



**SILTECH CORPORATION**  
225 Wicksteed Avenue  
Toronto, Ontario, Canada, M4H 1G5  
(416)424-4567 (Tel) (416)424-3158 (Fax)

TECHNICAL BULLETIN

**Silube<sup>®</sup> and Silsurf<sup>®</sup> Silicone  
Surfactants and HLB**

**DESCRIPTION**

**HLB (Hydrophile Lipophile Balance)** is a commonly used system for comparing the emulsifying power of organic surfactants. This system, devised by ICI many years ago, was primarily intended to compare non-ionic organic surfactants to one another.

**Silsurf<sup>®</sup> Silicone Surfactants** are the reaction of polydimethylsiloxane (silicone) and polyalkyleneoxide derivatives. When compared to organic non-ionic surfactants, these differ by having the hydrocarbon chain replaced by polydimethylsiloxane.

**Silsurf<sup>®</sup> Surfactants** are generally not effective emulsifiers for organic oils because silicone is not lipophilic (oil loving). They are ambiphilic, a requirement of surfactants, in that one part is hydrophilic and the other part is hydrophobic. Unlike organic surfactants, the hydrophobe is not also lipophilic.

**HLB** has become a ubiquitous concept and now indicates more than the emulsifying power of surfactants. For this reason, many people want to know the HLB of silicone surfactants. The formula used to calculate HLB does not include silicone materials so no number can be calculated.

However, in organic materials there is a linear relationship between HLB and **inverse cloud point**, a measurable phenomenon of all non-ionic surfactants. One can use the inverse cloud point of silicone surfactants to estimate the HLB of these silicone materials. Remember this still does not make them effective emulsifiers of organic oils.

That last point is an important distinction, for if one is trying to emulsify silicone oil, then the "silophilic" nature of **Silsurf<sup>®</sup> surfactants** is ideal and many of these are excellent primary or secondary emulsifiers of silicone oils.

The low surface tension and interfacial tension conferred by the silicone polymer does make it very tempting for designing organic oil emulsifiers. There are some specialized **Silube<sup>®</sup>** derivatives which are devised to include a lipophilic portion in the polymer. This is a hydrocarbon chain or in the newest materials a polypropylene oxide chain.

**Siltech's** original series of organic oil emulsifiers is **Silube<sup>®</sup> J208 212**, **Silube<sup>®</sup> J208 412**, **Silube<sup>®</sup> J208 612** and **Silube<sup>®</sup> J208 812**, which include progressively more lipophilic nature over hydrophilic and so run from O/W emulsifiers to W/O through the series. In other words the effective HLB decreases.

The newest product offerings are **Silube<sup>®</sup> J208-2I**; **Silube<sup>®</sup> J208-4I**; **Silube<sup>®</sup> J208-6I**; and **Silube<sup>®</sup> J208-8I**. These offer a very different type of emulsion performance and are preferred in some applications. Again the trend is from O/W to W/O.

## **Comparison of Siltech® Emulsifiers**

	<b>Water Solubility (1%/10%)</b>	<b>Effective HLB</b>	<b>Type of Emulsion</b>	<b>Lipophile</b>
<b>Silube® J208 212</b>	S/S	10-12	Oil/Water	Alkyl
<b>Silube® J208 412</b>	D/D	8-10	Oil/water	Alkyl
<b>Silube® J208 612</b>	I/I	6-8	Ester/Oil	Alkyl
<b>Silube® J208 812</b>	I/I	4-6	Water/Oil	Alkyl
<b>Silube® J208 2I</b>	S/S	10-12	Oil/Water	PPO
<b>Silube® J208 4I</b>	D/D	8-10	Oil/water	PPO
<b>Silube® J208 6I</b>	I/I	6-8	Ester/Oil	PPO
<b>Silube® J208 8I</b>	I/I	4-6	Water/Oil	PPO

### **TYPICAL PROPERTIES**

Appearance	Clear, yellow liquid
Viscosity, cSt	
Active Content %	100%
Water solubility	Varies by specific product

### **USES AND APPLICATION**

These materials are normally mixed into the "grease" phase with some shear –at around 1-5% of the final formulation - and then water is slowly added with stirring.

### **SAFETY**

Before handling, read the specific Material Safety Data Sheet and container label for safe use, physical and health hazard information.

### **STORAGE AND SHELF LIFE**

Check the individual data sheets and MSDSs for specific products, but generally when stored in the original, unopened containers between 10 and 40<sup>0</sup>C, **Silube® Emulsifiers** typically have a shelf life of 36 months from date of manufacture.

### **PACKAGING**

**Silube® Emulsifiers** are available in 20kg and 200kg containers.

### **LEGAL DISCLAIMER**

Siltech Corporation believes that the information in this technical data sheet is an accurate description of the typical uses of the product. Siltech Corporation, however, disclaims any liability for incidental or consequential damages, which may result from the use of the product that are beyond its control. Therefore, it is the user's responsibility to thoroughly test the product in their particular application to determine its performance, efficacy and safety. Nothing contained herein is to be considered as permission or a recommendation to infringe any patent or any other intellectual property right.

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