

# **Hazardous Airborne Pollutant Reduction**

**Self-study Narrations**



Version: 10.2

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# ***Module 1 - Environmental Compliance***

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## Learning Objectives

Learning objectives for this module include:

- explaining the requirements of the environmental protection agency (EPA) regulations.
- evaluating the EPA regulations and how they may apply to a specific business.
- identifying hazardous air pollutants (HAP) and how they can affect public health and the environment.
- using the appropriate personal protection equipment (PPE).
- identifying equipment that reduces the amount of HAP.
- evaluating the EPA final rule in-house training program compliance program.
- describing the owners' or managers' responsibility for implementing the EPA final rule in-house training program.

## Introduction

Hazardous materials are commonly used in collision repair facilities and other facilities that apply finishes to metals and plastics. Many of these materials are applied using a spray gun. When these materials are atomized or allowed to vent into the atmosphere through evaporation, hazardous air pollutants are released into the environment. The Environmental Protection Agency or commonly know as the EPA refers to hazardous air pollutants as HAP.

This online program discusses methods that may be used to reduce the amount of HAP that are generated through several different application techniques, using proper equipment, and the proper usage and maintenance of the equipment.

This program also provides compliance for the final rule from the EPA National Emission Standard for Hazardous Air Pollutants (NESHAP): Paint Stripping and Miscellaneous Surface Coatings (PSMSC) from area sources.

There are several benefits for reduction of HAP, including the safety and health of workers in the facility and surrounding areas, and a potential economic benefit from the overall reduction of the amount of materials that are used.

## Clean Air Act (CAA)

The Clean Air Act, commonly referred to as the CAA requires the EPA to develop emission standards and to identify the source of hazardous air pollutants. Within the refinishing process the hazardous air pollutants are emitted when the refinish materials are atomized during spray application, and during the evaporative curing process. The CAA also

requires the EPA to regulate the sources that pose the greatest potential health threat from these pollutants in urban areas.

On September 6, 2007, the EPA issued proposed air toxic standards for smaller emitting sources. These are called **area sources**. An area source is a manufacturing or service facility that has the potential to emit less than 10 tons per year of a single toxic air pollutant or less than 25 tons per year of any combination of toxic air pollutants.

Any producer of toxic air pollutants over these thresholds is considered a **major source** and is covered under a different National Emission Standard for Hazardous Air Pollutants. Most collision repair facilities are considered an area source.

The EPA has identified paint stripping operations and product surface coating as an area source of HAPs with the standard being NESHAP Paint Stripping and Miscellaneous Surface Coatings. Collision repair facilities are included in this category.

The focus of the standard is to reduce the amount of hazardous air pollutants by use of best management practices and choosing alternative methods and materials when refinishing. Reducing the amount of HAP can be achieved simply by an overall reduction of the amount of hazardous materials released into the environment.

### **HAP Definition**

The EPA defines an air pollutant as any substance in the air that can cause harm to humans or the environment. Air pollution can lead to smog, groundwater contamination, acid rain, or other environmental damage. Hazardous air pollutants are pollutants known or suspected to cause cancer or other serious health effects, such as reproductive effects, birth defects, or other adverse environmental effects.

Hazardous air pollutants are emitted when the refinish materials are atomized during spray application, and during the evaporative curing process.

### **Chronic And Acute Disorders**

Refinish materials have been associated with both chronic and acute adverse health disorders. Acute health disorders associated with exposure during spray application of coating materials include irritation of eyes, throat, and nose with long-term lung function impairment after high acute exposure. Chronic health disorders include adverse effects on the central nervous system, blood disorders, and cancer.

For purposes of the final rule, coatings are considered to contain HAP if the Occupational Safety and Health Administration (OSHA) has identified the substance as a carcinogen,

which is a cancer-causing agent, at a concentration of 0.1 percent by mass, or a combination of the target HAP is greater than 1.0 percent by mass.

### **HAP Materials And Compounds**

The EPA has identified a list of 188 materials and compounds that are classified as hazardous air pollutants, some of which are commonly used in refinishing materials. The list includes relatively common pollutants such as benzene, chlorine, methanol, and asbestos, as well as numerous less common substances.

Select the link to view a complete list of the 188 different materials the EPA has determined to be hazardous air pollutants.

### **Heavy Metals**

Refinishing and coating products may include compounds containing heavy metals. The heavy metals, also referred to as the target HAP, include chromium, lead, manganese, nickel, and cadmium.

