Which Spray Equipment Is Best for My Business?

By Diane Shattuck

Finish Specialist, Gemini Coatings

FR67

With all the different spray systems available today, how do you determine which one best fits "YOUR" needs as a small shop?

Questions to ask yourself

- How much finishing do you do on average?
- What type of parts will you be finishing?
- Where will you be finishing? shop/field
- What types of coatings will you be spraying?
- What other equipment will you need to support your spray system?

Choosing a spray system basically breaks down to three essential components.

1) Spray Gun **2)** Cup or Pot **3)** Power System

SPRAY GUN

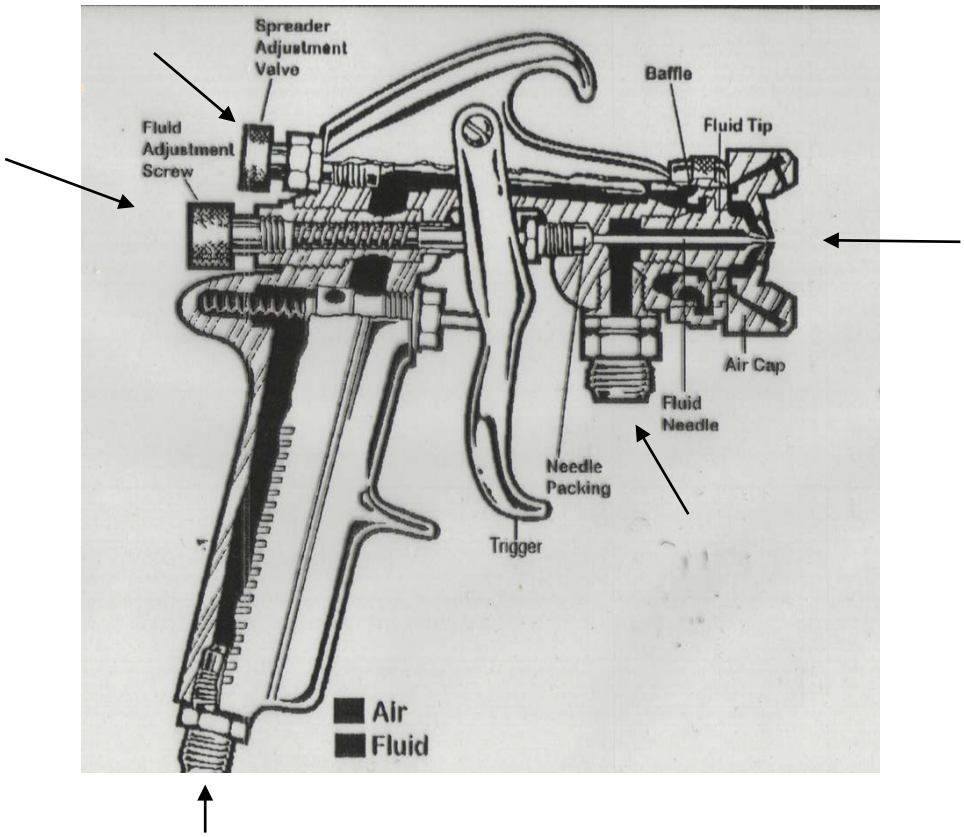
A tool that uses compressed air to atomize finishes and apply to a surface. The finish and air enter the gun through two separate passages and then mix together at the air cap (atomize) before landing on the targeted object.

CUP OR POT

A container that holds the finish, ranging in sizes from as little as 4 oz. (used on touch up guns) to 10 gallons pressure pots. They can be connected to the gun directly or by a fluid hose from the container to the gun.

POWER SYSTEM

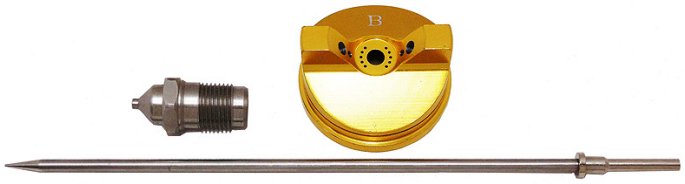
- **Turbine systems –** self-contained system, portable and generates high volume of slow moving air only when in operation. Controlled and consistent air pressure determined by how many stages (fan blade) very limited in variances of pressures.
- **Compressed air –** used as a source of power for many tools in your shop, has the ability to store energy on tap, available in all sizes, can produce high and low air pressures.



The Spray Gun

All spray guns basically break down the same way. You have inlets for fluid and air. The fluid enters the gun in the front, either from the top (Gravity feed) or bottom (cup or pressure). The fluid flows through a nozzle opening which opens and shuts by the needle and gets atomized by the air cap. The amount of fluid passing through the tip can be controlled by adjusting the Fluid adjustment screw on the back of the gun. The air enters the gun in the handle and travels to the face of the gun where it will intersect with the finish coming out the nozzle. At the air cap, the liquid exits the gun and is hit with a jet of air, which busts up the liquid into tiny particles called atomization. The air fan pattern is adjusted by the spreader adjustment knob on the back of the gun. Atomization, involves busting the liquid finish into tiny little droplets and transferring it to the surface you wish to finish. The air used to atomize and blow the liquid to the surface will affect how some droplets lay down and stick and some simply bounce off. This is what we call Transfer Efficiency. Different types of spray guns will produce different Transfer Efficiency.

The Viscosity of the material will directly influence how you pick your Air Cap, Needle and Nozzle to get the best atomization and flow of the material. Setting up your gun will be a balance of the three.



HOW TO CHOOSE NEEDLE / NOZZLE SIZE

The needles job is to open and shut the opening of the nozzle, therefore the needle and the nozzle should be a matching set. The needle can restrict and direct the flow of the material from the gun into the air stream. Here are 5 basic questions to consider when selecting the right combination.

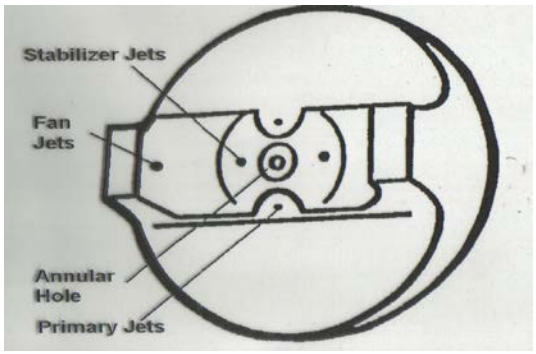
1. What is the viscosity and type of material ? -Higher viscoisty larger nozzle, Thinner material smaller nozzle.

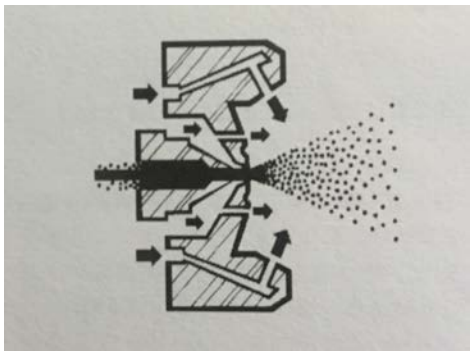
2. What is the size and shape of the object you are spraying? - General rule, use the largest possible spray pattern consistent with the object size. Air caps can deliver various pattern characteritics to help reduce time and the number of passes.

