Paint Safety Guidelines #4: Paint Spraying Systems

This information sheet describes various methods for spraying paint, including the advantages and disadvantages of each method. It will help you choose a method that gets the job done while minimizing worker exposures to the paint products being used.

Administrative controls are the third line of defense

Changing spraying methods is considered an administrative control for reducing worker exposures to controlled products. Before resorting to administrative controls, you should always consider substitution and engineering controls first. For more information, see the information sheets Reducing Exposures #1: Substitution Choices for Common Products and Reducing Exposures #2: Ventilation.

General guidelines

Follow these general guidelines for spraying paint:

• Do not use pressure-pot (conventional) sprayers or airless sprayers for small jobs such as doors.

• Consider rolling paint rather than spraying it when other tradespeople are working in the same area. Rolling paint will lower exposures for everyone.

• Ensure that workers know how to set up and operate the spray equipment safely.

• Set up spray equipment to operate at the lowest air pressure possible for paint atomization. This will help increase transfer efficiency and decrease worker exposure to paint fog.

• Try using an HVLP system before using a conventional spraying system, but first ensure that you have an air compressor that will provide the volume of air required by an HVLP system.

• If possible, rotate workers through jobs so the same workers are not always performing higher-exposure tasks.

• Give workers who have higher-exposure tasks extra breaks throughout the day. (Exposure limits are based on the duration of exposure as well as the concentration of the contaminant.)

Conventional sprayers

Conventional sprayers are systems that atomize paint by using an air compressor to supply highly pressurized air at a low volume. Conventional spraying systems are also classified based on the location of the atomization, as follows:

• External atomization means that the paint is atomized externally from the spray gun.

• Internal atomization means that the paint is atomized within the spray gun.

High-volume low-pressure (HVLP) sprayers

High-volume low-pressure (HVLP) sprayers have the highest transfer efficiency of the various spraying systems, which means that more paint sticks to the surface being painted, leaving less paint in the air and reducing worker exposures. HVLP sprayers use lower air and

fluid pressures than other systems, so the paint has less "bounce-back," which reduces paint fog.

Airless spraying system requirements

According to the Occupational Health and Safety Regulation, when using airless sprayers you must ensure that the spray gun, hose, fittings, and pressure vessel are designed and constructed to withstand the pressure involved. In addition, you must ensure that the airless gun:

• is bonded to the paint reservoir and pump to prevent static discharge, which could result in a fire or explosion

• has a trigger guard to prevent accidental activation

• has a safety device to prevent the nozzle from coming into contact with workers

Controlling the risk of fire and explosions

Follow these guidelines to avoid fires and explosions when spraying paint:

• Control all sources of ignition (no smoking in paint shops).

• Consider using latex paints instead of solvent-based paints. Latex paints do not pose a risk of fire and explosions.

• Make sure the ventilation system is in good working order. Look for electrical wires in the spray booth and fan motors within ducts or on fans.

• Store solvents and metallic powders safely. For more information, see the SHAPE information sheet Storing Paint Products.

Table 1: Comparison of paint spraying systems

Type of Spray System	Transfer efficiency %	Air Pressure (psi)	Fluid Pressure (psi)	Air Volume (cfm)	Comments	Spray Gun Cost (starting range)
Conventional	20-60	5-30	8-30	5-10	Good for a wide range of paint viscosities.	$100-$500
High-pressure low-volume (HVLP)	65-90	0.1-10	8-30	15-30	Best results for paints of moderate to low viscosity.	$100-$500 ($700 for turbine systems)
Airless	40-60	None	500-3000	None	Used for viscous paints, thick film or high production. Also used for conventional paints.	$1,500
Air-assisted airless	40-70	5-30	200-1000	5-15	Typically used for viscous paints with thick film buildup or high production rates. Also used for conventional paints.	$2,500

• Follow safe disposal procedures for used rags that may contain linseed oil, teak oil, or flammable materials that may spontaneously combust.

Eye wash stations

Every paint department should have at least one emergency eye wash station. Follow these guidelines:

• Eye wash stations can consist of either faucets or eye wash bottles.

• If you are using eye wash bottles, make sure that they have not expired.

• Eye wash stations, whether they consist of faucets or eye wash bottles, must have enough solution to provide adequate flushing for 15 minutes.

Further information

For more information, see the following resources:

• Coatings Guide — Application Equipment Index (http://cage.rti.org/equip.cfm)

• ABC's of Spray Finishing (www.devilbiss-gema.com.mx/pdf/i-239-c.pdf)

• Occupational Health and Safety Regulation, Sections 5.85 to 5.96, Emergency Washing Facilities; Section 12.138, Airless Spray Equipment; and Section 12.139, Design for High Pressure (http://regulation.healthandsafetycentre.org).

Table 2: Conventional spraying systems

Type of conventional system	Description	Advantages	Disadvantages
Siphon fed (external atomization)	Creates a vacuum at the nozzle to draw material from a cup.	• Lowest cost • Least maintenance • Quick colour change	• Operators must carry the weight of the material at the gun • Can only spray light materials • One-quart maximum • Spray position is limited.
Gravity fed	Uses the gravity to feed material to the gun from an attached cup.	• Ideal for most refinishing • Quick colour change • Easy to clean • Better atomization than siphon-fed systems • New models can apply paint 360 degrees	• Operators must carry the weight of the material at the gun • Can only spray light materials • One-quart maximum • Spray position may br limited for some guns. Technology unfamiliar to some workers.

Table 3: High-volume low-pressure (HVLP) spraying systems

Description	Advantages	Disadvantages
HVLP atomization is available for the following systems: • siphon fed • gravity fed • pressure fed • air-assisted airless • heated air-assisted airless	• High transfer efficiency (65–90%) • Sprays well into recesses and cavities • Higher transfer efficiency saves money spent on materials	• Atomization is not as fine as that of air-spray systems • Not recommended for heavy materials or where light production is required • Requires training to set up properly (for example, knowledge of paint viscosity) • Requires a large air compressor • Some systems for generating HVLP air may be expensive

Table 4: Airless spraying systems

Description	Advantages	Disadvantages
Hydraulic atomization is caused by the release of fluid under high pressure through a small orifice. Most widely used by painting contractors and maintenance painters.	• High fluid capacity • Fastest spray-application process • Large patterns • Low air consumption • Good for applying high-viscosity paints and adhesives • Limited paint fog and bounce-back • Allows for spraying cavities	• Requires strict maintenance • Hydraulic injection is potentially hazardous • Higher rate of overspray • Sharp patterns are difficult to blend • Painters must be trained to use the system safely • Expensive nozzles may flood the painting surface

Table 5: Air-assisted airless spraying systems

Description	Advantages	Disadvantages
Air-assisted systems use lower fluid pressures than airless systems (normally below 1,000 psi). Low-pressure air is added via the air nozzle to further atomize the pre-atomized spray. Generally used by furniture and industrial finishers.	• Less overspray and paint fog • Less tip wear • Longer pump life than airless systems • Greater film build on each pass of the gun	• Atomization is not as fine as air-spray systems • Hydraulic injection may occur • Tips may plug • Requires strict maintenance