Advantages of TergoSol™

Purpose

This document summarizes the enhanced safety, environmental and performance attributes of TBF Environmental's TergoSol product as compared to Methyl Ethyl Ketone (MEK) and Acetone. TergoSol was specifically designed to perform in surface preparation and precision cleaning/degreasing uses, as well as in aerospace cleaning applications.

Factors to consider

When evaluating the safety and quality of TergoSol versus other solvents, the following factors must be considered:

- Environmental considerations - toxicity and regulatory controls
- Safety - reduced hazards to the environment and workers
- Performance - comparable physicochemical characteristics to Acetone, MEK and other solvents that may be replaced with TergoSol

Environmental considerations

The following table details the environmental comparison between TergoSol, Acetone and Methyl Ethyl Ketone (MEK).

	TergoSol	Acetone	MEK
VOC Content: US EPA (outside SCAQMD*)	**0**	0	100%
VOC Content: SCAQMD*	**2.82** g/L**	0	100%
Maximum Incremental Reactivity (MIR, g O_3 / g organics)	**0.065**	0.43	1.49

*South Coast Air Quality Management District

**ASTM Test Method 313-91.TergoSol is comprised solely of solvents considered to be VOC-exempt by the EPA and as such is considered "zero VOC".

TergoSol is less toxic to the environment than conventional organic solvent alternatives. Methyl Ethyl Ketone is an emitter of Volatile Organic Compounds (VOCs), which can engage in photochemical reactions in the atmosphere to form ground-level ozone and smog precursors which are harmful to the environment. By contrast, TergoSol is formulated solely with materials considered VOC-exempt by the EPA and is designed not to create any photochemical reactions.

MIR is a quantifiable measure of relative ground-level ozone impacts of VOCs. A lower MIR value indicates less negative impact on the environment. TergoSol has a very low Maximum Incremental Reactivity (MIR) value when compared to Acetone and MEK.

Safety

The following table details the safety considerations of TergoSol, Acetone and Methyl Ethyl Ketone (MEK).

	TergoSol	Acetone	MEK
Flash Point (°C)	**4.5**	-20	-9
Oral LD_{50} (rat) (mg/kg)	**> 5000**	5800	2737

The flash point of TergoSol is higher than that of Acetone and MEK. The higher flash point demonstrates TergoSol is less flammable and consequently safer solvent for transport, handling and use.

Safety - continued

LD_{50} values can be used to determine the toxicity of a chemical. LD_{50} is the lethal amount of a material, given all at once, which causes the death of 50% (one half) of a group test population. The LD_{50} is one way to measure the short-term poisoning potential (acute toxicity) of a material. The greater the LD_{50} value the less toxicity of the product.

The oral LD_{50} (rat) for TergoSol is > 5000 mg/kg, a value higher than that of MEK, indicating that TergoSol is less toxic. Furthermore, studies of chronic exposure have found MEK to be carcinogenic. Chronic use can lead to serious developmental and reproductive issues. Although Acetone has a comparable LD_{50} to TergoSol, Acetone has been shown to enhance the toxicity of other chemicals through synergistic toxic effects.

Physical properties

The following table summarizes various physical properties of TergoSol compared to Acetone and Methyl Ethyl Ketone (MEK).

	TergoSol	**Acetone**	**MEK**
Evaporation Rate (n-Butyl Acetate = 1)	**5.35**	6.4	3.86
Boiling Point (° C)	**62**	55	80
Hansen Solubility Parameters $(MPa)^{1/2}$	**18.7**	19.9	19.1
Dispersion (δ_D)	**15.5**	15.5	16.0
Polarity (δ_P)	**6.3**	10.4	9.0
Hydrogen Bonding (δ_H)	**8.1**	7.0	5.1

TergoSol has an evaporation rate that is comparable to Acetone and higher than MEK. The boiling point of TergoSol is also close to the boiling points of Acetone and MEK. Additionally, the Hansen Solubility Parameters of TergoSol are very similar to the parameters for Acetone and MEK. These parameters indicate that TergoSol has comparable solubilizing capabilities and is thus a suitable replacement for MEK and Acetone with broad utility in cleaning and degreasing applications.

References

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