

New Water-Based Finishes

They're more durable, easier to apply and look a lot better, too

BY ANDY CHARRON

A lot of woodworkers won't get near water-based finishes because they believe these products cause excessive grain raising, don't adhere well over oil-based stains and look like plastic. When I first began using water-based finishes about eight years ago, these products were indeed difficult to use and didn't look so hot. That's not the case anymore. Water-based finishes are getting better all the time. Also, they don't give off noxious fumes, they dry fast, and they aren't flammable.

A prior survey in the magazine (*FWW*#115, pp. 48-53) evaluated 15 water-based finishes. Manufacturers have been busy, and there's a whole new crop of finishes on the market. I tried nine new finishes and compared them with a couple of time-tested finishes: nitrocellulose lacquer and shellac. I also compared the new finishes to Famowood Super Lac, a water-based finish that did extremely well in the previous evaluation, especially when measured on appearance.

The new finishes really stand out when it comes to stain resistance. Most were bulletproof. Grain raising wasn't objectionable with the majority of the finishes, and a few barely raised the grain at all. Some of the finishes



TARGET ENTERPRISES

OXFORD HYBRID GLOSS VARNISH

Good depth, warm tone. Closely approaches lacquer in appearance. Doesn't do well over oil-based stain.



GENERAL FINISHES

HIGH PERFORMANCE

POLYURETHANE

Slightly cloudy, plastic appearance. Flows out well.



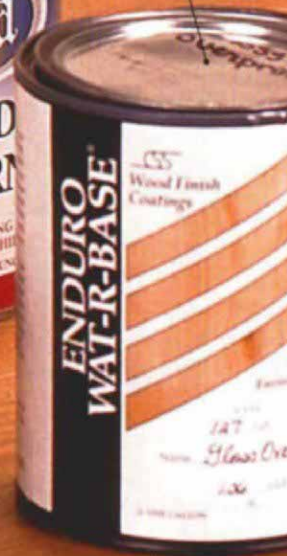
COMPLIANT SPRAY

SYSTEMS ENDURO

WAT-R-BASE POLY

OVERPRINT

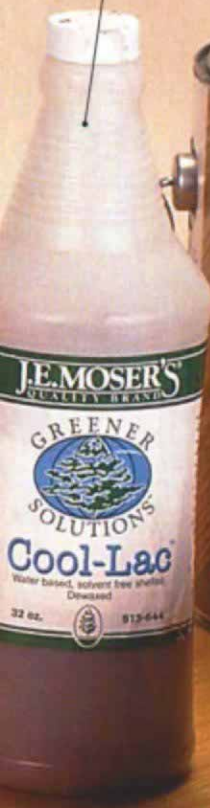
Top-rated finish with a warm tone and good depth. Closely approaches lacquer in appearance.



J.E. MOSER COOL-LAC
The first water-based shellac. Has a warm color, but finish is very thin and doesn't build well, which makes it difficult to rub out without cutting through coats.

PARKS PRO FINISHER POLYURETHANE
Only a very slight tint (approaching neutral) and good depth. Fills pores well.

SHERWIN WILLIAMS KEM AQUA
Commercial spray finish, available only in 5-gal. containers. Slightly blue tint and cloudy. More difficult than average to apply.



HYDROCOTE RESISTHANE PRE-CATALYZED LACQUER
Slightly blue tint, cloudy. Easy to apply.



FSM CORP. CLEARLY SUPERIOR 455
Slightly blue tint, cloudy. Fills pores well but difficult to rub to an even gloss.



VAN TECHNOLOGIES VANAQUA URETHANE
Neutral tone but slightly cloudy. Builds and fills pores quickly.



Finishes were tested on mahogany plywood. The author applied an oil-based stain to half of each panel, then three coats of finish.