3. What is the desired speed and finish quality?- For speed and coverage, choose a nozzle combination which produces a pattern as wide as possible with out jepordizing quality atomization.

4. What gun model are you using?- Many manufactures have different set ups available for different styles of guns, you may have some limitations on the selection of nozzles to the viscosity you wishto spray.

5. What is the CFM and PSI available from your compressor? - Air supply is paramont, if your air supply is limited because of an undersized compressor, or perhaps to many tools running off the compressor at the same time, your gun will be starved for air producing an incomplete atomization and a poor finish.





AIR CAPS

The air cap is a key player to ensure a quality finish. The air cap directs compressed air into the fluid stream to atomize it and form the spray pattern. Multiple jet caps are designed to provide better atomization of more viscous materials. They offer greater uniformity in the spray pattern due to equalization of air volume and pressure from the cap, and can provide excellent atomization for materials that can be sprayed with lower pressures.

HOW TO CHOOSE AN AIR CAP

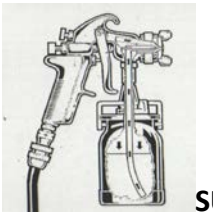
- What is the viscosity and type of material ?
- What is the size and shape of your object?
- What type of material feed system are you using? (suction, gravity or pressure)
- Size of Fluid tip?
- What is the CFM and PSI available from your compressor?

Remember that the material you are spraying is coming out of the nozzle at a certain flow rate, select the air cap that will correctly atomize it. Too much air and you have excessive overspray, too little air and you will have not broken the droplets up enough and you get orange peel. Dry spray will happen if air cap is to small to the nozzle, change out for larger air cap. Changing the fan pattern size does not atomaticlly change the flow rate, remember to reduce the flow rate out the nozzle if a smaller pattern is desired or runs will be in your future.

Conventional Spray guns- The "old Fashion" conventional spray gun typically used 40 PSI or more compressed air at the gun. The same air pressure going into the gun is the same air pressure coming out. Excellent atomization, however over 50% + lost in finish and overspray. **T.E 23-50%**

HVLP Spray gun – HVLP or High Volume Low Pressure, uses a high volume of air (CFM typically 13-25) delivered at a low pressure to atomize the finish (10 PSI or less at the air cap). HVLP guns use more air moving at a slower speed, the result is a softer, more controllable spray pattern that puts more finish were you want it and less overspray and bounce back. While slower, it offers better Transfer Efficiency than conventional spray. **T.E 65-80%**

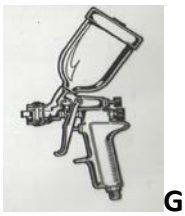
LVLP Spray guns -LVLP is all the benefits of HVLP but with less air requirements. If you do not have a large air compressor, you can get great results with just 5CFM@40. LVLP is also good for mobile painters due to **the smaller air requirements and low overspray.** LVLP compensates for the lack of air with a precision air cap that acts like a bunch of tiny Sharpe knifes that cuts your material. **T.E 65-80%**



SUCTION FEED – Compressed air travels through the gun, creating a vacuum of air at the air cap. The cup container attached to the gun usually has one or more vent holes on the lid of the cup, which allows outside air to enter the cup. This will create a siphon that draws the material up the fluid tube and into the gun. The material then flows through the fluid tip, mixes with the air coming from the air cap and voila, Atomization. This system is usually limited to a one quart size or smaller containers.

Advantages: Low maintenance and equipment costs, several tip sizes available

Disadvantages: Not for high volume spraying and Low Transfer Efficiency, must keep air vent open, hard to maintain even spray when cup starts to empty, can drip at gasket on cup rim. Limited angles that can be sprayed, cannot tip the spray gun upside down.



GRAVITY GUN – This gun uses gravity to flow the material from the cup (mounted above gun) into the gun fluid passage way flowing thought the nozzle and air cap. The cup has a vent hole at the top of the cup that allows outside air to pass through to ensure constant flow of material. Gravity guns are more efficient and require less incoming air to operate than suction feed guns since no atomizing air is needed to move the material from the cup to the fluid tip. You can usually use a smaller tip on a gravity gun than a siphon gun when spraying the same material and have more control. Smaller tip plus less air equals better Transfer Efficiency less overspray.

Advantages: Low maintenance and equipment costs, Lighter weight than Conventional guns, less overspray, material flows down the gun allowing finish to exit- good to the last drop, easy clean up.

Disadvantages: Weight of the gun is top heavy, may leak if tipped too far, cannot spray upside down

CONVENIENT ACCESSORIES – Many manufactures have developed adaptable cup systems to attach to both Siphon and Gravity guns. These systems allow for more versatile angles, easy color change and clean up.

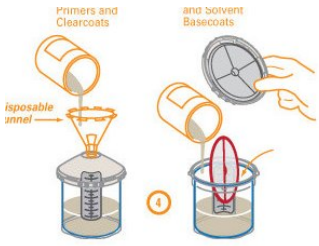
Advantages: Saves $$$ on solvent and Labor, fast color change, disposable, convenient.

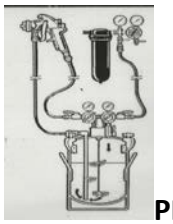
Disadvantages: Startup cost, have to buy adaptor for each gun, continual purchase

3M PPS

Sata RPS

DeVilbiss DeKups

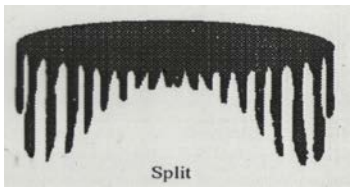




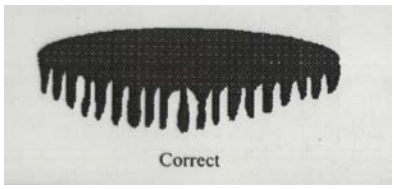
PRESSURE FEED – In this design, the fluid is pressurized in a cup or tank. The pressure forces the material through the fluid tip and to the air cap for atomization. This system does not have a venting hole on the lid of the container. These systems must be sealed tightly to work properly. The material when in a pressure pot and not on the gun will eliminate the excess weight on the gun, make it easier to maneuver in tight places, allow for larger fluid handling (less fill up) and allow you to spray faster. Pressure feed systems have valves that regulate air and fluid pressure. Air entering the pressure pot can be regulated to move the fluid to the gun, so pressure feed guns systems can spray thicker finishes, giving them an advantage over both Siphon and Gravity systems. The ability to regulate both fluid and air pressures can lend itself to the material being applied in greater amounts in less time.

Proper set up is a balance between air and fluid.

Too much fluid



Too much air



Right mix

Advantages; Greater flow rates = faster time. Available in several sizes of handling containers, can spray in tight spaces, great for large jobs.

Disadvantage; Harder to clean because of long fluid hoses.

