50-55°C, add Phase E to Phase ABCD with sweep mixing. Adjust the weight with water (at 50-55°C) as needed.
7. Keep cooling to 40-45°C with moderate to slow mixing.

### Formula Properties:

| Property  | Result        |
|-----------|---------------|
| pH        | 5 - 6         |
| Viscosity | 136 - 247 kcP |

Ingredient Information  
24/7 Online

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[www.floratech.com/info](http://www.floratech.com/info)



Emulsun

10. INCI/Trade names must be verified with each manufacturer  
11. Fragrance: Aquatonic EE17-22201 supplied by Premier Specialties, Inc.  
12. Preservative: Euxyl<sup>®</sup> PE 9010 [INCI: Phenoxyethanol (and) Ethylhexylglycerin] supplied by Schülke & Mayr