

Varnish Perfection

By Seb Borrello

Perfect varnish? In my dreams. Although I've never gotten there it's one of those things that you know it when you see it. It's a mahogany boat that has been beautifully faired and varnished. Having messed around with mahogany and varnish for over forty years I have great respect for those skilled in the art. At boat shows I'll walk the docks looking at the decks and transoms at various angles to check the fairing and finish. I'm the guy bobbing his head around searching for reflections. The planked boats generally look good and sometimes near perfect. The varnish is smooth and specular like a mirror. The topsides are harder to see, and usually have a few wiggles and a few varnish issues. Have you noticed that wood with a lot of curvature usually is well faired and the varnish job is excellent? What does varnish know about curvature? The veneered mahogany decks typically are a bit rough although well faired. On these the varnish had a mind of its own.

There are three main problems on our way to getting a beautifully varnished boat. They are 1: Non-uniformity of the varnish film thickness, 2. Lack of flow and 3. Dust. I wrote about a get-around for dust in the article *Finishing Touches* in the Spring 2006 Brass Bell. For me a get-around is a necessity. If you saw the shop where I varnish you'd think I was nuts to try it. It is the same place where we cut, plane and sand wood all day. The big door is open and any breeze deposits a beautiful film of dust. It is incredibly dirty. But after 5 PM we close the doors, water down the floor, and move around slowly.

We don't wear plastic suits; we don't take off our clothes, and we do get some dust nibs which we polish out per *Finishing Touches*. Dust is an enemy but I can't afford a "clean room."

When I carry a brush loaded with varnish it is all too easy to press too hard at the beginning of the stroke and lay on too much. The result is a sag or run. It is worth brushing out the sags as they occur. I keep going around the boat and try brushing them out. The sag line is a place of thick varnish which will not cure properly. Varnishing is after all the ancient art of polymerization even if the ancients didn't say the word *polymer*. I think varnish was invented by Egyptians to make furniture beautiful, especially for the afterlife. Please may we take our mahogany boats with us?

Varnish is basically a mix of oil and resins with solvent thrown in to make it brushable. Polymerization is a modern word meaning linking up of small molecules to form a long chain, the polymer or giant molecule. The oil and resin molecules (little geometric arrangements of hydrogen and carbon atoms) are small, and stay that way in the can because it takes too much energy to chain them up. Take a group of boys and tell them to form a line and hold hands. It won't happen. You need a lowering of their resistive energy. Put pretty girls between the boys and hand holding is a snap. Oxygen is the pretty girl of varnish polymerization. Oxygen in the air diffuses into the varnish after the solvent flashes off. The oil and resin molecules link up to the pretty oxygen and in just a few hours long chain

molecules or polymers are guarding your boat. Polyurethane varnish forms some zingo polymers, great for indoor furniture but not flexible enough for boats. The diffusion of oxygen into the varnish film can not complete (cure) if the film is too thick as on a sag line. Oxygen does not reach into thick varnish. The sag line stays soft. Not good. Try not to get sags. Varnish in thin layers, just enough to avoid widows.

When I use a bristle brush on the top sides I'll apply the varnish in an X pattern or a bunch of slashes, \\\ and then brush them out horizontally as the brush is depleted. I work back toward the wet line. This results in few runs and sags. After doing a side I'll take a light in one hand and nearly dry brush in the other going back and forth attacking the sags. It is best to varnish with thin layers. If you missed a spot and caused a "widow," don't worry. You'll cover it up



Topside boards partially wet sanded. Upper board still has many large surface tension depressions

on the next layer. But try to catch your sags as you go. These days I like to use the foam brush. I can lay the varnish

more evenly and when done file the brush in the round dust bin.

Now for the tough one. When we say "flow" we mean the varnish wets the surface smoothly and uniformly. It doesn't ball up or draw back. Varnish on wood does not like to lay flat. It's almost like water on clean glass. You need a flow agent such as detergent to get water to wet smoothly. This property of liquids to ball up is called "surface tension." Technically the surface energy is minimized when the liquid surface is curved, and nature loves minimum energy. Although it's not nice to fool Mother Nature, we can by sanding the varnish between layers. The scratched varnish presents a lower energy condition for the new layer. The energy of bonding to the scratched surface is lower than the energy of balling up.

You needn't worry about all this energy stuff. The idea is to get a uniformly gray surface when sanding the varnish. But there's the rub if you'll pardon the expression. You need five or six layers of varnish before you can sand. After several layers of this surface tension business the varnish has a lot of small hills and valleys, especially on wood with large pores. After six coats of varnish it is thick enough to sand with 320 grit to get it nearly uniform gray. On some planks it will be a lot of work to get uniform gray. You will be removing nearly a third the buildup, but it will be worth it. As you conquer the surface tension monster, the surface will become smoother and smoother. A better way to achieve uniform gray is to wet sand with 220 silicon carbide paper. Use lots of water, flush with clean water and final-clean with denatured alcohol. The varnish will lay beautifully on this surface. Then the old timer will look over your shoulder and say, "Now that

has depth.” “Depth” is the glass-like surface, not the actual thickness of the film. When the surface is smooth, the grain pops out into a beautiful presentation. As for final thickness, the thicker the finished film the more ultraviolet light protection there is where the film contacts the wood. So smooth and thick at completion are good.

Another trick when starting is to apply three coats of sealer which tends to lower the surface energy for better flow at the first coat of varnish. A neat trick is to fill the wood pores with neutral colored paste filler before staining. If you do this be sure to do the whole boat top or side with the same filler as it will change how the stain soaks in. Always practice on scrap wood before taking on the planks. With the pores filled the geometry effects of surface tension is lessened, and fewer coats of varnish will be necessary to achieve “depth.” This filler method works great on mahogany veneer but don’t tell anyone. Follow instruction on the filler can, and rub well with burlap across grain before it sets. Then there is filler-stain, a mix of filler and stain. Sounds great but I hate filler stain. It seems so dumb to put two difficult jobs together. I fill and let the filler harden well over several days and then stain. This way I can control the filling and the depth of stain independently. Couple of years ago I asked a filler stain company if they would sell the Chris-Craft stain separately. No way. It would violate some basic law of physics I guess. But then what do I know, I’ve yet to reach perfection.

Although I have no proof, I think curved wood counteracts surface tension. There may be a doctorate thesis in this for some bright student. Sorry about that.

Oh, and a little thing about cleaning your bristle brush. I have one of those brush spinner doodads but I nearly break my hand each time I insert a brush into its powerful jaws. It is a lot easier to use paper towel (surprisingly clean stuff) to dry your brush and cleaning cup between solvent rinses. Toweling results in a very clean and nearly dry brush and in my case no busted fingers. Uses less solvent too



Topside boards after more sanding are ready for cleaning and varnishing. The surface tension depressions are few and small.