### **EPA Final Rule Overview**

The EPA Final Rule for PSMSC was published on January 9, 2008. The goal of this EPA final rule is to reduce the amount of hazardous air pollutants emitted into the atmosphere by several methods, including a reduction of the amount of overspray created when refinishing materials are applied. Effectively cleaning spray guns without atomization of the cleaning solvent and applying coatings in a spraybooth are other effective methods of reducing the amount of HAP from being released into the environment.

Collision repair facilities and other industries that apply surface coatings are required to apply to this rule. Exemptions from the final rule include the following groups:

- individuals who use paint stripper or apply surface coatings to their personal vehicles, possessions, or property without compensation.
- hobbyists, who may apply coatings through spray application technique to no more than two vehicles per year, regardless of whether compensation was received for the application of the coating.

The final rule for PSMSC is available online by selecting the EPA link provided on this page.

### **EPA Final Rule**

The EPA final rule for PSMSC requires that any person who applies coatings with a spray gun receive training on how to reduce HAPs. The training must include techniques used

to increase transfer efficiency, reduce overspray, and proper spray gun cleaning. The initial paint training is valid for a five-year period and refresher training must be repeated at least once every five years.

### **VOC Definition**

Many of the products used in coating applications and refinishing processes contain hydrocarbons, meaning they are made using petroleum-based chemicals. Many of these products contain volatile organic compounds, or VOCs. The EPA defines a VOC as any organic compound that evaporates readily into the atmosphere. The VOCs in refinishing and paint stripping products are released into the environment when the solvents in the product evaporate during the curing process. EPA studies have shown that these VOCs contribute to depletion of the ozone layer, photochemical smog production, and adverse health effects.

Several geographic locations across the United States have been regulated for product and equipment type when refinishing vehicles since 1998. These geographic locations of VOC-regulated areas are primarily in coastal regions, including the Atlantic and Pacific Oceans and around the Great Lakes.

The National Rule of 1998 deals mainly with reducing VOC by regulating the amount of solvents that are used to atomize the products and requiring a higher amount of solids. There are also regulations on the type of cleaning solvents that are used to prepare a part for refinishing. The spray equipment that is used to apply the products to meet the National Rule of 1998 includes the use of high-volume, low-pressure (HVLP) spray guns. The final rule on hazardous air pollutant reduction also includes the HVLP spray gun requirement on a nationwide basis.

### **Right-To-Know**

It is important for workers to be informed of dangerous materials that they may be exposed to in the workplace. OSHA developed the employee "Right-To-Know" law that requires employers to inform employees of hazardous chemicals. Employers must inform employees about hazardous materials stored and used within the facility. According to OSHA, the number one safety and health violation for collision repair facilities is the failure to communicate hazardous materials that are used in the workplace.

Penalties should not be the reason for being compliant with health and environmental regulations. The regulations are there to protect the worker. Health and safety of a worker should be the reason for being compliant with the rules.

### **Safety Data Sheet (SDS) Description**

A safety data sheet (SDS) must accompany every hazardous material that is used in a workplace. The SDS is a technical document that provides detailed information for



handling, storing, disposing of, and using the material. Also included on the SDS is information on the effects of overexposure to the material, steps to avoid overexposure, and information on what to do in the event of an emergency. A good way to find out which pollutants may be released when applying coatings is to refer to the SDS.

Employers are allowed to add to or modify an SDS for the specific use of the material at the workplace. The revised SDS must not contain less information than the original SDS. The revision may include information on hazards relating to the specific workplace, including local laws, waste disposal laws, and additional exposure limits. The original SDS must be kept on file at the workplace. If a product is no longer used at a facility, it is required that the SDS or a product inventory sheet be kept on file for 30 years for medical evaluation purposes. This is to ensure the information is available for employees who may be affected by long-term health problems from exposure to a chemical several years after the exposure took place. Product inventory sheets must include information on where and when the product was used in the workplace.

### **Personal Protective Equipment (PPE)**

OSHA regulations require employers to provide the proper personal protective equipment to protect the workers from hazards. Personal protective equipment for painters and technicians that apply coatings and finishes, including automotive finishes, typically includes respiratory protection, eye protection, chemical-resistant gloves, and a full body refinishing suit.

Section 8: Exposure Controls / Personal Protection is the SDS section that provides the exposure limits, engineering controls, and personal protective measures that can be used to minimize worker exposure. The required information consists of OSHA Permissible Exposure Limits or PELs. PELs are exposure limits used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.

### **Product Information Sheets**

Not to be confused with an SDS, product information sheets provide specific directions on the correct usage of the product. Product information sheets do not provide compliance with the OSHA Right-To-Know law, although most product information sheets provide recommendations on the appropriate PPE that should be used. Some of the items that are included on a product information sheet for refinishing products include mixing instructions, recommended spray gun settings, dry and cure times, application instructions, and pot life of the product. The product information sheets will include the amount of VOCs that the product contains when mixed according to the directions.

