HVLP
CONVENTIONAL
AIRSPRAY

HVLP CONVENTIONAL SPRAY

PRINCIPLES BEHIND HVLP SPRAY

REASONS FOR HVLP SPRAY

TRANSFER EFFICIENCY

PRINCIPLES BEHIND HVLP SPRAY

HVLP atomization utilizes a high volume of air delivered at 10 pounds per square inch (psi) or less to atomize fluid material into a soft, low velocity pattern. This reduction in the velocity of the airstream from 30 to 70 psi typically delivered by conventional airspray methods results in a more controlled spray pattern, less bounceback and greater transfer efficiency. It also reduces the amount of volatile organic compounds (VOCs) into the atmosphere.

REASONS FOR HVLP SPRAY

In the 1990s world wide concern over air quality and hazardous emissions generated an enormous interest in HVLP spray equipment. Assuming a leading role in mandating more environmentally sound painting operations, the California South Coast Air Quality Management District (SCQMD) specified HVLP spray guns as one of only two types of spray equipment approved for use within its district (Los Angeles Basin).

Similar legislation has been adopted, or is now under consideration, in many other industrialized areas throughout the United States. As these areas introduce their own rules, the EPA will require them to be as strict, or stricter than the California legislation. High transfer efficiency equipment may ultimately be required in the spray finishing industry.

The essential characteristic of HVLP is low air velocity created by low atomizing pressures. HVLP is designed to atomize paint with an operating pressure at the air nozzle between 0.1 and 10 psi.

Overspray is a major problem in the finishing industry. Virtually all spray finishing operations can be adversely affected by overspray and this can result in costly material, maintenance and lost time.

Operators of spray painting equipment are also directly affected by overspray. The vapors emitted into the air can be hazardous to their health. Visibility in the spray area is also reduced by overspray in the air and this contributes to low productivity as well as being a safety hazard.

TRANSFER EFFICIENCY

The transfer efficiency of a spray finishing process is the amount of material that adheres to the target compared to the amount of material that was actually sprayed toward the target. Transfer efficiency is usually expressed as a percentage of the weight of solids sprayed versus the weight of solids received by the target. While finish quality and material savings are important

benefits, perhaps the most compelling reason to consider HVLP is the current trend toward legislated transfer efficiency requirements. The purpose of this legislation is to reduce the amount of VOCs released into the environment.

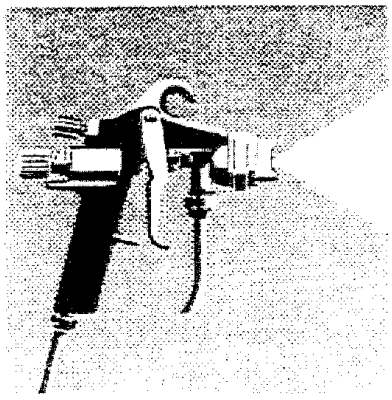
Keep in mind that altering the spray finishing process does not change the VOC level of the material, it only changes the amount of material you use. When you use less, you emit less.

Sprayer skill alone can account for a 20 to 50% (or even higher) difference in transfer efficiency. With variables being as equal as possible, the general transfer efficiencies for the four major spray systems are:

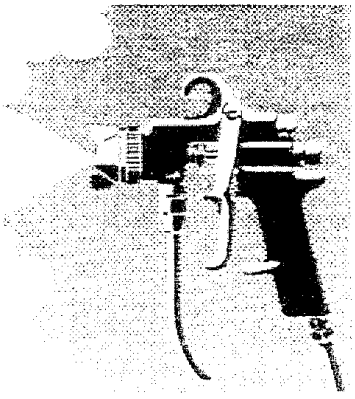
Electrostatic	=	85%
HVLP	=	65% to 85%
Airless	=	50% to 60%
Conventional	=	25% to 45%

HVLP VERSUS CONVENTIONAL AIR SPRAY

HVLP is most often compared with conventional air spray. HVLP is limited to 10 psi at the air cap, and conventional air spray is limited only by the size of the compressor being used; both use compressed air for atomization. It is common to see air pressures of 60 psi or greater used with conventional air spray when much less is actually required. These high air pressures typically produce transfer efficiency of 25 - 45% and a great deal of overspray and bounceback. HVLP conventional spray equipment transfer efficiency numbers fall in the 65 - 85% range.



