Oxsol Free Technology Update

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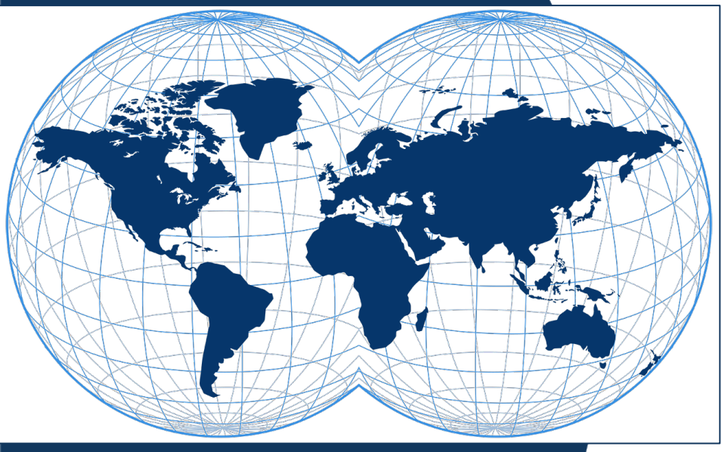
History

The PCBTF Problem

In 2018, parachlorobenzotrifluoride (PCBTF; trade name Oxsol 100) was discovered to be a potential carcinogen by the National Toxicology Program (NTP). In response, California's Office of Environmental Health and Hazard Assessment (OEHHA) placed Oxsol 100 on the Proposition 65 List, which is a list of chemicals known to cause cancer, birth defects or other reproductive harm. Consequently, California's South Coast Air Quality Management District (SCAQMD) has proposed eliminating Oxsol 100 as a VOC-exempt solvent in California due to its inclusion on the Proposition 65 List.

Industry Challenge

Due to the ongoing industry wide efforts to lower paint coatings VOC levels and the U.S. Navies requirement of a Flash Point greater than 100° F for many of its coatings, Oxsol 100 has become a common solvent in many of the U.S. Naval Coatings. Additionally, Oxsol 100 can be found in Ground Force, Aerospace, and Industrial Coatings industry wide.



Replacement Challenges

Limited Alternative Solvent Selection

- Maintain VOC < 250 g/l
- Maintain Flash Point > 100° F
- Extended Dry Times

Stable Supply Chain???

Global Acceptance

- REACH, AICIS (NICNAS) etc.
  - Compliance review in process

Initial Goal

Since Polysiloxane topcoats were transitioned by the Naval Sea Systems Command (NAVSEA) in the early 2010's to replace the 50-year-old silicone alkyd coating technology that was used on the exterior of surface ships to improve corrosion resistance, greater color and gloss retention, and improved adhesion to anti-corrosive epoxy primers. The following two specifications have been initially targeted.

- MIL-PRF-24635F Type V, Class 2, Grade B Comp. 1
- MIL-PRF-24635F Type VI, Class 2, Grade B Comp. 2

Progress to Date

Reformulation of MIL-PRF-24635F Type V, & VI Class 2, Grade B, Comp. 1 & 2, Color 26270 Haze Gray has been completed utilizing a proprietary blend of resins and solvents.

Initial Field Application has been conducted by NRL per an ESTCP project

Laboratory Test Results follow

Key Test Results Type V, Comp. 1

	24635F, Type V Requirements	Type V 1K Polysiloxane Control	Type V 1K Oxsol-Free Results
VOC	Maximum 250 g/l	208 g/l	249 g/l
Flash Point	> 100	102° F	105° F
Viscosity	Less than 95 KU (Krebs Units)	72 KU	77 KU
Dry-Through	Set -to-touch less than 4 hours; dry through less than 16 hours	6 hours	6.5 hours
Gloss	SAE AMS 595 Color No. 26270; 45-60 GU	45 units	57 units
Sag	50% Greater than manufacturers maximum WFT	8 mils	8 mils
Adhesion	5A or 5B	5A	5A

Key Test Results Type VI, Comp. 2

	24635F, Type VI Requirements	Type VI 2K Polysiloxane Control	Type VI 2K Oxsol-Free Results
VOC	Maximum 200 g/l	25 g/l	198 g/l
Flash Point	> 100	105° F	108° F
Viscosity	Less than 95 KU (Krebs Units)	75 KU	75 KU
Dry-Through	Set -to-touch less than 4-hours; dry thour less than 16-hours	2 hours	2 hours
Gloss	SAE AMS 595 Color No. 26270; 45-60 GU	57	55 units
Sag	50% Greater than manufacturers maximum WFT	12 mils	12 mils
Adhesion	5A or 5B	5A	5A

Future Goals (in process)

MIL-DTL-24631A F 187 (elimination of isocyanates and Oxsol 100)

TT-P-645

MIL-DTL-24607 & 24596 (Alkyds)

TT-P-28

MIL-DTL-1115

MIL-DTL-15090

MIL-PRF-24635F Type III

Questions? Thank you!