### **Environmental Benefits**

The reduction of HAP has many benefits to the environment and to the collision repair or coating application facility. Refinishing product makers have made many of the products more environmentally friendly.

Some environmental benefits of HAP reduction include better air quality both in and around the area of the facility. Other important environmental benefits include less chance of exposure to workers.

The environmental benefits reach beyond the repair facility to include reduced potential for smog and a reduction in airborne pollutants that could end up polluting groundwater.

### **Facility Benefits**

There are many benefits to the facility of HAP reduction that include better health and safety for the employees and residents in the surrounding area. For the repair facility, a HAP reduction in the amount of overall materials required to refinish a part can result in a potential economic savings. Savings can be found in extended spraybooth filter life and reduced gun cleaning solvent consumption.

### **Reduction During Mixing**

HAP reduction starts in the beginning of the refinishing process. One of the easiest ways to reduce the amount of HAP is to reduce the amount of material that is mixed. Since many of the products contain a catalyst or hardener, they will solidify after a specified period of time. Therefore, most painters try to spray the product until the gun is empty.

It is a good practice to mix only what is needed. There is no simple way to measure how much of a product should be mixed, but past experience may be helpful when making this determination. Reducing the amount of product that is mixed not only reduces the amount of HAP, it also reduces the amount of solid waste that a facility generates.

A few methods that could reduce the amount of HAP is to reduce the amount of primer-surfacer that is required by using a finer grit sandpaper for finish-sanding the body filler in the repair area, or by using a polyester-based glazing putty to fill imperfections and sandscratches. Primer-surfacers are typically spray-applied with thin, wet coats. Applying the primer-surfacer heavier than recommended may prevent the solvents in the primer from evaporating during the cure. This could lead to shrinkage, incomplete cure, or sandscratch swelling after the part is topcoated.

### **Reduction During Application**

There are several ways that the application process of primer-surfacer can reduce the amount of HAPs emitted. Some product makers have roll-on or brushable products that eliminate the need for spray application. A thinner is not required to make the product thin enough to spray through a spray gun. Since the effectiveness of a primer-surfacer is dependent upon the complete cure of the primer, brushing or rolling for application may require a heat source to bake the primer. Infrared heat lamps are commonly used to bake the primer until a complete cure has been achieved.

Another current trend is to use a UV-cure primer-surfacer. UV-cure product is increasing in popularity as low-VOC materials are mandated by local, state, and federal governments. The reason UV-cure products are low-VOC is because they use ultraviolet light to cure a product, rather than evaporation of solvents. The UV-cure process also takes less time compared to curing of conventional two-part refinish products. The resins in the primer change from a liquid to a solid through a chemical reaction when exposed to UV light.

Primer-sealer application serves several purposes that can reduce HAPs. The uniform color that some primer-sealers provide may reduce the amount of basecoat that must be applied until hiding is achieved. Some refinish product makers make a primer-sealer that can be tinted or mixed to closely match the basecoat. This also reduces the amount of basecoat that must be applied. To reduce the amount of VOCs emitted when applying topcoats, a higher percentage of solids is used than with traditional topcoats. Traditional topcoats typically require a reducer that evaporated from the paint film as it dried. The reducer allows the material to atomize when it is being spray-applied and to flow out as the coating dries.

Some refinishing product makers have developed clearcoats and single-stage finishes that require little or no reducer during spray application. The higher concentration of solids may relate to better coverage and increased film build. Some of these products may have a speed rating for the type of hardener that is added to the clearcoat. With the development of higher solid topcoats, different application and drying techniques may be required. Higher-solid products reduce the amount of VOCs that are released. HAPs are also reduced, as a higher film build and better coverage may be possible when using high-solid products.

### **In-House Training Program**

The EPA final rule allows facilities to develop an in-house training program tailored specifically to the products and equipment that the facility uses. Some key points that must be included in the training include a hands-on and classroom training on spray gun selection, setup, and operation to reduce the amount of overspray.

Information on spray gun air pressure, fluid, and pattern adjustments should be included as well as selection of the correct needle and fluid tip for the coating that is being applied. Various application techniques to improve the transfer efficiency, including spray gun distance and angle, application speed, and correct overlap during the application process are also important.

### **In-House Training Program Observations**

If the in-house training program is used, the training must include observation of the hands-on requirements, including the painter verifying that the air pressure at the spray

gun is adjusted to the equipment manufacturer's recommendations. The painter must demonstrate an increase in transfer efficiency through spray gun operation techniques. An observer or trainer must document that the travel speed and gun distance reduces the amount of overspray over traditional spray application processes.

