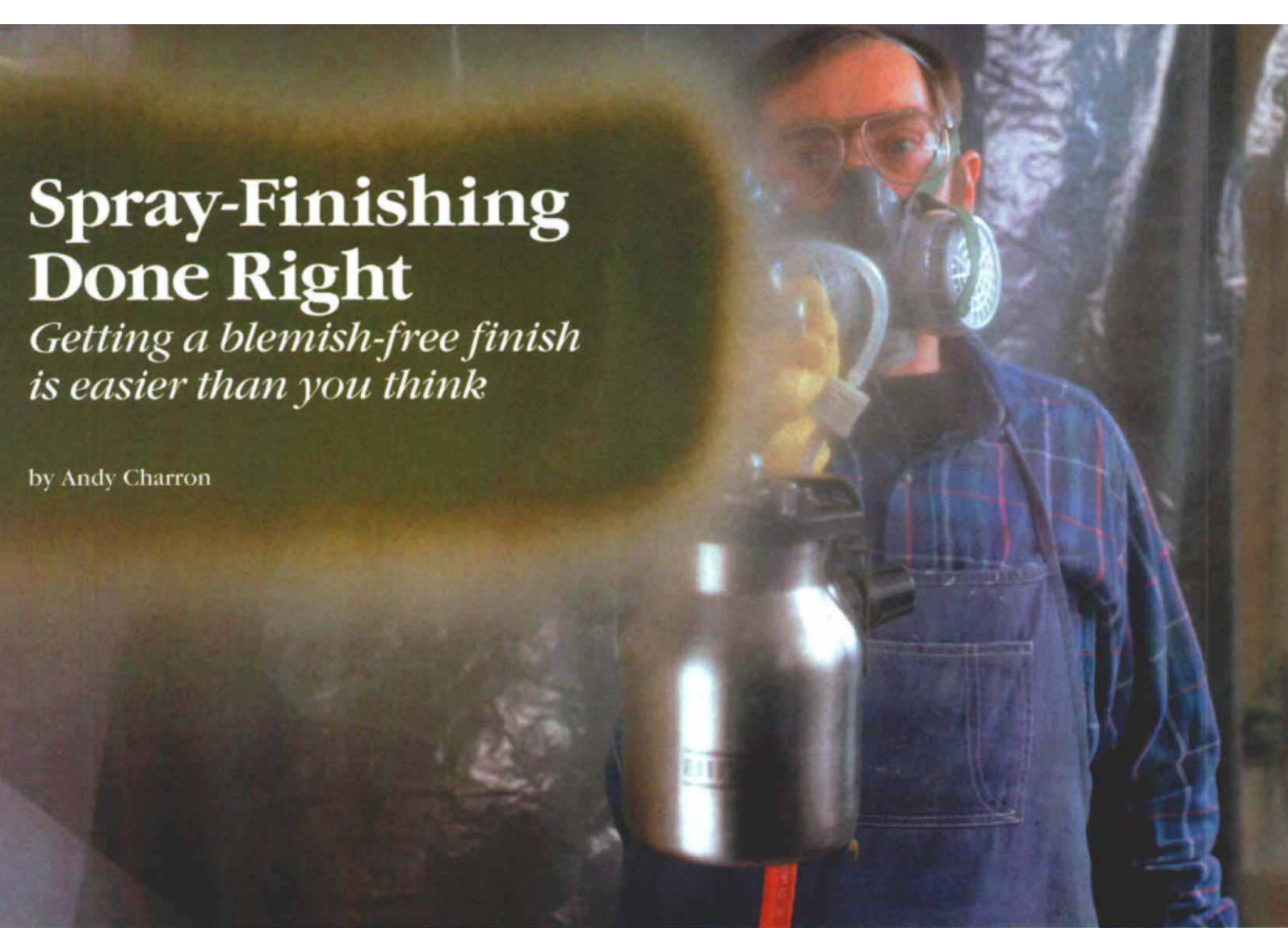


Spray-Finishing Done Right

Getting a blemish-free finish is easier than you think

by Andy Charron



Quite a few woodworkers I know are unenthusiastic, even fearful, about spray finishing. They believe the equipment is too mysterious, too costly and too hard to master. In fact, just the opposite is true. There are many simple-to-operate, reasonably priced spray systems out there (see *FWW#113*, pp. 58-61). It took me less time to become proficient with a spray gun than it did to master a router. Best of all, the finish from a gun is often so smooth that I don't have to rub it out. Following sound spraying principles and knowing how to use the equipment helps me produce virtually flawless finishes.