TURBINES- Turbines are complete systems that are portable, self-contained and great for the hobbyist, small woodworker and the onsite finisher. Turbines are an industrial- strength vacuum cleaner motor that generates a high volume of slowly moving air. They come in many sizes suited for different tasks. They come in different "stages" which refers to the number of fans that are mounted to the motor. The more stages, the more pressure it is capable of generating. The fan blades are either 5.7" or 7.2" larger the fan blade the more the CFM. Always buy the largest size you think you will ever need, unlike a compressor you can't pump up the volume. If you think you will be spraying lacquers and pigmented finishes look to get at minimum a 3 stage turbine. **T.E 65-80%**

Bleeder- Air is constantly flowing out the face of the gun even when not pulling the trigger to help keep excess heat from building up in the turbine and burn out the motor.

Non Bleeder- Non-bleeder guns have a valve mechanism in the handle that interrupts the flow of air to the tip of the gun when the trigger is pulled. These guns work similar to conventional style guns. Turbines will have a pressure relief valve somewhere in/on the unit when a non-bleeder gun is supplied with the unit.

Advantages; Portability, Low maintenance, minimal space and equipment and affordability

Disadvantages; Pressure-generating limitations, noise, need to switch on and off repeatedly.

AIRLESS – An airless sprayer works by pumping paint at a very high pressure, up to 3,000 PSI, through a hose and out a tiny hole in the spray gun tip. The tip is designed to break up the paint evenly into a fan-shaped spray pattern of tiny droplets. Airless systems pump the paint directly from the can or 5 gallon bucket, making it easy to apply a lot of material in a short time due to the high pressure, fine particles of paint don't all stick to the surface, a large percent of the paint can drift in the air and land onto everything in sight. This means you will need to spend extra time masking the area to keep everything paint free. Low viscosity materials are hard to spray, they are prone to foaming. CATION: the pressure at the tip can inject coating right through your skin and into blood stream; it can even amputate your finger. **T.E 40-60%**

Advantages; Fast, less expensive than Air Assisted Airless. Plug into 110v outlet. Portable system with only one hose to tend with.

Disadvantages; Not designed for "fine" finishing, can be dangerous, tips clog easily. Extra time in prepwork.

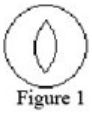


Figure 1 Tip

Figure 2 Airless Spray pattern

Both Airless and Air Assist Airless spray guns use high fluid pressure to atomize. Fluid is forced through an elliptical shaped orifice. The orifice shape and size help determine the pattern size and shape, the tip size also influences the material flow rate as well.

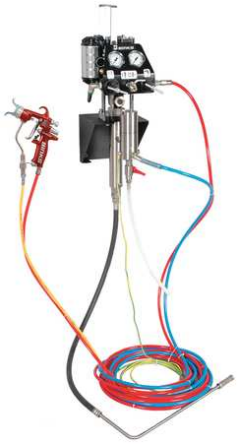
AIR ASSISTED AIRLESS – Uses hydraulic pressure like the airless system but with only using typically 300-600 PSI. Air Assisted Airless combines the best of Airless and conventional spray guns, they deliver great quantities of material through the gun quickly while also introducing air at the tip of the gun to create atomization. The finish comes out like a soft gentle rain. The tip size determines fan width and flow rate. **T.E 65-87%**

Advantages; Fast, excellent atomization, soft spray, minimal overspray, can spray into corners, capable of very large consistent fan patterns, pick up tube can go in can, pails or drums. Fast clean up. BEST Transfer Efficiency, finest finish and saves $$$$$$ on time and material.

Disadvantage; Not designed to spray thin viscosities, initial cost is high (will get back in material savings quickly)

Figure 3 Air Assisted Airless without air

w/air mix



If you purchase more than $1000 worth of finishes per month, this equipment will pay for itself within a year in material savings alone.

Before you choose a gun, FIRST choose the compressor.

Getting the system that is the right size is paramount to save on both time, expenses & rework.

COMPRESSORS – (Wikipedia)

> An **air compressor** is a device that converts power (using an electric motor, diesel or gasoline engine, etc.) into potential energy stored in pressurized air (i.e., compressed air). By one of several methods, an air compressor forces more and more air into a storage tank, increasing the pressure. When tank pressure reaches its upper limit the air compressor shuts off. The compressed air, then, is held in the tank until called into use. The energy contained in the compressed air can be used for a variety of applications, utilizing the kinetic energy of the air as it is released and the tank depressurizes. When tank pressure reaches its lower limit, the air compressor turns on again and re-pressurizes the tank.

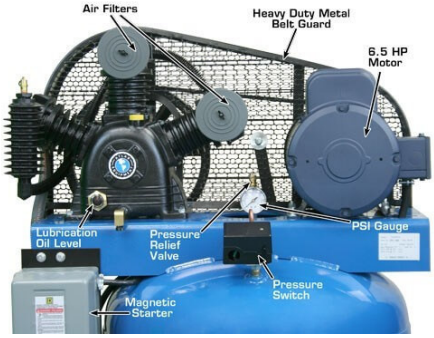
What size Air Compressor do I need?

- Add up CFM requirements
- Determine DELIVERED CFM -Delivered CFM is the AVAILABLE Air
- Delivered CFM will increase when PSI is decreased and increase when PSI is decreased.
- Add anticipated usage and growth
- Consider the duty cycle of the compressor (time running vs. being idle)
- Multiply CFM by 1.5 (if you expect to use 26 cfm of air you would need 39 cfm)

TYPES OF COMPRESSORS

- **Reciprocating** –single stage or two stage

One of the oldest technologies sizes up to 25 HP or so. Great for light duty applications, Works by moving a piston within a cylinder to compress air. Single stage – one or more pistons all same size, can produce up to 125 psi. Two stage – two or more cylinders of unequal size, can deliver air over 175 psi.



- **Rotary – screw**

Type commonly used – single stage spiral lobe oil flooded screw air compressor, Consist of two rotors (like two large screws whose threads mesh), Continuous duty, on demand air, easy to maintain, operate and provide great installation flexibility.

How important is size?

- Volume, pressure and cleanliness of air is vital to performance of your finishing system
- Over worked air compressors produce dirt and oil
- Oversized is expensive to start and run in partial demand situations
- Pipe size and correct layout is very important to prevent condensation from forming within the air lines.