The in-house training program must include observation that the pressure in the spraybooth is adjusted to efficiently trap overspray in the filtration system. Spraybooth filter change intervals should correspond with the pressures of the spraybooth to ensure that the spraybooth is filtering the overspray with maximum efficiency. The required spraybooth filters with at least 98% efficiency must be used.

Finally proper cleaning of spray guns and equipment without the atomization of solvents outside of an enclosed gun cleaner must be observed.

### **Manager Or Owner Responsibility**

The manager or owner of the facility must provide a description of the methods used to complete the classroom portion of the training and to observe and certify the hands-on elements have been successfully completed.

Additionally the manager or owner of the facility must provide training for each person who applies coatings through spray application techniques. The painter must complete the initial training within the initial deadline that applies to the particular facility and refresher training every 5 years.

### **Module Summary**

Topics discussed in this module included:

- the requirements of the EPA regulations.
- the EPA regulations and how they may apply to a specific business.
- hazardous air pollutants (HAP) and how they can affect public health and the environment.
- the appropriate personal protection equipment.
- equipment that reduces the amount of HAP.
- the EPA final rule in-house training program compliance program.
- the owners or managers responsibility for implementing the EPA final rule in-house training program.

# *Module 2 - Refinish Application*

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## Learning Objectives

Learning objectives for this module include:

- identifying how to reduce the amount of methylene chloride (MeCl) paint stripper that is used.
- identifying spraybooth requirements and filter maintenance schedules.
- identifying spray application techniques and gun adjustments that reduce the amount of HAPs released into the environment.
- identifying spray gun cleaning requirements.

## What Is Methylene Chloride (MeCl)

Also covered under the final rule is the use of paint strippers containing methylene chloride. Methylene chloride (MeCl), the active ingredient in some commercial paint strippers or removers, is a hazardous air pollutant, as identified by the EPA. Another name for MeCl is dichloromethane. MeCl is a colorless liquid with a mild, sweet odor.

The primary means of exposure to MeCl is through inhalation of vapors as the solvent evaporates, although exposure could also occur from skin contact or drinking contaminated water. The EPA has determined that MeCl is a probable cancer-causing agent in humans. Symptoms of exposure from breathing fumes containing MeCl include feeling unsteady and dizzy, nausea, and a tingling sensation of the fingers and toes. In smaller amounts, exposure to MeCl may cause a person to become inattentive and less accurate in tasks that require hand-eye coordination. Skin contact may cause burning and redness of the skin.

The proper safety equipment when using paint strippers includes skin, eye, and respiratory protection. When using an MeCl-based paint stripper, OSHA has set limits of exposure for breathing air that may be contaminated with MeCl. The appropriate safety equipment should be used when working with paint strippers or removers.

## Finish Removal With MeCl Paint Stripper

The MeCl portion of the standard will affect very few collision repair facilities, as the threshold that will require a written reduction plan is using over 2000 lb. per year of MeCl-based paint remover. If MeCl paint stripper is used in any amount, the facility must notify the EPA of being a source. If the minimum threshold is not met, there are no reduction requirements. If the threshold amount is exceeded, the standard requires the facility to develop a written reduction plan that includes identifying the criteria to evaluate the necessity of using an MeCl-based paint stripper, using alternative methods for finish removal where applicable, and maintaining records of the amount of MeCl stripper that has been used. It is, however, a good practice to reduce the amount of MeCl used even though the regulation does not require reduction.

Some alternative finish removal techniques and processes include using a non-MeCl or low-MeCl content paint remover. Using a mechanical finish removal process such as sanding or grinding the finish is an alternative to using paint strippers. Lastly, blasting with water, sand, and other media can remove finishes without using MeCl.

When using a paint stripper containing MeCl, placing a sheet of plastic film over the finish can reduce the overall amount of vapors that are emitted. This reduces the amount of evaporative loss of the paint stripper, equating to less total amount of stripper required to remove a finish.

### **Vacuum Sander Benefits**

Dust created during the sanding process may contain toxic materials such as isocyanates, lead, chromium, and silica that are harmful to the lungs and nervous system. Use of a High Velocity Low Volume vacuum sanding system can protect workers and others nearby from harmful dust.

When used and maintained properly, vacuum sanders can control 93 - 98% of the dust generated from the disc sanding operation.

### **Central Vacuum Sander**

Central vacuum systems consist of multiple vacuum sanding drops connected to a central vacuum system by means of retractable, flexible hosing. Such systems produce sufficient suction to handle up to four to twenty technicians sanding at the same time.