HVLP Conventional

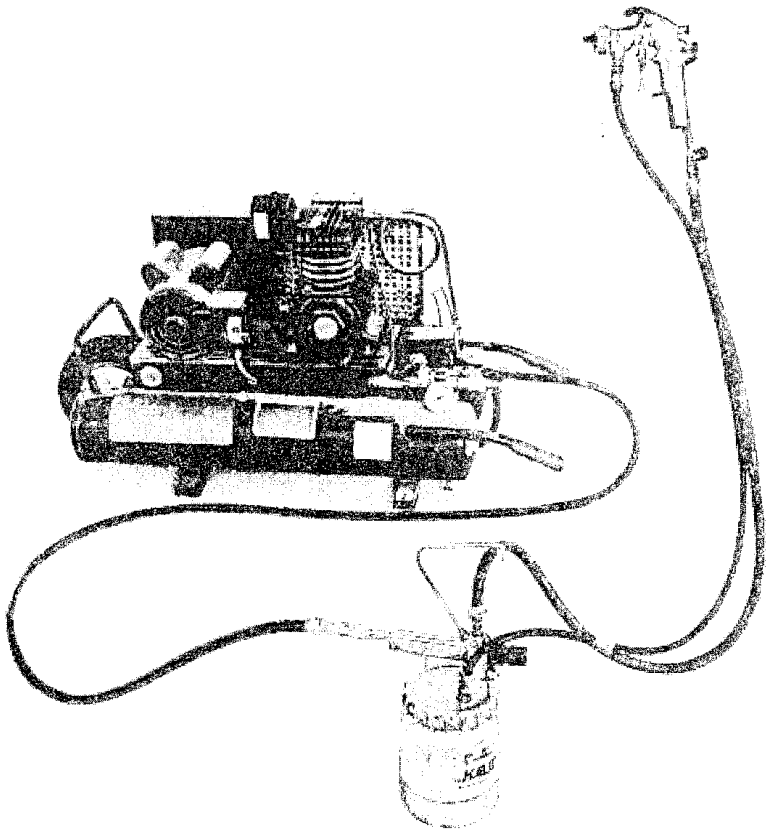


Conventional Air Spray

COMPONENTS OF AN HVLP SYSTEM

Although HVLP systems can vary in their design, they all must have three major components:

- High Volume Air Source
- Material Supply System
- Specially Designed HVLP Spray Gun.



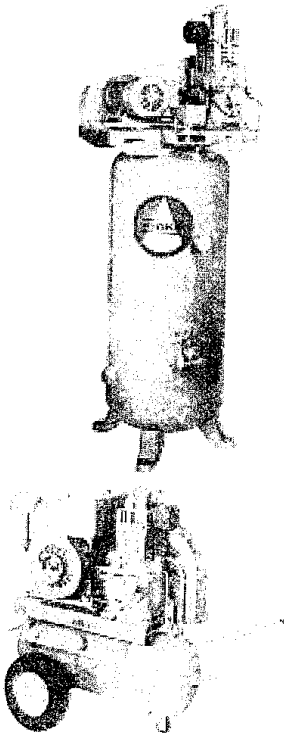
HVLP Conventional Spray System

HIGH VOLUME AIR SOURCE

HVLP conventional spray guns operate on compressed air supplied by portable field compressors or stationary shop compressors. Because of the higher volume of air required for HVLP, compressors powered by electric motors must be one horsepower or larger to maintain sufficient volumes of air to the spray gun.

Shop air compressors, because of their larger size, easily maintain volumes of air great enough to operate a large variety of fluid nozzles and air cap combinations.

Portable field compressors of only one horsepower will supply sufficient cubic feet per minute (cfm) to operate HVLP spray guns, as long as the spray gun's fluid nozzle and air cap orifice sizes are small enough to allow the gun to continually atomize the material being sprayed.



Shop and
Field Compressors

CHOOSING A COMPRESSOR FOR HVLP SPRAY

Shop Compressors

Shop compressors are generally run by electric motors of five horsepower or more. These air compressors have large air holding tanks and their output should be in the 15 - 20 cfm range. Compressors of this size are capable of supplying sufficient air to operate any of the HVLP equipment, including the larger fluid nozzles and air caps needed for heavier material atomization.

Portable Compressors with Electric Motors

Portability is a major concern when spray painting in the field. Most painters use portable compressors because they are small enough to be lifted in and out of trucks, and they can be easily rolled from place to place on the job site. Because they are used for interior work, portable compressors are commonly powered by 110 volt AC electric motors. These motors produce 6 - 9 cfm at 80 - 100 psi.