Product	Manufacturer	Adhesion over oil-based stain	Stain resistance (22 max.)
Clearly Superior 455	FSM Corp. (800) 686-2006	Pass	19
Cool-Lac	J.E. Moser (Woodworker's Supply) (800) 645-9292	Pass	22
Enduro Wat-R-Base Poly Overprint	Compliant Spray Systems (800) 696-0615	Pass	21
High Performance Polyurethane	General Finishes (800) 783-6050	Pass	20
Resisthane Pre-catalyzed Lacquer	Hydrocote (800) 229-0934	Pass	20
Kem Aqua	Sherwin Williams (800) 474-3794	Pass	22
Oxford Hybrid Gloss Varnish	Target Enterprises (800) 752-9922	Fail	22
Pro Finisher Polyurethane	Parks (800) 225-8543	Pass	22
VanAqua Urethane	Van Technologies (218) 525-9424	Pass	22
BENCHMARK FINISHES			
Solvent-based nitrocellulose lacquer	Various	Pass	21
Super blonde shellac	Various	Pass	16
Famowood Super Lac	Eclectic Products (800) 349-4667	Pass	22

were difficult to apply, although most went on without a hitch.

Rating the products on appearance is the most subjective test, but an important one, and several finishes scored very high. Even the finishes that scored low on appearance are light-years ahead of what I was using five years ago. It's fair to say that water-based finishes are getting better, and I imagine the trend will continue.

Resins and additives have been improved

Traditional finishes such as lacquer and shellac have very few ingredients, primarily resins (solids that form the finish film) and solvents (also called carriers), which

dissolve the resins. Water-based finishes are similar in that they, too, contain resins and solvents. But water-based finishes have many more additives than traditional lacquers, sometimes as many as 20, to deal with the basic incompatibility of water and resin. The other chemicals, especially ones called surfactants, allow water and resins to mix together, forming an emulsion. As the water evaporates, alcohols or cosolvents soften the resins, allowing them to coalesce and form the finish film.

Although manufacturers are unwilling to give away trade secrets, they did tell me they've made headway with the types of resins and additives used in finishes. These improvements translate to finishes that

bond better to solvent-based products and are tougher, yet easier to sand and rub out.

With the exception of one water-based shellac, the resins in the water-based finishes I tested are acrylic, urethane or a combination of both. These finishes go by many descriptive terms, including lacquer, polyurethane or varnish, but for purposes of discussion, most water-based finishes are technically lacquers, meaning they can be redissolved by their own solvents.

Finishes were all tested the same way

I used squares cut from the same sheet of mahogany plywood to test all the finishes (see the photo above left). First, I applied a coat of Minwax red-mahogany oil-based

Heat resistance	Raised grain	Sanding	Best applicator	Appearance
Fail	Moderate to heavy	Moderate	Brush or spray	Poor
Fail	Moderate	Easy	Brush	Good
Pass	Minor	Easy	Spray	Excellent
Pass	Minor	Easy	Brush or spray	Good
Pass	Heavy	Moderate	Brush or spray	Fair
Fail	Moderate	Moderate	Spray	Fair
Pass	Moderate	Moderate	Brush or spray	Excellent
Pass	Moderate	Moderate	Brush or spray	Good
Fail	Moderate	Moderate	Spray	Good
Pass	Minor	Easy	Spray	Excellent
Fail	Moderate	Easy	Brush or spray	Good
Pass	Moderate	Easy	Spray	Excellent

Finishes impress FWW editors

To see how the two best-looking water-based finishes looked on furniture, we applied them to small tables. A third table was sprayed with nitrocellulose lacquer for comparison.

The Oxford finish on the maple has a lot of depth and makes the grain of the wood pop, although it has a heavy yellow bias. The cherry also looked good with a more natural tone. The lacquer actually seemed to have less clarity than the others.

—Matthew Teague, assistant editor

The Enduro and Oxford finishes both impart a nice, warm tone to the wood and are not muddy like other water-based finishes I've used. When I ran a fingernail across the three tables, the Oxford finish was fairly easy to scratch, unlike the other two. I'll try the Enduro on my next project.

—Anatole Burkin, associate editor

The three finishes are indistinguishable to me. They reflect light with the same clarity, and they all give a good sense of depth. Also, the water-based finishes don't have that bluish "skim-milk" cast to them.

