Applicator Training Bulletin

First, why spray? Use of spray technology to apply your coating brings advantages of speed; uniformity of application for quality control and lower coating costs; and reduced labor expenses when compared with using a brush or roller, especially on irregular surfaces and intricate shapes.

The two most common methods of paint spray application are air atomized spray and airless spray. Air atomized spray uses compressed air to atomize, or transform, a coating into very fine particles or droplets as it exits the spray gun. In airless spray, a pump pressurizes the coating at a high level and forces it through a small elliptical orifice, or opening, as it exits the spray gun, causing the paint to atomize hydraulically.

This Applicator Training Bulletin describes the proper methods of setting up, operating, and maintaining air spray equipment, specifically conventional and high volume low pressure (HVLP) technologies. Low volume medium pressure (LVMP) technology is also addressed.

Setting Up Air Spray Operations

Figure 1 shows one configuration of an air spray equipment system. Components needed to apply coatings by air spray are:

- a fluid hose to supply coating to the spray gun (if using a pressurized gun);
- an air hose to supply atomizing air to the spray gun; and
- an air spray paint gun.

The most important element in air spray application is the person operating the gun. The operator is responsible for applying the coating, using a technique best suited to the job, and keeping equipment in good working order.

**Air Compressor**

The air compressor needs to supply clean, dry air of sufficient volume and pressure for all of the components in the air spray system. Typically, each full-production spray gun requires 15–20 CFM of compressed air, and each air-driven agitator requires 10–15 CFM of compressed air. Air pressure at the air compressor of 90–100 psi is recommended. Air compressors are usually equipped with an air receiver tank, drain, and oil separator.

**Compressed Air Filter**

An air filter will be needed between the compressor and the pot, especially on humid days. It is important to periodically drain moisture from the air filtration unit. If the unit is equipped with an automatic drain, ensure that a preventative maintenance program is in place.

**Air Supply Hose**

Check the air hose and fittings from the air compressor to the paint tank or pump to make sure they are in good condition and free of leaks. The inside diameter (ID) of the air hose needed is based on the length of the hose and the number of guns and air agitators used. Typically, for a one-gun setup, a ¼-inch ID air hose up to 50 feet long is sufficient.

**Coating Containers**

Siphon or gravity gun setups use a cup attached to the gun to deliver the coating.
For bigger jobs that require more paint, using a pressure-feed paint tank, also called a pressure pot, is an economical method of supplying coating to the spray gun. Flow is positive and uniform as paint is forced out of the tank by applying compressed air to the coating. Increasing or reducing the tank air pressure increases or decreases the flow of paint from the tank. Maximum tank working pressures can vary from 60–110 psi. Read the rating on a tank before using it.

The tank is a metal container with a removable, clamp-on lid that has a sealing gasket. The lid forms an airtight seal when securely clamped to the tank shell. Sizes of tanks vary from two quarts to twenty gallons; two and five gallon tanks are the most common.

Other features of the tank are a fluid-riser tube and an outlet manifold (or a bottom outlet used with heavy or highly-filled paints), a fluid outlet valve, a safety relief valve on the tank lid, a tank air vent valve, and tank air pressure regulator(s) with gauge(s). Consider accessories such as an air-driven paint agitator to easily mix or keep paint in suspension. Tank liners also make cleanup easier.

A paint pump can be used in place of a pressure pot. The paint pump pressurizes paint and forces it from a source container to the gun. As with a tank, the paint pressure is controlled by the pump air regulator. The paint pump has several advantages over a pressure tank. The pump normally draws the paint from the original paint container, can operate at higher pressures, is lighter in weight, and is easier to clean than the tank. However, a pump is more complex than a tank and does not deliver paint as uniformly as a tank.

**Hoses**

The fluid and air hoses that supply paint and atomizing air from the tank or pump to the spray gun should be serviceable, clean, and of the proper size and inside wall construction. The normal sizes are 5/16-inch ID for paint and 3/8-inch ID for air. When paint is viscous (thick, for example), highly filled, or pressure-sensitive, or when the hose run is over 50 feet long, a 3/8-inch ID paint hose may be recommended. Follow the paint manufacturer’s instructions on proper hose size.