As a rule of thumb, you can calculate the cfm of an electric motor driven compressor by multiplying the horsepower of the electric motor times four. This would give you 6 cfm for a 1-horsepower motor.

Electric horsepower X 4 = cfm

Portable Compressors with Gasoline Engines
Under certain conditions a gasoline engine powered compressor may be needed. Gasoline engines are more powerful than electric motors of comparable size. Portable compressors that use a one-horsepower electric motor are equipped with a five-horsepower gasoline motor for operation on sites where electricity is not available.

The cfm rating for gasoline engine powered compressors is calculated by multiplying the horsepower of the engine times two. This would give you 10 cfm for a 5-horsepower engine.

Gasoline horsepower X 2 = cfm

Extreme caution should be used when operating gasoline powered equipment. Proper ventilation is a must.

MATERIAL SUPPLY SYSTEMS

Conventional HVLP spray guns are simply a replacement for conventional spray guns. The new technology has made it possible to replace the spray gun on a system, while leaving in place the material supply system itself. These new systems are known as "Air-Restricted Systems" and cover the following types:

- Siphon Feed HVLP
- Pressure-Assisted
- HVLP Pressure Tank
- HVLP Pressure Pump
- HVLP Siphon Feed Touch Up
- HVLP Gravity Feed HVLP

AIR PRESSURE

Atomizing air pressure must be set to allow for the drop in air pressure between the regulator and the spray gun. Air pressure at the spray gun is critical for HVLP spray guns. The length of the supply hose and the number of fittings and quick disconnects in the line all have adverse effects on air pressure to the spray gun. You may lose as much as five pounds of air pressure for every quick disconnect in your air supply line, thus allowing insufficient air pressure and air volume at the air cap, which may cause atomization problems.

AIR SUPPLY LINES

Air supply lines for HVLP conventional spray guns and their material supply systems must be of sufficient inside diameter (ID) to deliver adequate air pressure and volume to operate the system.

The air supply lines coming in from the primary air source, such as the compressor, are almost always 3/8" or 5/16" ID. This provides the air volume and constant air pressure needed for quality HVLP atomization.

Problems arise when HVLP guns are added to an existing system and the air supply line from the material supply container to the spray gun is not replaced with a larger inside diameter air line. Standard air lines from pot to gun would most likely be 1/4" ID, and are not capable of supplying adequate air volume and air pressure to the gun.

Conventional HVLP spray guns require 5/16" or 3/8" ID air lines from the compressor to the material supply pot, and from the pot to the spray gun.

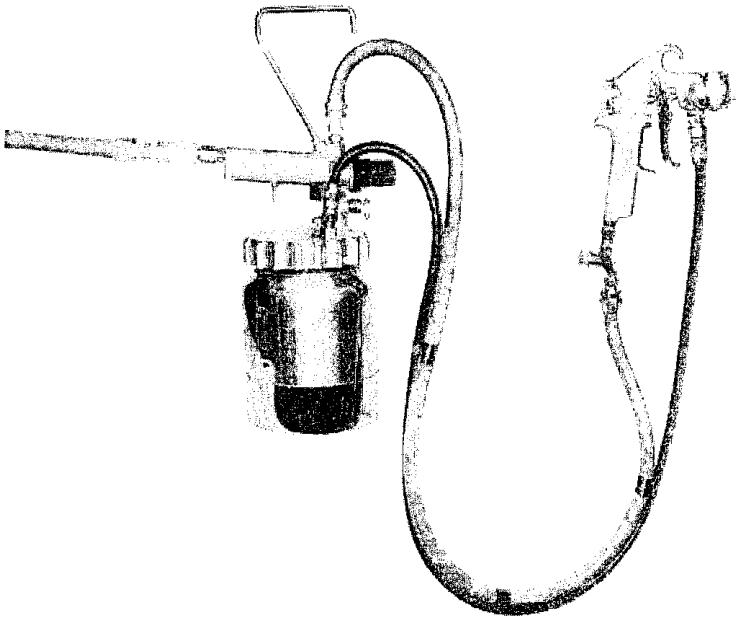
Cross Section View Showing Comparison of Inside Hose Diameters (not to scale)

HVLP CONVENTIONAL SPRAY GUNS

Non-Air Restricting Spray Guns

Non-air restricting spray guns rely on an air conversion unit to reduce the air pressure and the air volume to 10 psi or less before it reaches the gun. High pressure air from the compressor passes through the air conversion unit on its way to the spray gun, assuring the correct air pressure and air volume at the air cap of the gun.