Where to spray

The best place to spray is in a booth where a powerful exhaust removes overspray and dust from the air. If you're spraying solvent-borne finishes, you really have no other choice than to use an explosion-proof spray booth. But they're costly. You don't need explosion-proof equipment to spray waterborne finishes, and they're getting better and better (see *FWW#115*, pp. 48-53). You only need a place that is well-ventilated and clean. If you have the floor space, you can build a spray room that has an exhaust fan and intake fil-



Spraying takes a bit of practice. Surface preparation, finish consistency and technique all are important.

ters to ensure a steady supply of clean, fresh air. No matter where you plan to spray, check with your local building officials first.

Careful preparation is essential

How you prepare the surface is just as important as how you spray the finish. Sand the entire piece thoroughly (see the photo at left on p. 72). For stained work, I usually raise the grain with a damp cloth, let the surface dry and sand with 220-grit before I spray. For waterborne finishes and dyes, I sand to 180-grit and spray a light coat of dye stain or finish. This raises the grain and stiffens the fibers, making them easier to sand with 220-grit.

Spraying paint or pigmented lacquers is more involved. Opaque finishes highlight tiny imperfections (see *FWW#111*, pp. 62-65). They often

Thin the finish to a sprayable consistency

require at least two rounds of filling, sanding and priming before the wood is ready to be sprayed. Life would be easier if you could always pour finish straight from the can into a spray pot and begin applying it. But occasionally,

you'll have to thin it. Which thinner you use and how much you add will depend on the material you're applying, the spray system you're using and what the piece will be used for. Some manufacturers do a lousy job of providing thinning information. If the appropriate thinner is listed on the label, use it. Because some cans of finish say that the contents don't need to be thinned, they don't list a thinner. If this is the case, you generally can thin the finish with the solvent that's recommended for cleanup.

Finding the correct viscosity—The viscosity of a finish is a measurement of its resistance to flow. Thinning a finish lowers the viscosity, which allows it to be broken into smaller particles (or at-



Sprayed finishes are only as good as the surface below. The author primed this bookcase and now sands it with 220-grit paper in preparation for spraying on a tinted waterborne lacquer topcoat.

omized) more easily by the spray gun. The finer the atomization, the smoother the appearance.

Thinners can eliminate common spray problems (see the box on pp. 74-75) like orange peel, but if used improperly, thinners actually cause problems. Waterborne finishes are especially sensitive to thinning. Overthinning can prevent the finish from forming a clear, hard film.

Some spray-gun manufacturers recommend finish viscosity for a particular needle/tip combination. This information may be given as a ratio or a percentage of thinner and finish. The viscosity also may be given as the number of seconds it takes to empty a certain size viscosity cup. Viscosity cups have small holes in the bottom, which let liquid drain through (see the photo at right on the facing page). Appropriately sized cups are available from most spray-system makers.

Room conditions are a factor—Temperature and humidity dramatically affect how much thinner to use in a finish and how it will spray. Low temperature and high humidity are not especially conducive to spraying. Even if you follow all the labels exactly, you may have to adjust the amount of thinner you add. You can keep records of how much thinner you need for different conditions. After a while, you'll get a feel for this.

SPRAY THE LEAST VISIBLE AREAS FIRST

Before spraying, make a dry run through the whole process. To help prevent you from overcoating or missing areas, visualize and then practice the sequence of spray strokes. Although the order in which you spray parts of a piece may vary slightly, there are a few rules of thumb worth following: Start with the least visible areas, such as drawer bottoms and cabinet backs, and work your way to those parts that will be seen. For example, spray the edges of tabletops, doors and shelves before the tops. This minimizes the overspray on the most visible surfaces. Working from the inside out holds true for case pieces, too, as shown in the series of photos at right. Always work from the wettest edge, so you can easily blend areas you've just sprayed. Where possible, move the gun away from your body, toward the exhaust fan (assuming you have one). This will help prevent overspray from settling on previously sprayed areas, and it will give you an unclouded view, too.—A. C.



1 Spray overhead corners, and, then fill in the inside top.



3 Shelf tops and fronts—Remember to overlap strokes.



5 Do the exterior cabinet sides and front corners.



2 Coat interior back and sides. *These areas won't be highly visible when the piece is finished.*



4 Finish the face frame. *Begin with the inside edges, and then move to the front of the case.*



6 Spray the top. *By leaving the top for last, the most visible part of the case isn't marred by overspray.*

Straining the finish and filling the pot

Your finish and your equipment should be as clean as possible because a speck of dirt or dried finish could ruin the job. To remove impurities, pour the finish through a strainer or filter (available at paint-supply dealers). As an added precaution, you can install a filter on the end of the dip tube that draws finish from the pot, or put an in-line filter near the gun. To keep the air that comes from the compressor dry and clean, I run the line through a canister-type separator, which filters out water, oil and dirt before they get in the hose supplying air to the gun.



