

# Environmentally Acceptable Spray Gun Cleaners

## **Background:**

Typically, conventional gun cleaners contain a high concentration of volatile organic compounds (VOC), hazardous air pollutants (HAP), and/or toxic compounds, such as methyl ethyl ketone (MEK) and/or toluene, as their primary active ingredients. Although these conventional solvents work well, their usage is being minimized or phased out because of their known or suspected harmful effects to human health and the environment. For example, the Aerospace National Emission Standards for Hazardous Air Pollutants (NESHAP) requires all solvents used for various cleaning, wiping, and other processes at painting facilities be stored in closed containers with lids to prevent the volatilization of solvents into the open atmosphere. Other compounds, such as methylene chloride are only being allowed on a restricted-use basis.

According to the NESHAP, spray gun cleaning operations require one of four specified techniques, but specify no requirement for solvent material composition. Whereas, all VOC and HAP-containing wipe solvents must meet composition requirements and have vapor pressures less than 45 millimeters (mm) of mercury (Hg) at 20 degrees Centigrade (°C), or meet an alternate plan administered by the permitting agency and approved by the Clean Air Act. This can be an important issue at many facilities where the same product is used for spray gun cleaning and hand wiping operations.

VOC- and HAP-based solvents are widely used throughout the aerospace industry at commercial and military facilities as spray gun cleansers because of their good performance characteristics. Spray gun cleaners generally fall into one or more of the following categories:

Alcohols	Aliphatic Hydrocarbons	Amines
Aromatic Hydrocarbons	Esters	Glycol Ethers
Ketones	Organosiloxanes	Other, such as terpenes (e.g., d-Limonene)

The cleaning effectiveness of these compounds as generic cleaners has been demonstrated. Variations in chemical composition, concentration, blends, water content, and other factors appear to have a greater effect on the cleaning efficiency of a particular product than the chemical type alone.

Mr. Steve Kmetzsche, OO-ALC/TIELM requested CTIO assistance in evaluating and then recommending EA gun cleaners for use in their new gun washers

**Project Sponsor/Customer:** OO-ALC/TIELM, Hill AFB; AF wide  
**Period of Performance:** Sep 96- Sep 97

***Objective:***

In response to the ever-changing environmental regulatory arena, many product manufacturers, vendors, and ultimately the users at aerospace facilities, are searching for environmentally acceptable (EA) solvents complying with new federal, state and local regulations. Many solvents are required to meet state regulations more stringent than the NESHAP, requiring even lower vapor pressures and VOC content. The objective of this project was to conduct a study and identify potential EA solvents for use as spray gun cleaners for Hill AFB and eventually other USAF bases.

***Status:***

Work performed for this request consisted of data gathering and evaluation tasks including literature and vendor searches, product evaluations, facility visits, and conversations with aerospace facility personnel. Additional information includes new product data for added diversity in the bench-scale selection process.

This report includes tables of (1) spray gun cleaner products designed specifically for a particular spray gun or those historically used as spray gun cleaners; (2) additional solvents that may be effectively used as alternative EA spray gun cleaner solvents; (3) gun cleaners used at specific survey sites. Surveys were conducted for Eglin AFB, Nellis AFB, Hurlburt AB, Randolph AFB, Kelly AFB, Tinker AFB, Lockheed-Martin, Northrup-Grumman, McDonnell Douglas, Raytheon E-Systems, Dee Howard and Boeing.

Most facilities surveyed had closed spray gun washers or containers to meet the NESHAP standards. Those who did not were planning to soon. According to Graco representatives, most types of solvents can be used in Graco spray guns washers because they are constructed of stainless steel and other solvent resistant materials. Most importantly, the compatibility of particular solvents and/or products with the construction materials and components of the particular spray guns in use at Hill AFB needs to be determined.

In addition to the VOC and HAP aspects of EA solvents, other issues encountered included toxicological concerns, flammability hazards, and compatibility of waste streams and disposal requirements of alternate products.

The products listed in the project letter report represent possible choices of alternative solvents for use as spray gun cleaners. However, the number of solvents discovered that consistently work as well as MEK in spray gun cleaning and multipurpose situations, and are also well received by management and shop users were limited. Many suitable alternatives were identified. CTIO did not accomplish any tests and therefore their validated performance is unknown.

Implementation of the solvent solution for an EA Gun Cleaner was conducted by OO-ALC and was based on the Hill AFB bench-scale testing of various solvents suggested in this report and from other sources, with the final selection based on the following criteria:

- Meets performance criteria appropriate for the types of coatings used
- Compatibility with the spray guns and spray gun washer systems
- Resulting emission reductions of approximately 40-50%
- Meets environmental, safety, and health requirements established by Hill AFB biomonitoring and environmental personnel

**Project Plan:** Dated May 97

**Letter Report:** Titled: "Field Response Request for Environmentally Acceptable Spray Gun Cleaners"

**Dated:** Sep 97

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**As of Date:** Apr 01