WHAT SIZE TANK

The size of the compressor tank, generally measured in gallons, should be selected by the overall type of usage. If the usage will be in short rapid spurts, such as when using a brad nailer, then a small tank size can be used. If the compressor is to bear long periods of usage, such as spray painting, a larger tank size is vital. If your air compressor pump and motor are too small and CANNOT deliver enough CFM, then a larger tank is actually a liability. The inadequate motor and air compressor pump MUST fill and pressurize the air tank BEFORE the air is delivered to your air tool. With a compressor pump and motor that are too small, the larger tank is a liability. Larger tanks=longer wait

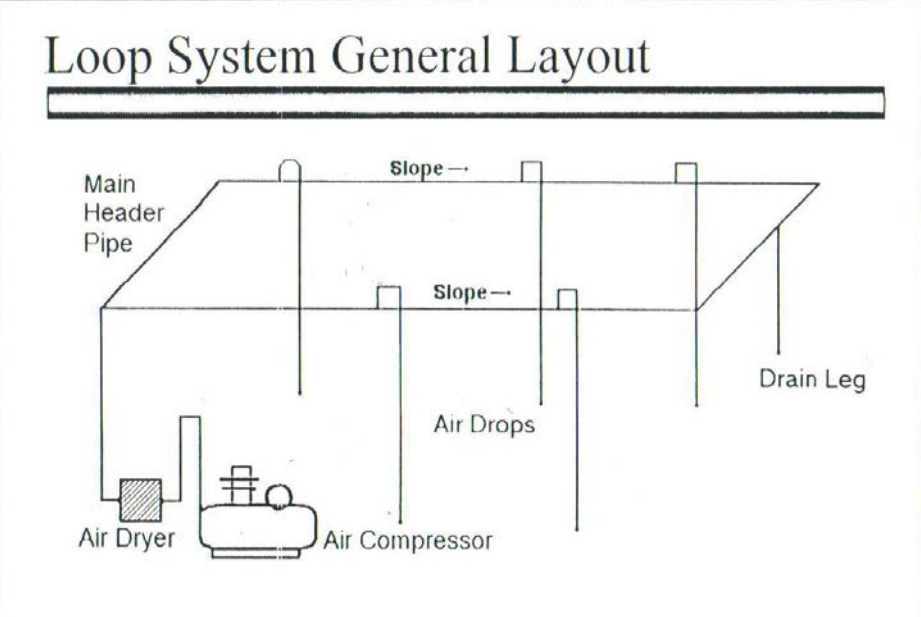
LAYOUT AND DESIGN

Getting a steady supply of clean, dry air to the gun is critical for proper performance of the spray gun and the finishing material, not to mention all the other tools you may run off the air like sanders, nail guns etc. Improperly run air lines can cause problems once you begin spraying. When air is compressed, moisture can form, depending on the type of airline you choose you may have further condensation taking place. The piping should be same size as outlet on the compressor. Use longest lengths as possible, keeping unions or connectors to a minimum. Slope the line so that water can be drained at a drop leg and not gather in the pipe. Loop your airline system back to itself if you have multiple drops, this will ensure an even pressure. Allow for minimum of 25' to first leg drop, further away the better.

Difference in quantity and quality of air to user

- Make sure compressor is in well ventilated area. Should be cool, dry, and relatively free of dust
- Aluminum pipe is the BEST, less pressure drop per foot.
- Galvanized pipe is better than black pipe less prone to rusting
- NEVER use plastic pipe – develops stress cracks, gets brittle when cold, or shatters on impact. Warm temperatures cause it to sag, that will accumulate water driving you crazy with intermittent moisture problems.
- Plastic is also an insulator so air doesn't cool as efficiently and moisture doesn't condense so filters do not catch as much of the water.
- Plastic piping will melt in case of fire, if compressor is charged…it could turn into a blast furnace.

The Plastic Piping Institute does not recommend ABS pipe for use in exposed compressed air systems. Neither does OSHA



FILTERS- remove dirt and moisture from the air supply.

- Make sure in-line filters and regulators are sized to fit the pipe
- A refrigerated dryer or a cyclone filter placed right after the compressor will help trap water before it enters the pipe
- Have properly sized regulators and oil/water filters at each drop

AIR DRYERS- Air dryers lower the dew point by reducing moisture and removing other contaminants of raw, untreated air. These contaminants can clog and damage equipment and cause costly rework and downtime. Optimum efficiency and maximum productivity can only be achieved by using proper moisture and air treatment equipment. Some common problems that can happen when the air is not filtered or dry; Loss of surface gloss, Surface blemishes, Poor adhesion of finishing materials, Rust scale to form on the inside of iron piping, ultimately resulting in damage to tools and equipment.

REFRIGERATED AIR DRYERS - The compressed air passes through a heat exchanger where it is chilled to the appropriate temperature; the Unit is placed right after the compressor. A 20 degree reduction in temperature condenses ½ the water vapors in saturated air. The cooled air makes the water condense and fall out of the air stream. Designed for high volume of spraying.

CYCLONE SEPARATORS -Centrifugal Air Filter Units, spins the incoming air, forcing the heaver water and oil particles to fly out of the air and collect on the side and bottom of the container to be drained off. Filters out water and oil aerosols and dirt particulates to 5 microns. This type of filter is the least efficient system.

COALESCING FILTERS- Trap and remove liquid oil and water from the compressed air or gas system. Filters literally squeeze air and water vapors together passing through cartridges made up of increasingly density filter media until they form droplets that gravity will carry away. Coalescing filters will filter the air down to .01 microns. You will need to replace the filter elements usually one to two times a year.

DESICCANT FILTERS- Usually last in line on the drying chain. Only removes the water, it has chemical desiccants that are elements like activated alumina or silica gel that naturally absorbs moisture. When the desiccants need changing it will turn from Blue to pink.

IN LINE FILTER – a small disposable unit that attaches to your spray gun to trap water and dirt.

Never skimp on your filters, saving a few dollars on a cheap filter will only cost your hundreds later when refinishing from a contaminated finish. Use filters designed specifically for spraying finish, stay away from generic “air-tool” devices.

MAINTAINING THE SYSTEM

Check all automatic drains on both compressors and filters to ensure they are operating properly

- Drain compressors and filters at start of each day
- Hot and Humid weather you may have to drain occasionally during the day
- Drain your pipe system at drop legs occasionally
- Check compressors air filter regularly and blow it out or replace when dirty. This could restrict air intake making compressor to work harder
- Check for leaks, it is estimated that 20% of systems air and energy is wasted by leaks in the system

AIR PRESSURE REGULATORS - Proper air pressure is essential when using paint spray guns. To achieve professional results make sure your gun is getting the recommended amount of air, and you need to be able to adjust it accurately.

Diaphragm pressure regulator

gun regulator

HOSES - Choosing the right size hose is a critical part to the finishing system. The hoses size has a direct effect on the overall efficiency of the entire system it is the last link in the chain. The inside diameter of the hose limits the amount of material that can flow through a hose in a given time period. Pressure drop through a hose is directly proportional to the hose length. Double the length you double the pressure drop.

What Length To Use?