Check the finish with a viscosity cup. *A stopwatch and the recommended viscosity cup show whether thinner must be added. Once thinned, the finish is passed through a filter.*

Selecting suitable fluid tips and air caps

The fluid tip in a spray gun controls the amount of finish that gets deposited on a surface. In general, lighter finishes require a small tip. Thicker materials (or those with a higher percentage of solids) require larger fluid tips. The air cap in a spray gun controls the velocity of the air, which governs how finely the fluid is atomized. Air caps with smaller holes cause the air to leave the gun at a higher velocity, thus producing finer atomization. Air caps are matched with fluid tips to give optimum performance.

Most guns come equipped with a standard setup appropriate for several finishes. The setup includes a fluid tip that's about .050 in. dia. and a corresponding air cap. The standard setup will produce acceptable results with most finishes, but sometimes it's worth trying other combinations of fluid tips and air caps.

In a turbine-driven high-volume, low-pressure (HVLP) system, the amount of air feeding the gun is constant, so adjustments to the air pressure can only be done by changing air caps. If you are using a waterborne finish with a turbine and a bleeder-type (constant air flow) gun, make sure that the nozzle stays clean. These guns are prone to blobs of finish drying on the air cap and then blemishing the work.

Adjusting the gun

Spray guns come with adjustments for air and fluid. The type of finish being sprayed, the size of the object to be coated and the speed of application all play a role in deciding how to control the fluid and air. I always test my fan pattern and finish delivery rate on scrap wood or cardboard so that I can make adjustments before I actually spray the piece.

Turbine-driven HVLP systems—Adjusting a turbine-powered spray gun is a simple process: no matter what type of gun you own, the idea is to start air flowing through the gun first, and then introduce finish slowly until it flows continuously and evenly. The gun should apply a full, wet coat with no heavy spots or misses. From this point, you can open or close either knob to obtain the best spray rate and fan pattern.

If you want to spray a lot of material in a hurry, open the fluid control more. If you are coating large surfaces, widen the fan pattern. If you're trying to achieve a fine finish or you're spraying

small items, you'll have more control of how much finish is applied and where it lands by restricting the fan and fluid. But remember, how you set one knob affects the other. For example, if you increase the air flow without adjusting the fluid, the finish may be too fine. Conversely, opening the fluid control without widening the fan can cause runs and sags. At the ideal settings, the finish will coat evenly and flow together well.

Compressor-driven systems—With high-pressure spray guns and conversion-air HVLP guns (both powered by a compressor), you have the ability to control the air pressure entering the gun in addition to adjusting the fluid rate and fan shape. Getting all three adjustments coordinated can be a bit tricky and takes some trial and error, but being able to regulate the air pressure at the gun allows more spraying options.

Develop a spray strategy

Regardless of the size and shape of the object you're spraying, the main thing to keep in mind is that you want to spray an even coat over the entire piece. Always spray the finish in several thin coats rather than one heavy one. Lighter coats are less likely to run, dry faster and make sanding between coats easier.

If the pieces you are spraying are so small that the air from the gun blows them all over the place, try placing them on a piece of screen or wire mesh. I prefer spraying small parts with my turbine HVLP gun because the spray is softer. A good production tip for spraying many small pieces is to put them on a lazy Susan and spray several at once (see the photo above). Rotate the turntable as you spray, so you don't build up too heavy a coat on the pieces.

Position large work on sawhorses or a stand so that the height is



Turntable for even, quick coats—After arranging trophy bases on a lazy Susan, the author sprays with an HVLP gun.

comfortable. You shouldn't have to bend, reach or otherwise contort your arm or body while you're spraying. You should be able to turn and move the work easily. I sometimes support the work on stickers or points (blunted drywall screws work well) to make sure that the bottom edge gets good coverage.

Spraying uniformly

To maintain even spray coverage, there are a few things to remember. Grip the gun firmly, but not so tightly that your hand gets tired or uncomfortable. Point the nose of the gun so it's perpendicular to the work surface, and hold the gun at the same distance from the work on each pass. Move the gun parallel to surfaces, not

Correcting spray-finish troubles

Fine Woodworking contributing editor Chris Minick found big improvements in his finishes when he switched to spray equipment. But the transition wasn't painless. Here's his list of common spray problems and, where they're not obvious, the solutions.