### **Portable Vacuum Sander**

Self-contained or portable units are designed for operation by one to three technicians at the same time. The unit comes with attached wheels and can be easily moved from one location to another in the shop, depending on where the sanding has to be performed.

### **Solvents**

Solvents traditionally make up about 60% of the total formulation. Solvents are added to coatings to disperse the other constituents of the formulation and to reduce viscosity, thereby enabling application of the coating.

Solvents are a major source of environmental concern because at normal temperatures and pressures they can become a vapor.

### **Binders**

Binders account for 30% of formulation. Binders are liquid polymeric or resinous materials that are used in coatings to hold the pigment and additives together, to provide adhesion, and to enable the coating to cure into a thin plastic film.



The binder provides the working properties of the coating and determines the performance of the film, including flexibility, durability and chemical resistance.

**Pigments**

Pigments account for 7 to 8%. Pigments are insoluble particles of organic or inorganic materials, either natural or synthetic, that are dispersed in a coating to provide color and opacity to a substrate, or to improve the substrate's environmental resistance and the flow properties of the paint.

The type of pigment in the paint determines the color and color stability of the paint or coating, while the amount of pigment determines the gloss, hiding power and permeability of the coating.

Many pigments still contain lead, chromium, cadmium, or other heavy metals. These paints cannot be disposed of in a landfill and must be handled as a hazardous waste because the heavy metals can leach out of landfills and contaminate groundwater.

The four commonly recognized classes of pigments are colored, white, metallic, and functional pigments.

**Additives**

Additives make up the last 2 to 3% of the paint components. Additives are materials that improve the physical and chemical properties of the coating.

**Bare Metal Coatings**

When bare metal is exposed, it is necessary to apply a primer that will adhere to bare metal and provide corrosion resistance. Primers are the foundation for the outer finish. There are several different types of products that accomplish this.

Self-etching primers and epoxy-based primers are two common types of primers that provide adhesion of the topcoats and corrosion resistance. Self-etching primers, also called wash primers, generally contain an additive or acid that chemically etches the metal, allowing excellent adhesion to the bare metal. Epoxy primers generally consist of an epoxy resin and a catalyst or hardener. One benefit of an epoxy primer is that the catalyzed product dries in a permanent solid state. Some epoxy primers require a metal etching or conditioning product to be applied before the application of the epoxy primer. These products typically contain a phosphate coating or an acid to clean and etch the bare metal.

Within the last several years, refinish product makers have reduced the amount of heavy metals that were typically used for priming and corrosion-resistance treatment to bare

metals. Lead-free or chromate-free primers have been introduced that reduce the amount of heavy metals that are released into the environment.

### **Primer-Surfacers**

The purpose of a primer-surfacer is to fill minor surface imperfections that may be present in an area where damage to a finish has been repaired. Primer-surfacers may also be called primer fillers. Most primer-surfacers are made from talc and urethane resins. The talc is used to fill imperfections, including sanding scratches, pinholes, and broken paint edges. The urethane resins cure through a chemical reaction with a hardener or catalyst. This may be referred to as a 2-part or 2K product.

Primer-surfacers are generally applied through a spray gun. Some primer-surfacers are mixed with a thinner or reducer that makes the material thinner and easier to atomize during spray application. The thinner evaporates out of the sprayed product. After the primer-surfacer has cured, the surface is sanded with a fine sandpaper to make the finish smooth, and the sand scratches or other imperfections are filled in.

### **Primer-Sealer**

The chemical makeup of most primer-sealers is very similar to a primer-surfacer. The major difference is that there is typically a higher concentration of resins to talc than a primer-surfacer. The purpose of a primer-sealer is to provide a smooth foundation and uniform color for the new topcoats. Due to the lower concentration of talc, there is less filling characteristics. Primer-sealer is not intended to fill imperfections. Primer-sealers are generally not sanded unless there is debris in the sealer coat. Primer-sealers typically require a reducer to make the primer-sealer thinner and more viscous. This helps with the atomization during spraying applications.

### **Direct-To-Metal Products**

Some refinishing product makers have developed undercoats that can be applied directly to clean bare metal. These products typically provide filling characteristics as well as resistance to corrosion.

### **Topcoats**

The color and final appearance of the vehicle is dependent on the topcoats. Nearly all vehicles are finished with a basecoat that provides the vehicle color, and a clearcoat. Single-stage topcoats or finishes provide the color and protection from the environment. Single-stage finishes are still common in the trucking industry and for fleet vehicles. Most vehicle finishes are multi-stage, meaning a basecoat and a clearcoat are applied at the factory.

