Alternatives to Methylene Chloride in Paint and Varnish Strippers: Availability of Safer Alternatives & Requirements for Meeting Stage 1 of the California Safer Consumer Products Regulations

Basic Information

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Chemical(s) of Focus  Methylene chloride (DCM) (75-09-2)
Alternatives Considered  Benzyl alcohol (100-51-6); 2-(2-butoxyethoxy) ethanol (112-34-5); Caustic soda (1310-73-2); Dimethyl sulfoxide (67-68-5); 1,3-dioxolane (646-06-0); Estasol (mixture of 3 dibasic esters) (a) Dimethyl succinate (15–25%), (b) Dimethyl glutarate (55–65%), & (c) Dimethyl adipate (10–25%) (95481-62-2); Formic acid (64-18-6); Hydrocarbon solvents (likely used as a mixture, but assessed individually) (a) methanol (67-56-1), (b) acetone (67-64-1), & (c) toluene (108-88-3); d-Limonene (138-36-3)
Sectors       Paint/varnish strippers
Technical Function  Cleaning agent, Solvent

Methodology

Framework       California Safer Consumer Products Regulation [STAGE 1 ONLY - PRIOR TO THE PUBLICATION OF OFFICIAL GUIDANCE]
Attributes Considered  Chemical Hazard, Exposure
Chemical Hazard Endpoints  Human Health: Carcinogenicity; Mutagenicity; Reproductive toxicity; Developmental toxicity; Endocrine activity; Acute toxicity; Systemic organ toxicity; Neurotoxicity; Skin sensitization; Respiratory sensitization; Skin irritation; Eye irritation
Environmental: Aquatic toxicity; Chronic aquatic toxicity; Persistence; Bioaccumulation
Other Hazards: Reactivity; Flammability
Tools Used to Assess Chemical Hazard  GreenScreen®
Other Tools Used  Cannot be determined

Goal, Summary, Findings, and Impact

Purpose/Goal  To: (1) identify less hazardous alternatives to methylene chloride in formulated paint stripper products; (2) identify candidate
alternatives for methylene chloride in paint stripping formulations that will likely be considered in actual/future Stage 1 submissions for this “priority product” in California; and (3) identify challenges and needs confronting compliance with the alternatives analysis process under the California Safer Consumer Products regulations.

Report Summary
This analysis models the perspective of a manufacturer of a methylene chloride-based paint stripper for consumers that seeks compliance with the California Safer Consumer Products regulations. The category of paint strippers that is the subject of this alternatives analysis includes both consumer and professional uses. The report provides an example of the flow of a California Safer Consumer Products Regulation-type alternatives analysis, specifically the scoping and hazard assessment step as specified for Stage 1 submissions. The report identifies 11 alternatives to methylene chloride and uses the GreenScreen® for Safer Chemicals version 1.2 hazard assessment method for assessing chemical hazard.

Key Findings/Impact
This analysis found safer chemical alternatives to methylene chloride. Using GreenScreen® comparative hazard assessment method, only two of the 11 alternatives were screened-out—methanol and toluene—due to "high" hazard levels for developmental toxicity and/or reproductive toxicity. The remainder of alternatives (N=9) were safer, yet not free of hazards, as reflected in GreenScreen® Benchmarks. Nine alternatives were rated as a GreenScreen BenchmarkTM 2 chemicals, "Use but search for safer substitutes." One alternative, DMSO was rated as a GreenScreen BenchmarkTM 3 chemical, "Use but still opportunity for improvement." Although DMSO demonstrated the lowest hazard rating overall (highest benchmark score), DMSO can potentiate the hazards of other substances. Given that the function of this chemical is to dissolve paints and varnishes, DMSO could potentiate the hazards of those substances (e.g., the hazards associated with lead in lead paint), and other substances in the paint stripper formulation. These results demonstrate that hazard ratings need to be considered with additional information about a substance – such as conditions of use – that help to inform the inherent hazard of a given substance.