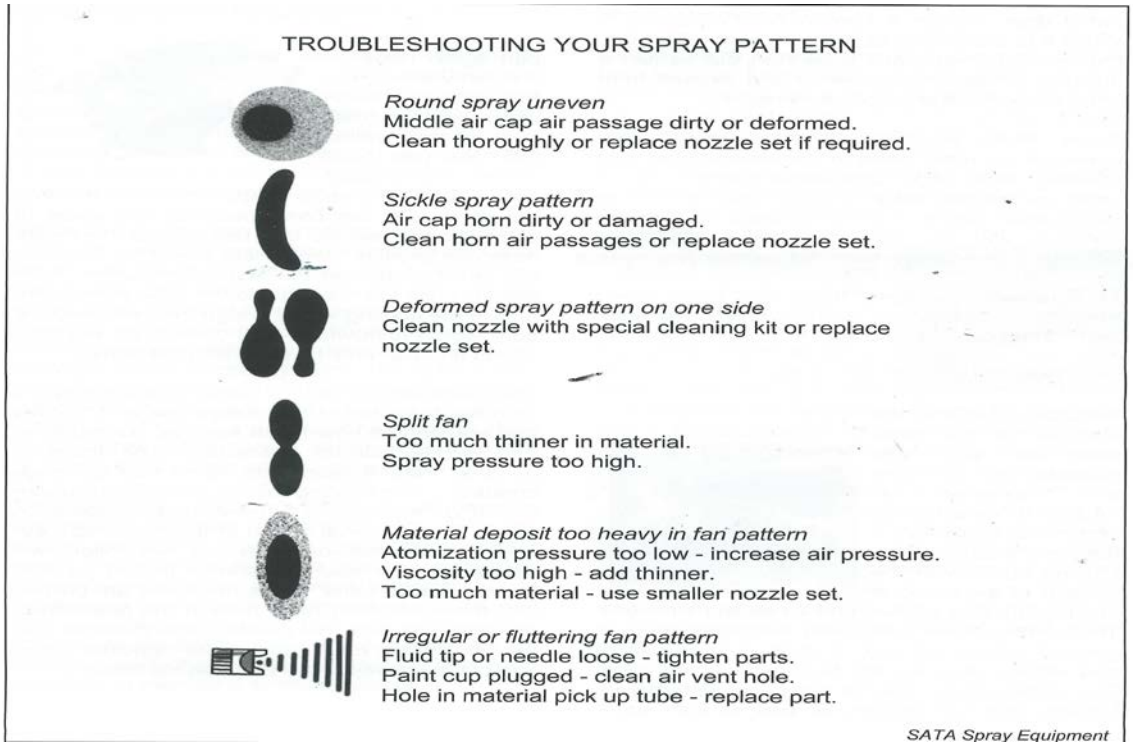
Air Hose Lengths

Length	ID
0 – 10'	¼"
10' – 20'	5/16"
20' – 50'	3/8"
50' – 100'	½"

Fluid Hose Lengths

Length	ID
0 -20'	¼"
20' -35'	3/8"
35' – 100'	½"

TROUBLESHOOTING SPRAY PATTERNS

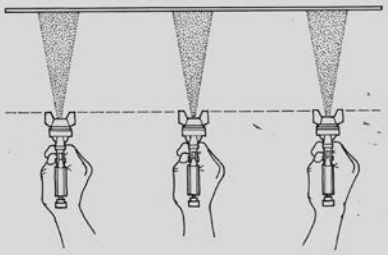


PROBLEM	CAUSE	SOLUTION
No fluid out of the gun.	Tip is blocked.	Relieve pressure on pump. Carefully remove spray tip and filter. Take care with residual pressure in the hoses.
Pattern width narrows during reversing phase of pump.	Air trapped in the fluid circuit. Viscosity too high.	Check connections and suction hose quality. Reduce viscosity
Aircap becomes dirty frequently.	Too much atomizing air.	Reduce atomizing air.
Fluid seeping from the air holes of the aircap.	Defective tip seal. Tip loose.	Replace it. Tighten it.
Fluid leak at the packing	Packing is worn.	Tighten up the packing holder without blocking the needle. If there is still a leak, replace the packing and the needle.
Fluid leak at the front part of the gun, trigger released.	Impurities in the paint.	Trigger the gun 3 or 4 times.
	Needle worn or nozzle worn.	Replace needle and nozzle.
Air leak at the valve	Valve worn	Change valve.
Permanent air leak at the gun aircap when the trigger is released.	Friction on the needle. Valve worn	Remove the trigger and check the needle. Replace valve.

Basic Spray Technique

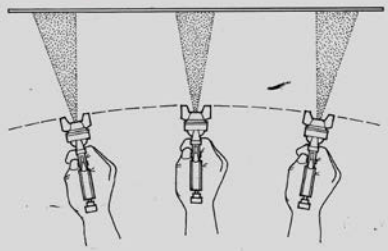
Correct

Move the gun in a straight line, holding it at the same distance from the workpiece for the entire pass. Maintaining a flexible wrist helps keep the tip of the gun parallel to the surface being sprayed.



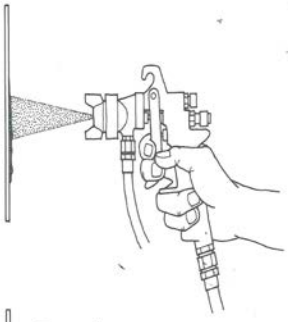
Incorrect

Moving the gun in an arc across the workpiece will result in uneven coverage: too much material in the middle and not enough at the edges.



Optimum Distance from Workpiece

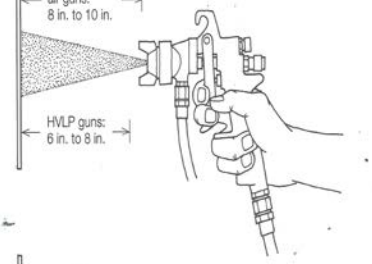
When the gun is held too close, material goes on heavy and tends to sag or mottle.



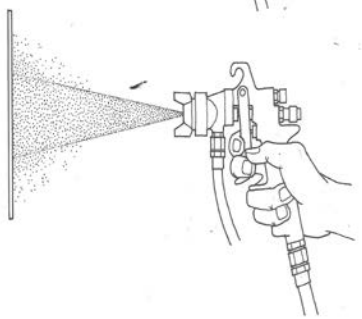
When the gun is held at the optimum distance, a full, wet coat is applied with minimal overspray.

Compressed-air guns: 8 in. to 10 in.

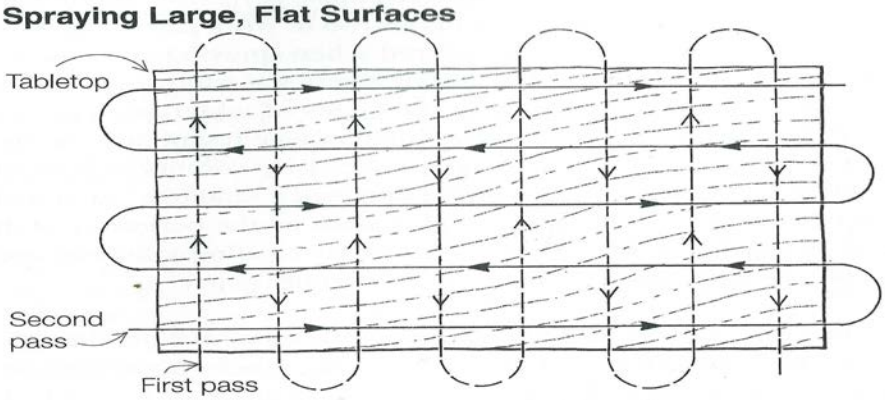
HVLP guns: 6 in. to 8 in.



When the gun is held too far away, dry spray or excessive overspray results.