The standard paint hose liner is nylon; the standard air hose liner is a synthetic rubber.

**Spray Gun**

The operation of an air atomized spray gun involves atomizing a stream of fluid with a stream of compressed air. The air-to-paint balance is controlled by the viscosity (thinness or thickness) of the paint and the air pressure put on the paint in relation to the volume and pressure of atomizing air. The spray gun has a fan control knob for adjusting fan width within the limits of the air cap. Figure 2 shows the various parts of a typical air spray gun.

In recent years, low volume medium pressure (LVMP) guns have been developed. LVMP has the atomization benefits of conventional air spray and the efficiency of HVLP. If you are not required by a regulatory agency to use HVLP, LVMP is highly recommended.

If you are not using a spray gun designed in the last ten years, the air reduction savings for modern spray guns will typically be greater than the cost of purchasing new spray guns.

**Start-Up Procedure and Operation**

Begin setting up the equipment by connecting the air hose and the paint hose to the spray gun and pressure tank. Then, turn the tank and gun air regulator handles counterclockwise so there will be zero pressure when the main air supply is connected to the tank. Next, pull the ring on the safety pressure relief valve on the tank, to make sure it operates freely. Close the main air supply valve on the tank, and tighten the tank lid clamps. You are now ready to connect the main air supply hose to the tank.

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**Editor’s Note:** This Applicator Training Bulletin is an update of an original article on conventional air equipment, written by Herb Chilman and Jerry Gonser of Spray-Quip, Inc. The article originally appeared in the June 1989 issue of the JPCL and was updated for this issue by Steve Stalker for Finishing Brands, Inc. (DeVilbiss, Ransburg, BGK, and Binks).
Once the main air supply hose is securely connected to the pressure tank, slowly open the main air supply valve on the tank. Look at the regulator air gauge. If it shows pressure, turn the handle counter-clockwise to reduce pressures to zero.

Prior to loading the paint into the tank, check for proper operation of the tank and fittings. Adjust the tank regulator to 10 psi to pressurize the tank. Look and listen for leaks around the tank lid and fittings on the lid, as well as leaks at paint hose connections to the tank and the gun.

Prior to connecting the gun to fluid and air, adjust the fluid adjustment screw until the trigger can be fully pulled toward the rear of the gun. While holding the trigger to its maximum travel, turn the fluid adjustment knob clockwise until it stops.

Adjust the air regulator to the spray gun to 20 psi. Check for air leaks at hose and gun connections.

Prepare the coating (by mixing, thinning, etc.) to the correct spraying viscosity suggested by the manufacturer. Remember that spraying viscosity can vary considerably with the temperature of the paint.

Maintaining a consistent coating temperature will help ensure the consistent atomization of the coating. Load the prepared paint into the pressure tank. Clamp the lid tight, turn the air regulator handles counter-clockwise so that zero pressure shows when the main air supply is on, and then turn on the main air supply.

Hold the spray gun and point it toward a grounded waste container. Trigger the spray gun fully. No air or paint should be flowing from the gun. While holding the gun with the trigger fully depressed, you should then fill the paint hose with paint by increasing the tank pressure regulator to 5 psi for thin materials or 10 psi for thick materials. Remember, the hose is full of air, so keep the gun open to remove the air. Let the stream of paint continue to flow from the gun until all air bubbles are pushed out and a solid stream is achieved.

**SettingPressures on a Pressurized System**

- Step 1: Using control knob on fluid regulator, set fluid pressure at 5–10 psi.
- Step 2: Using control knob on air regulator, set air atomization pressure at 30–35 psi.
- Step 3: Spray a test pattern (fast pass) on a piece of paper, cardboard, or wood. From that test pattern, determine if the particle size is small enough and uniform throughout the pattern to achieve the required finish quality. If particle size is too large or is giving too much texture in the finish, turn the atomization pressure up in 3–5 psi increments until particle size and texture of finish is acceptable.
- Step 4: Spray a part with these settings. If you are not able to keep up with the production rate required or if the finish is starved for material, increase the fluid pressure in 2–4 psi increments using the fluid regulator control knob (or use a larger capacity fluid tip) until required wet coverage is accomplished.
- Step 5: Remember, as you turn up the fluid pressure, the particle size will increase. Once the coverage required is obtained, it will be necessary to re-adjust the atomization pressure in 3–5 psi increments, as explained in Step 3, to insure required particle size and finish texture is acceptable.
- Step 6: If using HVLP, use an “Air Cap Test Kit” to verify that the air cap pressure is not above 10 psi, if required by a regulatory agency.

