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REMASOL ZV - VOC Compliant Solvent

REMASOL ZV is VOC compliant solvent that is an efficient, cost effective alternative to Heptane for use as a cleaner or co-solvent. It has similar evaporation rate to Heptane.

PRODUCT ADVANTAGES

- No Hazardous Air Pollutants (HAPS)
- No Environmentally Hazardous Ingredients
- No Ozone Depleting or Ozone Creating Chemicals
- Considered "Zero VOC" in all 50 States and Canada
- Can be used as a cleaner or degreaser

Shelf Life: 1 Year from Date of Manufacture in unopened original container.

PURPOSE

This document summarizes the enhanced environmental, safety and performance attributes of **REMA TIP TOP**'s "zero VOC" heptane replacement. **REMASOL ZV** is designed as a replacement for Heptanes and other organic solvents that are used for cleaning/degreasing purposes, and are used as a primary or co-solvent in a variety of applications.

FACTORS TO CONSIDER

When comparing the safety and quality of **REMASOL ZV** to traditional organic solvents, the following factors should be considered:

- Environmental considerations - toxicity and regulatory controls
- Safety - reduced hazard to the environment and workers
- Performance - comparable physicochemical characteristics to Heptanes and other solvents that may be replaced with **REMASOL ZV**

ENVIRONMENTAL CONSIDERATIONS

The following table compares the environmental considerations of **REMASOL ZV** to Heptanes:

	REMASOL ZV	Heptanes
VOC Content: US EPA (outside SCAQMD)	0	100%
VOC Content: SCAQMD	0.9* g/L	100%
Maximum Incremental Reactivity (MIR, g O_3 / g organics)	0.047	1.28

*ASTM Test Method 313-91. South Coast Air Quality Management District (SCAQMD) considers <5 g/L VOC content to be "zero VOC". **REMASOL ZV** is comprised solely of solvents considered to be VOC-exempt by the EPA, CEPA, NPRI and SCAQMD, and as such is considered "zero VOC".

REMASOL ZV is far less toxic to the environment than commonly used conventional organic solvents. Heptanes are emitters 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, **REMASOL ZV** is formulated solely with VOC-exempt materials.

MIR is a quantifiable measure of the relative ground-level ozone impacts of VOCs. A lower MIR value indicates less impact on the environment and health. **REMASOL ZV** has a very low Maximum Incremental Reactivity (MIR) value compared to Heptanes.

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SAFETY

The following table compares the safety considerations of **REMASOL ZV** to Heptanes:

	REMASOL ZV	Heptanes
Flash Point (°C)	5.4	-4
Oral LD_{50} (rat) (mg/kg)	5,000 -13,000	> 5,000

The flash point of **REMASOL ZV** is higher than that of Heptanes which indicates a less flammable and consequently safer solvent for transport, handling and use.

LD_{50} values can be used to determine the toxicity of a chemical. LD_{50} is the quantity 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 chemical product, and a larger LD_{50} value correlates to a product that has less acute toxicity. The oral LD_{50} (rat) for the components in **REMASOL ZV** range from 5000 to 13,000 mg/kg, which provides a range that is higher than the oral LD_{50} (rat) value for Heptanes.

PHYSICAL PROPERTIES

In addition to environmental and safety considerations, in order to be useful as a replacement solvent, the performance characteristics of **REMASOL ZV** should be similar or superior to that of Heptanes. The following table summarizes various physical properties of **REMASOL ZV** and Heptanes.

	REMASOL ZV	Heptanes
Evaporation Rate (n-Butyl Acetate = 1)	2.5	3
Surface Tension (dynes/cm)	20.4	20.1
Kauri Butanol (Kb) Value	51.3	29
Hansen Solubility Parameters $(MPa)^{1/2}$	14.9	15.3
Dispersion (δ_D)	13.8	15.3
Polarity (δ_P)	4.5	0
Hydrogen Bonding (δ_H)	3.6	0

REMASOL ZV has a comparable similar evaporation rate and surface tension to Heptanes. The dispersion properties of **REMASOL ZV** are also similar to the dispersion solubility parameters for Heptanes.

The solvency, expressed as Kauri Butanol value, for **REMASOL ZV** is 51.3, while Heptanes has a value of 29. This demonstrates that **REMASOL ZV** has greater solvency compared to Heptanes and can thus perform more efficiently as a solvent.

CONCLUSION

As described above, **REMASOL ZV** is a zero-VOC solvent alternative to the Heptanes and other solvents that exhibits lower toxicity than many conventional solvent alternatives with a safer and superior environmental and performance profile. It is useful as a brake cleaner/degreaser, cleaner, and as a primary and co-solvent in formulation and in a wide variety of applications.

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5/20