### **Basecoats**

Basecoat consists of pigment that provides the color. Basecoats traditionally are a solvent-based product where the pigments, additives, and resins are combined to match the desired color. The basecoat is typically combined with a reducer to allow it to be

atomized during spray application. Basecoats are applied to a prepared substrate. The basecoat may require blending techniques or tinting to match the original vehicle color.

There are also waterborne basecoats. Instead of using petroleum-based resins and solvents in the basecoat, water soluble solutions and resins are used. Waterborne refinish products still contain hazardous air pollutants, although the solid content is higher than a solvent-based product. This equates to less VOCs emitted during the spray application process. The application of clearcoat is required to protect the basecoat from ultraviolet (UV) radiation from the sun.

### **Clearcoats**

Clearcoat is a non-pigmented coating that provides chemical and scratch resistance to the finish. Clearcoat also provides the finish with resistance to deterioration from the sun's UV radiation. Clearcoat is typically a two-part product that cures by chemical crosslinking using a hardener or activator. To assist in the atomization of the clearcoat, there may be a reducer or thinner added. There are waterborne clearcoats that are effective for automotive use.

### **Reducing HAPs**

One of the most important considerations when applying coatings is to ensure that the products are mixed correctly. It is also important to mix only the required amount of material. This keeps the amount of hazardous air pollutants and hazardous solid waste to a minimum. Past experience may be helpful when making the determination of how much product to mix.

Refinish product makers provide mixing instructions on the product information sheets. Most products are required to achieve a specific amount of VOC reduction. This means that the amount of solvents that evaporate during use can only be a certain amount or percentage of the product. Therefore, it is crucial that products be mixed correctly using the recommended products and procedures. Exceeding the amount of reducers or solvents that the product maker recommends will make the product non-compliant.

Mixing ratios can be referenced to determine how much reducer or hardener should be added to the product. This will ensure that the product will be thin enough to be spray-applied, yet not exceed the amount of VOCs that are permitted.

Some mixing methods include using a digital scale to mix the product according to the manufacturer's recommendations, measuring in a calibrated mixing cup, or measuring the viscosity of the product with a viscosity cup. Most refinishing product makers have weight measurements for mixing a product so that the correct amount of reducers and hardeners are added when mixing on the digital scale.

## **Spraybooth Requirements**

The final rule requires that refinishing and coating products be applied in an approved prep station or an enclosed spraybooth. The spray environment is required to have at least three complete walls or curtains, and a ceiling covering the entire spray area.

The spray area must have filters made of fiberglass or other media that is at least 98% efficient. This means that 98% of the overspray from the spray application is captured in the filters.

## **Downdraft Spraybooth**

There are several types of spraybooths used in a collision repair facility. One of the more common is a downdraft spraybooth. A downdraft spraybooth operates by drawing air in from the ceiling and out through the floor. There are typically intake filters in the ceiling that filter the air coming into the spraybooth and filters in the floor to trap overspray.

## **Crossdraft Spraybooth**

Another type of spraybooth is a crossdraft spraybooth. A crossdraft spraybooth typically has intake filters in one end of the spraybooth and overspray filters in the other end.

## **Prep Stations**

Prep stations are another type of spray environment that is often used in a collision repair facility. These typically have the same type of makeup as a downdraft spraybooth, with the exception of the walls. Prep stations typically have curtains on two or three sides, instead of a solid wall. Most prep stations will qualify for a spray environment under the EPA Final Rule as long as the curtains reach all the way to the floor and there is a filtration system to trap overspray.

Some local or state regulations prohibit the application of coatings in a prep station. Before using a prep station for coating application, always check the local or state regulations to verify if coatings may be applied in this environment.

## **Manometer / Magnahelic**

Spraybooth pressure may be determined with a measuring device called a manometer or a magnahelic. Both devices measure the air pressure inside the spraybooth as opposed to the pressure outside the spraybooth. Nearly every spraybooth will have some type of pressure measuring device. The final rule requires that positive pressure be no more than 0.05" of water.

## **Air Pressure Adjustments**

Spraybooths typically have adjustments for the amount of air pressure that is in the spray environment. The adjustments may increase or decrease the amount of air entering and exiting the spraybooth. When more air is entering the spraybooth than is removed, it is considered to have positive pressure. Negative pressure will draw out more air than what is supplied. The final rule suggests that negative pressure should be used, as this method draws the most overspray through the filters.

Most downdraft spraybooth manufacturers recommend a slight amount of positive pressure to reduce the amount of debris that could enter the spray environment. As long as the spraybooth has doors and other openings that are completely sealed and the spraybooth is equipped with a pressure balancing system, a slight amount of positive pressure is allowed.