Proper setup utilizes no more fluid and air pressure than is needed to produce the required quality and a flow rate that will meet production requirements.

**Setting Pressures on a Gravity or Suction Feed System**

- Step 1: Spray a horizontal test pattern (air cap horns in a vertical position). Hold the trigger open until the paint begins to run. There should be even distribution of the paint across the full width of the pattern. The fan control knob is normally adjusted fully counter-clockwise. If the distribution is not even but is symmetrical, a different fluid tip may help. If the pattern is not symmetrical, there is a problem with either the air cap or the fluid tip/needle that must be corrected.
- Step 2: If the pattern produced by the above test appears normal, rotate the air cap back to a normal spraying position and begin spraying. (Check the service literature for typical pattern size for the cap you are using).
- Step 3: With the fluid adjusting screw properly set, and the air pressure set at approximately 30 psi, make a few test passes with the gun on some clean paper. If there are variations in particle size specks and/or large globs, the paint is not atomizing properly.
- Step 4: If the paint is not atomizing properly, increase the air pressure slightly and make another test pass. Continue this sequence until the paint particle size is uniform.
- Step 5: If the pattern seems starved for material, and the fluid adjusting screw is set to maximum travel, the atomization air pressure may be too high, or the material may be too heavy. Recheck the viscosity or reduce the air pressure.
- Step 6: If the material is spraying too heavily and sagging, reduce the material flow by turning the fluid adjusting screw (clockwise).

The proper spray technique is to hold the gun perpendicular to the surface to be sprayed at a distance of approximately 12 inches. Swinging the gun in an arc will greatly reduce the quality of the painted surface.

**Maintenance**

Following a few maintenance procedures can help ensure the quality of your work.

- During start-up and operation, periodically check air gauges and pressure relief valves.
- Drain air filters periodically. Lubricate and
adjust the spray gun paint needle packing daily.

- Because the gun air cap and fluid nozzle determine the quality of your spray pattern, you should clean the air cap and fluid nozzle as needed, following the manufacturer’s directions.

- Use only the proper wrenches and cleaning brushes. Do not use items such as channel locks or steel brushes, which will damage the cap or nozzle.

Cleanup
To prepare for the cleanup procedure, turn off the tank air pressure, vent the tank, loosen the air cap ring of the spray gun by turning it three times, hold a cloth over the air cap, and pull the trigger to force paint back into the tank. Remove the tank lid from the tank, and pour paint from the tank back into the original container.

To clean the equipment, first pour a small amount of cleanup solvent into the tank, and wash the sides of the tank and the paint riser tube, agitator, etc. Then, install the tank lid, pressurize the tank, shut off the atomizing air to the gun, remove the air cap, and trigger the gun. Be sure to catch the cleanup solvent in a grounded waste container. Repeat the operation until the tank, hose, and gun are clean. During the final operation, blow the system dry using compressed air. Next, remove the spray gun, wipe it clean, and lubricate it. Do not put the gun in a bucket of solvent to clean it; the solvent will attack the packings, causing the gun to leak. Remove the air and fluid hoses and roll them up. Remove the tank lid, wipe the tank and the lid clean, and reassemble them. Once these parts are reassembled, turn off the air at the compressor, relieve the air pressure, and remove and roll up the air supply hose. All components should then be stored in a secure area.

Conclusion
The success of any spray job depends on the skill of the operator and on his or her understanding of the equipment with which he or she is working. To ensure a successful spray application, remember these key points.

- Follow paint and equipment manufacturers’ recommendations.
- Use properly sized equipment.
- Follow the spraying, maintenance, cleanup, and safety procedures described above.
- Use common sense.

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