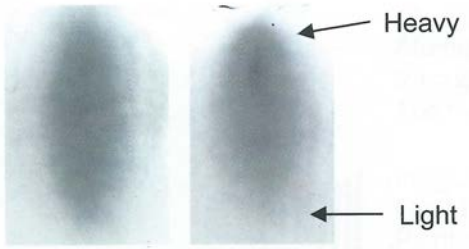


Spraying Large, Flat Surfaces

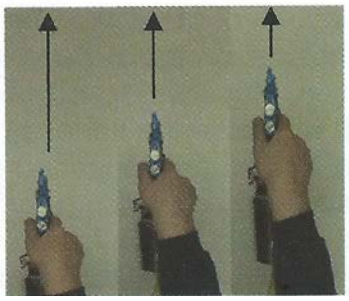


Two passes, first across the grain, then with the grain, help guarantee a full, even coat on large surfaces like tabletops.

Tipping the gun results in more finish at the bottom of the pattern than at the top.



Overlap each stroke by 50%.



Holding your gun at an angle instead of perpendicular to the surface, will cause the finish applied to be a different rate causing either the top or the bottom of the spray pattern to be slightly heavier. This can result in several problems. One common problem is the finish could appear to be stripped when you view it from an angle. This will be more pronounced when spraying dyes or pigmented finishes.

SPRAY GUN MAINTENANCE

Maintaining your equipment is extremely important for success in a quality finish. A chipped saw blade will never give you a straight cut, thus a dirty or bent needle, nozzle or air cap will never give you a great finish.

Only use Spray Gun Cleaning tips and brushes. NEVER use pins, paper clips, nails, wire brushes or the like when cleaning your equipment, they will scare the surface and damage the equipment permanently.

ESTIMATING COATING MATERIAL

You will need to know, what type of finish you will be using, what are the volume solids, what type of T.E does your spray equipment get and what size and shapes are your parts to be finished.

V.S% = Volume Solids **T.E = Transfer Efficiency** **DFT = Dry Film Thickness**

WFT = Wet Film Thickness **SQ. FT. = Square Foot**

Conventional = 33% T.E **Airless= 50%** **HVLP = 65% T.E** **LVLP = 65%** **AAA= 85%**

Total dry mils should finish between 2.5 – 5 DFT

Using a wet mil gauge, measure applied wet mils.

Wet mils to dry mils **Wet mils X Volume solids= Dry mils**

example: 4 WFT X 25% V.S = 1 DFT 1 DFT x 4 coats = 4 dry mils

If you want to have a total of 4 dry mils, working with 25% V.S you will need to apply 4 coats @ 4 wet mils

Now let's say we are working with 35% Volume solids applied @ 4 wet mils.

4 WFT x 35% V.S = 1.4 DFT 1.4 DFT x 3 coats = 4.2 dry mils

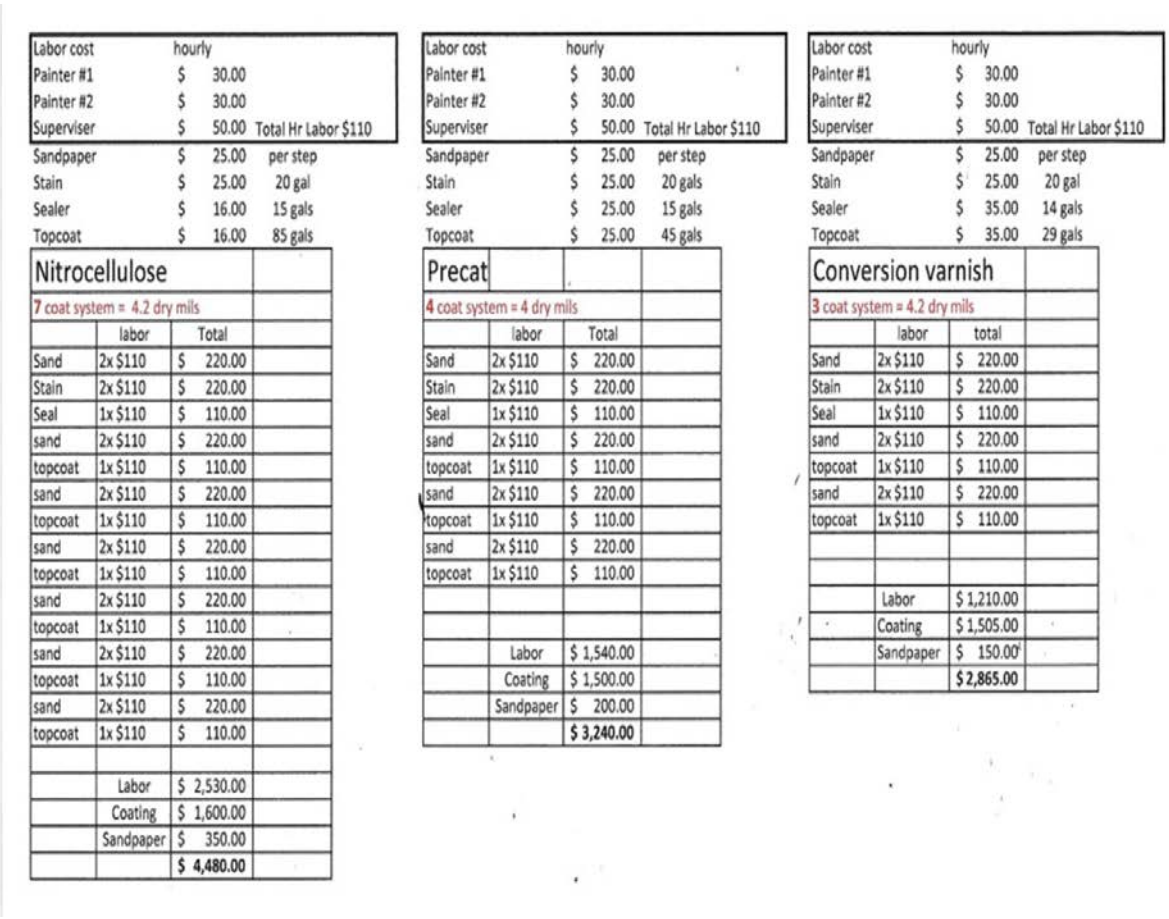
Working with 35% V.S. you would need to only apply 3 coats @ 4 wet mils

You have been contracted to finish three identical cabinet packages for a builder. Each package has 6,000 sq. ft. of surface area. The contract calls for stain and clear finish that is 4 dry mils in thickness.