HVLP turbine spray guns are non-air restricting guns, and can be used with air conversion units.

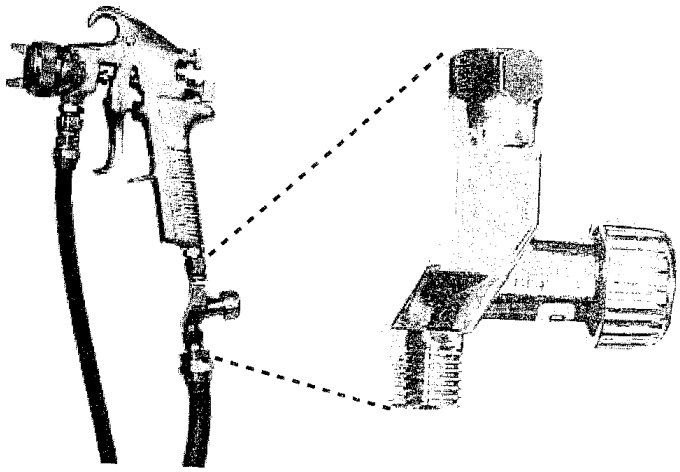


Non-Air Restricted Spray Gun

Air-Restricted Spray Guns

The most common HVLP spray guns in use are the air-restricted design. Air-restricted guns have machined air passages that reduce the incoming air down to 10 psi at the air cap. These guns do not rely on conversion units or "cheater valves" to reduce the incoming air pressure.

Cheater valve is a slang term for an air volume control valve, installed at the air inlet of the spray gun. Applicators use this valve to adjust the atomizing air pressure entering the gun. Air volume control valves are available with attached air pressure gauges that will indicate how many psi of air are actually entering into the gun body.



Air Volume Control Valve

There are two types of air-restricted HVLP spray guns. The first type will reduce air pressure of 50 psi or less coming into the gun to 10 psi or less at the air cap. These guns are very easy to use, and look and operate like the standard conventional spray guns. Set the air pressure at 50 psi coming from the compressor to the spray gun, and adjust these guns in the usual manner.

The one problem with this technology is that it is possible to override the HVLP capabilities of the gun by allowing more than 50 psi of air to enter the gun. When more than 50 psi enters the gun body, the air at the air cap is above 10 psi. If this happens, the gun is out of compliance with HVLP regulations, causing high amounts of overspray and low transfer efficiency.

HVLP OPRATORS CHECKLIST

HVLP OPERATOR'S CHECKLIST

1. Is your compressed air source large enough? A typical air restricted HVLP spray gun requires at least a one-horsepower compressor.
2. What is the length and ID of the air line? It is recommended that the shortest length and largest ID air line that is practical for the job be used. Air lines of 5/16" ID minimum are recommended.
3. Are you using quick disconnects on your air lines? If your air supply system is borderline, stay away from them. Although these items are a convenience, they also cause unwanted pressure drops which may rob valuable air pressure.
4. Have you selected the proper air cap and fluid nozzle? Your equipment supplier should be able to supply the correct combinations. Remember as your flow rates increase, your atomization quality may decrease. Experiment with a variety of nozzle combinations to find the combination that works best.
5. Check your atomization air pressure with an air cap test gauge.

HVLP HELPFUL HINTS

HVLP HELPFUL HINTS

For those applicators trained in conventional air spray, HVLP can be quite a change. With a maximum of 10 pounds of air at the air cap, even the sound of the gun is much different.

Most applicators find that they need to hold the spray gun closer to the target, somewhere in the 6 to 8 inch range, rather than the 8 to 12 inch range they have been using with conventional spray.

Because of the larger paint particle size, it is common practice to increase the amount of overlap in each pass of the gun. Increasing the overlap assures that the larger particles on both sides of the spray pattern are covered with a wet coat of paint.

A major mistake is to thin the paint too much. The illusion that the paint is too thick is caused by the low atomizing pressure of the HVLP equipment. Low pressure decreases the amount of VOCs in the air, and increases transfer efficiency. If you thin the paint too much, the result is a lot of overspray and bounce back. For the best results thin the paint as little as possible remembering that the atomized particle size will be larger than that of conventional air spray.