### **Indications For Replacement**

The measuring devices often are used as an indicator of when the spraybooth filters require replacement. When there are increased positive pressure readings, less material is able to flow through the filters. The positive pressure will push the overspray outside of the spray area. When the pressure indicates that there is considerable positive pressure that cannot be adjusted through the ventilation system, the filters should be inspected and replaced, if necessary.

### **Filter Efficiency**

When replacing the filters, the used filters should be disposed of following state or local regulations. The residue from the filters may contain hazardous materials. The replacement filters should be at least 98% efficient.

### **HVLP Gun**

The EPA final rule requires that spray guns that are used in the automotive refinishing process exhibit a transfer efficiency of at least 65%. This means that 65% of the product that is applied is transferred to the part or object that is being coated. It is the responsibility of the spray gun equipment manufacturer to test the gun to be certain that this transfer efficiency is achieved. If 65% of the refinish material is applied to the part, the remaining 35% ends up being overspray. Some other guns that may meet the 65% transfer efficiency include reduced pressure (RP) spray guns, or low-volume, low-pressure (LVLP) spray guns.

One important consideration when using HVLP spray guns is that the gun may require a larger volume of air as opposed to a traditional spray gun. A typical HVLP spray gun will require around 15 cubic feet per minute (cfm) of airflow, although the amount of air pressure is reduced. Traditional high pressure spray guns typically require around 10 cfm. To meet the air supply demands of HVLP equipment, a larger compressor may be required.

The advantage of using HVLP, RP, or LVLP spray guns is a reduction in refinish product costs. Because HVLP guns have increased transfer efficiency over a traditional high-pressure spray gun, more material is applied to the object being coated. This creates less overspray and reduces the amount of total material required to achieve the proper coverage and film thickness. Although a spray gun is considered to be HVLP, the spray gun adjustments must be made according to the instructions provided by the gun manufacturer. An HVLP gun with an input air pressure exceeding the recommended

pressure will produce excessive overspray and will not meet the transfer efficiencies required by the EPA final rule.

### **Gravity Feed Spray Gun**

Gravity feed spray guns are commonly used in a collision repair facility. With a gravity feed spray gun, the refinish material flows down to the gun head. A needle and seat regulate the amount of refinish material that is provided to the fluid tip and air cap. Air pressure is routed through the gun body and is directed out of the air cap. Holes in the air cap direct the airflow, which makes the pattern. This airflow atomizes the refinish material, breaking it into tiny droplets. High-volume low-pressure, HVLP spray guns use a large volume of air at a reduced air pressure to atomize the refinish material.

### **Siphon Feed Spray Gun**

Siphon feed guns are also common in a collision repair facility. With a siphon feed gun, the refinish material is drawn up through a tube by a vacuum that is created through a venturi in the air cap. As air pressure flows through the gun, the refinish material is drawn up to the gun head. The needle and seat regulate the amount of refinish material provided to the fluid tip and air cap. The holes on the air cap direct the airflow across the fluid tip, atomizing the refinish material into small droplets.

A variation of a siphon feed gun is a pressure feed gun. With this type of gun, regulated air pressure is applied to the top of the gun cup. The pressure causes the fluid to be pushed up through the pickup tube and into the gun head.

### **Exemptions**

Exemptions from the EPA final rule include airless sprayers and guns that have a cup that holds no more than three fluid ounces of refinish material.

### **Improves Overall Appearance**

Applying a finish with a spray gun requires a great deal of technique and gun adjustments. The overall appearance of the finish depends greatly on the atomization of the material. If the paint droplets are not properly atomized, they will land on the surface, giving an orange peel appearance. Having too much atomization may produce a dry-spray effect.

Most refinishing product makers have specific recommendations on gun setup and adjustments for specific products and types of guns. Following the refinish product maker's recommendations for gun setup is a good starting point for properly applying a finish.

### **Fluid Needle And Tips**

Most spray guns have different fluid needle and fluid tip sizes for a specific type of product. The size regulates how much material is released at the air cap. Larger size fluid needles and fluid tips are generally used for products that are thicker or more viscous, than are used for basecoats that are generally thinner.

The needle and fluid tips are generally machined as a matched pair. Some common sizes are 1.3 through 1.8 mm needle and fluid tips.

### **Main Adjustments**

A spray gun has three main adjustments.

The air input adjustment regulates the amount of air that passes through the gun body. Excessive air pressure will result in a dry finish and excessive overspray.

The fluid flow adjustment regulates how much paint is allowed to pass through the fluid needle and seat.

The fan adjustment regulates how much air passes through the air horn passages of the air cap. Increasing the amount of air creates an oval-shaped pattern, and decreasing the amount of air creates a round pattern.