Orange peel



- 1) *Atomization pressure too low:* Increase pressure and adjust fluid.
- 2) *Spray gun too far from work:* Maintain 6- to 10-in. gun distance.
- 3) *Coating viscosity too high:* Thin to correct application viscosity.
- 4) *Not enough coating thickness for proper flow.*

Blush or cottoning



- (Right half shows blush)
- 1) *High humidity:* Dehumidify shop, or add retarder to finish.
 - 2) *Improper thinner:* Use only recommended thinner.
 - 3) *Moisture in spray equipment:* Install water separator in air line.

White spots



- 1) *Water contamination in spray equipment:* Install water separator in air line.
- 2) *Water on work surface:* Dry work surface before spraying.

Sags and runs



- 1) *Coat too heavy:* Decrease fluid flow to spray gun.
- 2) *Spray gun too close to surface:* Maintain 6- to 10-in. gun distance.
- 3) *Thinning solvent drying too slowly:* Use faster evaporating thinner.
- 4) *Drafty spray room.*



Plan for drying—The author uses racks to cure his spray-finished items. The area is warm, dry and dust-free.

in an arcing, sweeping motion. Begin your stroke 6 in. or so before the gun is over the wood, and continue the same distance beyond the other side. Trigger the gun a split second after you start your motion, and keep spraying until your arm stops. As you spray across the piece, move your arm steadily and smoothly without changing speed.

For most HVLP guns, hold the gun about 6 to 8 in. from the surface. This will let you spray a full, wet coat with minimal overspray and decent coverage. Move the gun at about the same speed you would a brush. Each pass should overlap the previous one by about half. When spraying small objects or tight places, reduce the flow and move the gun closer. To avoid clouds of overspray and

bounce back, work from inside corners out. Use more wrist action, and trigger more quickly. On large areas, increase the flow, pull the gun back an inch or two and make passes in opposite directions. I lightly spray across the grain to make a tack coat. Then I immediately spray with the grain.

In situations where your spray passes intersect, such as the stretcher-to-leg joint of a chair, release the trigger a bit sooner than you normally would. This will feather out the finish. If overlapping passes still give you a problem, mask off adjacent areas.

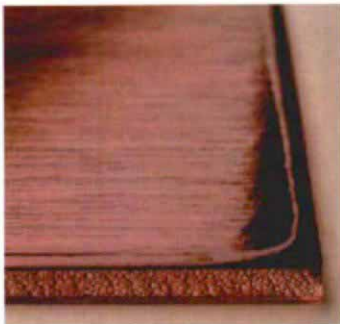
Drying and cleaning up are critical

It's easy to forget that once you spray a piece, the finish needs a warm, dry and dust-free place to cure. If you don't have a separate drying area (see the photo at left), production in your shop can grind to a halt. Even if you have a designated area, storing a number of wet cabinets, doors, drawers and trim pieces can be a problem. I use a system of racks to dry components and store them for short periods. Plywood trays, slipped into old baker's racks, come in handy when I have to dry lots of small pieces. When I'm drying round or odd-shaped items, like balusters, I hang them on an overhead wire from swivel hooks. Each piece can be rotated and sprayed and then hung in my drying area.

I have made it a ritual to clean my spray gun thoroughly while my work is drying. After cleaning the parts with the solvent recommended on the finish container, I dry them with compressed air. Then I coat all the fluid passages with alcohol and let it evaporate before I store the gun in its case. □

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Fat edge



- 1) *Corner profile too sharp: Slightly radius 90° edges.*
- 2) *Drafts on one side of workpiece.*
- 3) *One side of workpiece warmer than other.*

Cratering



- (Solid chunk in center)*
- 1) *Solid contaminant (usually from non-loading sandpaper) lowers surface tension: Sand defect, and wipe entire surface with mineral spirits.*

Fisheyes



- 1) *Silicone or wax residue from paint stripper or old finish: Wipe surface with mineral spirits; mist coats (let each dry) to trap contaminants.*
- 2) *Oil in spray equipment (usually from compressor): Install oil separator in air line.*

Microbubbles



- (Haze, waterborne finish only)*
- 1) *Coating is drying too fast: Add retarder to finish.*
 - 2) *Defoamer deactivates in waterborne finish: Don't use waterborne finish that's more than 1 year old.*
 - 3) *Atomization pressure too high.*