You quote

NITROCELLULOSE	**15% Volume Solids @ $16 a gallon**	**100 gallons/100% T.E**
PRECAT	**25% Volume Solids @ $25 a gallon**	**60 gallons/100% T.E**
CONVERSION VARNISH	**35% Volume Solids @ $35 a gallon**	**43 gallons/100% T.E**

Job #1 **Job # 2** **Job # 3**



Labor cost	hourly	
Painter #1	$ 30.00	
Painter #2	$ 30.00	
Superviser	$ 50.00	Total Hr Labor $110
Sandpaper	$ 25.00	per step
Stain	$ 25.00	20 gal
Sealer	$ 16.00	15 gals
Topcoat	$ 16.00	85 gals

Nitrocellulose			
7 coat system = 4.2 dry mils			
	labor	Total	
Sand	2x $110	$ 220.00	
Stain	2x $110	$ 220.00	
Seal	1x $110	$ 110.00	
sand	2x $110	$ 220.00	
topcoat	1x $110	$ 110.00	
sand	2x $110	$ 220.00	
topcoat	1x $110	$ 110.00	
sand	2x $110	$ 220.00	
topcoat	1x $110	$ 110.00	
sand	2x $110	$ 220.00	
topcoat	1x $110	$ 110.00	
sand	2x $110	$ 220.00	
topcoat	1x $110	$ 110.00	
	Labor	$ 2,530.00	
	Coating	$ 1,600.00	
	Sandpaper	$ 350.00	
		$ 4,480.00	

Labor cost	hourly	
Painter #1	$ 30.00	
Painter #2	$ 30.00	
Superviser	$ 50.00	Total Hr Labor $110
Sandpaper	$ 25.00	per step
Stain	$ 25.00	20 gals
Sealer	$ 25.00	15 gals
Topcoat	$ 25.00	45 gals

Precat			
4 coat system = 4 dry mils			
	labor	Total	
Sand	2x $110	$ 220.00	
Stain	2x $110	$ 220.00	
Seal	1x $110	$ 110.00	
sand	2x $110	$ 220.00	
topcoat	1x $110	$ 110.00	
sand	2x $110	$ 220.00	
topcoat	1x $110	$ 110.00	
sand	2x $110	$ 220.00	
topcoat	1x $110	$ 110.00	
	Labor	$ 1,540.00	
	Coating	$ 1,500.00	
	Sandpaper	$ 200.00	
		$ 3,240.00	

Labor cost	hourly	
Painter #1	$ 30.00	
Painter #2	$ 30.00	
Superviser	$ 50.00	Total Hr Labor $110
Sandpaper	$ 25.00	per step
Stain	$ 25.00	20 gal
Sealer	$ 35.00	14 gals
Topcoat	$ 35.00	29 gals

Conversion varnish			
3 coat system = 4.2 dry mils			
	labor	total	
Sand	2x $110	$ 220.00	
Stain	2x $110	$ 220.00	
Seal	1x $110	$ 110.00	
sand	2x $110	$ 220.00	
topcoat	1x $110	$ 110.00	
sand	2x $110	$ 220.00	
topcoat	1x $110	$ 110.00	
	Labor	$ 1,210.00	
	Coating	$ 1,505.00	
	Sandpaper	$ 150.00	
		$ 2,865.00	

This is ONLY gallon cost @ 100% Transfer Efficiency. To figure REAL cost, add in **spray equipment actual T.E**

Square feet per gallon = 1604 x V.S x T.E = Sq. Ft. @ 1 dry mil.

Example: 1604 x .35% V.S x 65% T.E = 364.91 Sq. Ft. @ 1 DFT

Using **different spray equipment** with the same gallon of coating. 35% Volume Solids

1604 x .35 V.S x 33%T.E (Conventional) = **185.26 sq. ft.** @ 1 DFT

1604 x .35% V.S x 50% T.E (Airless) = **280.70 sq. ft.** @1 DFT

1604 x .35% V.S x 65% T.E (HVLP/LVLP) = **364.91 sq. f**t. @ 1DFT

1604 x .35% V.S x 85% T.E (Air Assisted Airless) = **477.19 sq. ft.** @ 1 DFT

COST per Sq. Ft.

Let's say the 35% Volume Solids material cost $35. Using the different spray equipment we will have different cost.

Conventional = **185.26 sq. ft.** @ 1 DFT	$35/185.26 = **.19 cents** @ 1 dry mil
Airless = **280.70 sq. ft.** @1 DFT	$35/280.70 = **.12 ½ cents** @ 1 dry mil
HVLP/LVLP = **364.91 sq. f**t. @ 1DFT	$35/364.91 = **10 cents** @ 1 dry mil
Air Assisted Airless = **477.19 sq. ft.** @ 1 DFT	$35/477.19 = **.07 cents** @ 1 dry mil

6,000 sq. ft. Quote using **NITROCELLULOSE** 7 coat system **15% Volume Solids @ $16 a gallon**

1604 x .15 x T.E = sq. ft. **6,000/ sq. ft. = gallons@ 1 DFT X 4= total gallons needed**

$16 x total gallons =$ **$16/sq. ft. = $ @ 1 dry mil X 4 = $ SQ. FT COST**

Conventional 33% T.E = **79 sq. ft.** @ 1 DFT	304 gallons**/$4,864**	$. 80 cents sq. ft
Airless 50% T.E = **120 sq. ft.** @1 DFT	200 gallons/**$3,200**	$ .52 cents sq. ft
HVLP/LVLP 65% T.E= **156 sq. f**t. @ 1DFT	154 gallons/ **$2,464**	$.40 cents sq. ft
Air Assisted Airless 85% T.E= **204 sq. ft.** @ 1 DFT	118 gallons/**$1,888**	$.32 cents sq. ft

6,000 sq. ft. Quote using **PRECATALYZED** 4 coat system **25% Volume Solids @ $25 a gallon**

1604 x .25 x T.E = sq. ft. **6,000/ sq. ft. = gallons@ 1 DFT X 4= total gallons needed**

$25 x total gallons =$ **$25/sq. ft. = $ @ 1 dry mil X 4 = $ SQ. FT COST**

Conventional 33% T.E = **132 sq. ft.** @ 1 DFT	182 gallons**/$4,550**	$. 76 cents sq. ft
Airless 50% T.E = **200 sq. ft.** @1 DFT	120gallons/**$3,000**	$ .50 cents sq. ft
HVLP/LVLP 65% T.E= **261 sq. f**t. @ 1DFT	92 gallons/ **$2,300**	$.38 cents sq. ft
Air Assisted Airless 85% T.E= **340 sq. ft.** @ 1 DFT	71 gallons/**$1,775**	$.29 cents sq. ft

6,000 sq. ft. Quote using **CONVERSION VARNISH** 3 coat system **35% Volume Solids @ $35 a gallon**

1604 x .35 x T.E = sq. ft. 6,000/ sq. ft. = gallons@ 1 DFT X 4= total gallons needed

$35 x total gallons =$ $35/sq. ft. = $ @ 1 dry mil X 4 = $ SQ. FT COST

Conventional 33% T.E = **185 sq. ft.** @ 1 DFT 132 gallons**/$4,620** $. 76 cents sq. ft

Airless 50% T.E = **281 sq. ft.** @1 DFT 84gallons/**$2,940** $ .50 cents sq. ft

HVLP/LVLP 65% T.E= **365 sq. f**t. @ 1DFT 66 gallons/ **$2,310** $.38 cents sq. ft

Air Assisted Airless 85% T.E= **477sq. ft.** @ 1 DFT 50 gallons/**$1,750** $.28 cents sq. ft

You will find the VOLUME SOLIDS on the manufactures product data sheet.