### **Air Cap Pressure**

The amount of air pressure at the air cap is what provides the atomization to the refinish material.

If there is too much air cap pressure, there will be excessive overspray, as there is a large amount of atomization. Generally, the cap pressure should not exceed 10 psi. Some gun manufacturers have a maximum input pressure stamped or engraved on the gun body. This pressure should not be exceeded, as it will produce excessive air cap pressure. As the input pressure increases, the air cap pressure increases. Also, the air cap pressure will change as the fan adjustment is changed.

### **Transfer Efficiency**

When applying a finish with a spray gun, there are several different variables that will affect the transfer efficiency. The gun travel speed and gun distance to the object are variables that will affect the amount of HAPs generated during the spray application. These variables can also affect the final appearance of the finish.

Most refinishing product makers have recommendations for gun distance when applying a specific product.

### **Atomization**

The final appearance of the finish is dependent on the proper atomization of the material. The finer the atomization, the smoother the finish will be. Atomization is dependent on

several variables, including the viscosity of the material, the speed of the reducer, the amount of air pressure that is used, and spray gun technique.

Since the final rule and VOC regulations prohibit over-reduction of refinish materials, and HVLP spray guns limit the amount of pressure that is used to atomize the product, spray gun operation technique is often used to influence the final appearance of the finish.

### **Spray Gun Speed**

The travel speed of a spray gun should be consistent. If the travel speed is too slow, the material may sag and run. This type of finish is unacceptable, and will need to be sanded down and possibly reapplied. If the travel speed is too fast, the material lays down dry with a rough texture. This finish will not present an acceptable topcoat appearance.

### **Overlap**

When spraying refinish materials, an adequate and sufficient overlapping of the material is required. Typically, an overlap of 50 - 75% is recommended to get complete coverage and hiding of the material being sprayed. When applying metallic or special effect finishes, keeping the overlap consistent is crucial. If the overlap is inconsistent, striping and mottling of the finish may occur.

### **Spray Gun Distance**

Spray gun setback can have effects similar to that of travel speed. A spray gun that is too close will have a heavy material deposition. This will result in runs and sags. These defects will require removal. If the spray gun distance is too far away from the surface, the result is a dry, rough texture, or poor coverage.

### **Spray Gun Angle**

When applying a finish with a spray gun, it is important to hold the spray gun perpendicular, or at 90 degrees, to the object. An exception to this may be when the finish is being blended to achieve a color match. In this case, a technique called "fanning" the spray gun is used to taper off the amount of finish that is applied.

All of the variables in spray gun technique can be used to reduce HAP. By moving the spray gun closer and moving at a faster travel speed, less overspray is generated than if the gun is held further away and the travel speed is reduced.

### **Cleaning Best Practices**

Atomization of solvents and remaining refinish materials when cleaning a spray gun is a source of air pollution.

A traditional method of cleaning a spray gun included spraying solvent through the spray gun. Traditional siphon-feed guns required this, as it was difficult to get solvents



into the gun head. Other technologies, including gravity feed spray guns and enclosed gun cleaners, have made it possible for cleaning to be done without atomization of the solvent.

The final rule requires that all spray gun cleaning be done in an enclosed gun cleaner that pumps a cleaning solvent through the gun. If a facility does not have a spray gun cleaner, the gun can be manually cleaned, as long as the solvent is not atomized through the gun.

### **Waterborne Product Cleaning**

Waterborne refinishing products may pose some additional challenges when cleaning spray guns. Since a special cleaning solvent, water, or a combination of water and denatured alcohol, is used to clean the spray guns, the same spray gun cleaning equipment cannot be used to clean a gun that is used to spray a solvent-based product. Water may cause corrosion to the parts of a spray gun. Therefore, the spray gun may have fluid passages and internal parts made of stainless or coated steel, specifically designed for applying a waterborne product. Some paint gun manufacturers may specify de-ionized water, a special cleaning solvent, or isopropyl alcohol to clean up equipment used to mix and apply waterborne products.

Waste that is generated from waterborne products does contain hazardous materials. The water or solvents used to clean spray equipment should be disposed of as hazardous waste. A separate waste disposal container should be used so that solvent-based and waterborne waste do not get mixed together. The waterborne waste should not be washed down a drain.

When disposing of liquid or solid hazardous waste, check with local or state regulations concerning the requirements of disposal.

### **Module Summary**

Topics discussed in this module included:

- how to reduce the amount of methylene chloride (MeCl) paint stripper that is used.
- spraybooth requirements and filter maintenance schedules.
- spray application techniques and gun adjustments that reduce the amount of HAPs released into the environment.
- spray gun cleaning requirements.

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