Safer Alternatives in Automotive Refinishing

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Automotive refinishing is auto body work specialized in the surface preparation and re-painting of automobiles. Waterborne refinishing paints are becoming more prominent as volatile organic compound (VOC) regulations spur manufacturers to develop alternatives to traditional solvent-based paints.

Purpose of the project: conduct a feasibility study to determine if waterborne paint systems and alternative gun cleaners are viable safer alternatives for the Local Hazardous Waste Management Program (LHWMP) to promote to auto body shops in King County.

Key questions to be addressed included:
- What are the key hazards of waterborne paints?
- Are there competing alternative paints?
- What are waste streams from waterborne paints?
- Extensive literature review
- Key informant interviews with local shop owners, manufacturers, jobbers, and government and NGO staff.
- Limited sampling/analysis of waterborne paint products and wastes

Few evidence-based conclusions about the safety of waterborne paints can be drawn. While reduced solvent volume may improve worker and ecological health, different solvents are used in waterborne paints, and there is limited occupational exposure assessment data for those solvents.

Waterborne paints do not reduce the risk of exposure to isocyanates—the leading cause of occupational asthma. The designation of waterborne paint waste is uncertain. More sampling is needed. Local shops should have their waterborne waste tested to determine designation.

LHWMP should not encourage King County shops to switch to waterborne paints until a comprehensive risk assessment can be conducted.

Introduction and Objectives

Comparison of the Key Hazards

To our knowledge no independent studies have been conducted that have critically reviewed the occupational or public health risks associated with applying waterborne coatings. A summary of the available information on relevant health & safety factors is summarized in the table below:

<table>
<thead>
<tr>
<th>Solvent-Based Basecoats</th>
<th>Waterborne Basecoats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solvent content = 70-85% (e.g. xylene, toluene, ethylbenzene, methyl ethyl ketone, etc.)</td>
<td>Solvent content = 10% (e.g. 2-butoxyethanol, low molecular weight polar ketones &amp; alcohols); 70% H2O</td>
</tr>
<tr>
<td>Known health hazards</td>
<td>Lower VOC emissions</td>
</tr>
<tr>
<td></td>
<td>Workplace smells more pleasant; workers report fewer headaches</td>
</tr>
<tr>
<td>Thinned with solvent</td>
<td>Thinned with deionized water (ideally)</td>
</tr>
<tr>
<td>Gun cleaner is often lacquer thinner</td>
<td>Gun cleaner uses flocculating agent</td>
</tr>
<tr>
<td>High VOC content</td>
<td>Acute inhalation hazard</td>
</tr>
<tr>
<td>Irritant, CNS depressant, etc.</td>
<td>Sample (n=1) contained acetone, toluene, barium, MEK, xylene, etc.</td>
</tr>
<tr>
<td>Combustible</td>
<td>No occupational exposure assessments</td>
</tr>
<tr>
<td>Flammable</td>
<td>Should not designate for ignitability (due to lower solvent content)</td>
</tr>
<tr>
<td>Waste designates as Dangerous Waste in WA</td>
<td>Waste designation uncertain (yet sometimes promoted as non-hazardous)</td>
</tr>
<tr>
<td>Sample (n=1) designated for persistence (140 ppm halogenated organic compounds (HOCs))</td>
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</tr>
</tbody>
</table>

Both potentially contain the same:
- Heavy metals (could cause the waste stream to designate for toxicity)
- HOCs (could cause the waste stream to designate for persistence)
- Isocyanates (leading cause of occupational asthma)

Waste Stream

Fig. 1: Kristina & supervisor Larry Brown at a waterborne refinish painting training class, wearing appropriate personal protective equipment.

*Special thanks to Larry for his mentorship*

Methods

- Extensive literature review
- Key informant interviews with local shop owners, manufacturers, jobbers, and government and NGO staff.
- Limited sampling/analysis of waterborne paint products and wastes
- Analyzed by OnSite Environmental Lab
- Tested for volatile & semi-volatile organic analytes, metals, pH, flashpoint, organic halogens, and acute fish toxicity

Competing Alternative Paints

Waterborne paints achieve compliance with VOC regulations by reducing solvent content, but there are also low-VOC solvent-based formulations on the market. Low-VOC paints are produced using solvents that the U.S. EPA has exempted from the VOC regulations.

Despite marketing as “safer alternatives” to traditional paints, no evidence-based studies of their effects on health have been conducted. One exempt solvent being used is parachlorobenzotrifluoride (PCBTF), the structure of which is suggestive of toxicity (i.e. benzene ring, chlorine and fluorine substituents).

Conclusions & Recommendations

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