GEMINI COATINGS

PRODUCT DATA SHEET

PRESIDIO
Conversion Varnish-CLEAR

DESCRIPTION

PRESIDIO Clear Conversion Varnish is a fast curing, high build, catalyzed varnish that exhibits excellent flexibility. This varnish can be applied over stained or natural wood as a self-sealing system or over a high quality conversion varnish sealer or primer. PRESIDIO exceeds the performance parameters outlined by KCMA and ASTM. For wood substrates only. For interior use only.

PRODUCT NUMBERS / SHEENS

PCV550-0010 (10°)
PCV550-0020 (20°)
PCV550-0030 (30°)
PCV550-0040 (40°)
PCV550-0060 (60°)
PCV550-0090 (90°)

PRODUCT ADVANTAGES

- HAPs & AIM Compliant
- Fast Cure Schedule
- Excellent UV Resistance
- Water Clear
- Self-Sealing
- High Build With Fewer Coats
- Short Filled Containers To Allow For The Addition Of Catalyst
- Catalyst Supplied in Pre-Measured Containers
- Non Photo Chemically Reactive
- Phthalate Free

Note: These numbers represent actual control values in a manual, sealed substrate. Spray techniques, texture, and reading as well as film thickness may give different results on actual work, but they may be used for comparison. To the best of our knowledge, the above technical data is true and accurate at the date of issuance but is subject to change without prior notice.

COATING PROPERTIES

Viscosity: 16-21 #2 Zahn
Weight Solids: 43.86-45.58 %
Volume Solids: 34.99-35.87%
Weight/Gallon: 8.01-8.15 lbs. gal
Coverage: 561-575 sq. ft. per gallon at one mil dry film thickness.
VOC (reg./coating): 4.46-4.51 lbs./gl. or 531-538g/l
VOC (actual/material): 4.43-4.49 lbs./gl. or 530-537 g/l
VOC Ratio: 1.18-1.26 lbs. VOC/lbs. solids
HAPS Ratio: 0.3092-0.3317 lbs. HAPS/lbs. solids
Dry Times:
Air Dry: at 78° F, relative humidity 50%
To touch: 7 minutes
To Handle: 15-18 minutes
To sand/recoat: 35-40 minutes
Force Dry:
Flash: 8-10 minutes
Bake:15 min @ 110° F
Cool down: 15 min
Stack immediately after cool down
Relative humidity will affect the speed of drying. Ideal conditions are 75° or warmer at 50% humidity or less. Dry time will be faster at higher temperatures and lower humidity and equally slower at colder temperatures and higher humidity.

Dry Film Thickness:
Maximum DFT for the complete system must not exceed 6 dry mils.
NOTE!!!!
Maximum DFT for the complete system utilizing the Flat (10 sheen) version must not exceed 4 dry mils.

Pot Life: 4 days @ 77° F in a sealed container

Shelf Life: 12 months @77° F if unopened and stored in a cool dry area. Always rotate stock.
Storage: Keep away from heat or sparks.

PREPARATION INSTRUCTIONS

Catalyzation:
Use pre-packaged catalyst kit:
For one gallon-short filled to 121.9 oz this is equal to 6.1 oz or 180 mil of C1000 per 121.9 oz. (5% by volume). Allow ten minutes for induction.

Reduction:
Important: Always catalyze *BEFORE* reducing!

Thinning: This product is supplied ready to spray (after catalyzation). If needed due to conditions in your facility, use SOL-9059 HAPs Free Reducer or SOL-9011 HAPs Free Thinner at levels not to exceed 4% by volume*

Retarder: If a slower dry time is desired, use SOL-9012 Haps Free Retarder at levels not to exceed 4% by volume*

*Thinning this material may result in increasing the VOC levels of this product. Refer to your local regulations before thinning.

Approved Companion Products

CVS-0400 High Solids Catalyzed Vinyl Sealer
CVP-1000 Presidio Vinyl Primer Surfacer
CVP-1100 Presidio HS Primer Surfacer

Revised September 2015

The following supersedes any provision contained in the forms, letters and papers of your company. This product is designed and intended for professional application only. All products should be thoroughly tested under application conditions prior to use. The information contained herein is believed to be reliable. HOWEVER, GEMINI MAKES NO WARRANTY CONCERNING THIS PRODUCT, WHETHER EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. UNDER NO CIRCUMSTANCES SHALL GEMINI BE LIABLE FOR SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR ANY OTHER DAMAGES FROM ALLEGED NEGLIGENCE, BREACH OF WARRANTY, STRICT LIABILITY, OR ANY OTHER LEGAL THEORY, ARISING OUT OF THE USE OR HANDLING OF THIS PRODUCT. THE SOLE REMEDY OF THE BUYER AND THE SOLE LIABILITY OF GEMINI FOR ANY CLAIMS SHALL BE LIMITED TO THE BUYER'S PURCHASE PRICE OF THE PRODUCT WHICH IS THE SUBJECT OF THE CLAIM OR THE AMOUNT ACTUALLY PAID FOR SUCH PRODUCT, WHICHEVER IS LESS. TECHNICAL ADVICE FURNISHED BY GEMINI SHALL NOT CONSTITUTE AN EXPRESS WARRANTY, WHICH IS EXPRESSLY DISCLAIMED. ALL TECHNICAL ADVICE GIVEN IS ACCEPTED AT THE RISK OF THE BUYER. CAUTION: DANGER! FLAMMABLE! VAPORS MAY CAUSE FLASH FIRE. VAPOR HARMFUL. HARMFUL OR FATAL IF SWALLOWED. HARMFUL TO EYES. KEEP OUT OF THE REACH OF CHILDREN. BEFORE using this product it is essential that the "Material Safety Data Sheet" describing the product as well as the "Product Label" be reviewed. If your company does not have such information or has any questions, contact the manufacturer.

Gemini Coatings, Inc • 2300 Holloway Drive • El Reno, OK 73036 • (800) 262-5710 • www.gemini-coatings.com

Finishing is more than just pulling a trigger on a gun and having fluid flow out onto your wood.

Choosing the best system for *you* will depend on your basic needs, growth expectations and economic standing. Here are three things to remember.

The **Compressor** is a key component in the selection of your equipment. Selection of the proper size, how you pipe your lines, change your filters and maintain your equipment will affect the quality of finish you can produce.

The **type of spray gun** you choose will determine your transfer efficiency and should match the general needs and scope of your everyday finishing needs.

Proper **spraying technique** is paramount to success and less rework.

Diane Shattuck

Gemini Industries, Inc.

Dianes@gemini-coatings.com

Dianeshattuck@msn.com

Cell 813-390-8696

Credits

The College of Wood Finishing Knowledge By Ron Bryze 2006

Spray Finishing By Andy Charron 1996

ITW- Industrial Finishing www.binks.com www.DeVilbiss.com

Sata Spray Equipment www.sata.com

CA Technologies www.spraycat.com

Sames Kremlin www.Sames-Kremlin.com

Wikipedia www.wikipedia.org