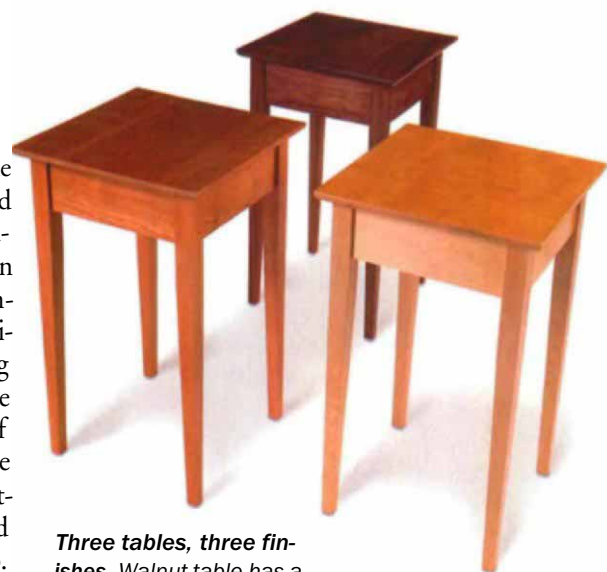
—Jefferson Kolle, senior editor



Testing adhesion over an oil-based stain. A sharp knife was used to slice into the finish, then packing tape was placed over the cut. After five minutes, the tape was pulled off.

stain to half of each panel. I allowed the stain to dry for two days, then applied three coats of finish to each panel, using either a brush, a spray gun or a combination of both, going by manufacturers' recommendations. I let each coat dry for a minimum of two hours before lightly sanding and applying another coat. Although some manufacturers offer sanding sealers, all of the products I tested can be used on bare wood, and that's what I did. Then I subjected the panels to common household chemicals to see how they would hold up.

After I had finished with the various tests, I sanded the topcoats using 240-grit, 400-grit and 600-grit sandpaper, then rubbed them with pumice and rottenstone. I also



Three tables, three finishes. Walnut table has a nitrocellulose-lacquer finish. Cherry table is finished with Enduro Wat-R-Base Overprint. Maple table has an Oxford Hybrid Gloss Varnish finish.



Food-stain test. Finishes were subjected to a variety of common foods and cleaners. Most finishes held up very well. Cleaning products, however, were hardest on the finishes.



Hot-spoon test. Several finishes were marred when a hot spoon was allowed to cool on the panel.

tested traditional shellac, nitrocellulose lacquer and a previously tested water-based product for comparison.

Testing adhesion over an oil-based stain—The adhesion test determines if a water-based finish will stick to an oil-based stain. I used a sharp knife or razor to slice an X into the finish where it was applied over the stain. Then I placed a piece of packing tape over the X and pressed down firmly. I let the tape *sit* for about five minutes and then yanked it off (see the left photo on p. 71). The finish held fast on eight panels. Only one finish chipped off, failing the test.

Common foods were used for the stain test—I gave each finish what I call the kitchen-table test. Tables are subjected to food spills, and a good finish should survive the onslaught as well as the chemicals used to clean up the mess.

I placed a small amount of the following common household products on each panel: milk, orange juice, hot coffee, mustard, ketchup, red wine, grape jelly, vinegar, olive oil, Windex and Fantastik (see the photo above). After one hour, I wiped each spot off, checking for damage. If there was no damage, the finish received 2 points. If the finish was slightly damaged (dull), it got 1 point. If the finish was severely stained, damaged or eaten away, it got no points. All of the finishes I tested scored at least 19 points, and several got a

perfect 22. Windex and Fantastik caused the most damage.

A finish for a table needs to withstand heat—Tables are often exposed to hot pots, cups and spoons. To re-create this scenario, I put a spoon in boiling water for a few minutes, then placed it on a test panel (see the right photo above). After the spoon had cooled, I removed it. If the spoon left no mark, the finish passed the test. If the spoon stuck to the finish or left a dull impression, it failed.

New products are easier to sand and rub out—Water-based finishes have a reputation of causing excessive grain raising and of being difficult to sand. A simple way to gauge the roughness is to brush a finger across the first coat after it dries.



Too-thin finishes are tricky to sand. Some finishes, such as J.E. Moser's Cool-Lac, a water-based shellac, go on so thin that it's difficult not to sand through to previous coats.

The first coat of finish causes most, if not all, the grain raising. In my test, if a panel felt rough, like medium-grit sandpaper, I rated the raised grain as "heavy." If the panel felt more like fine sandpaper, I rated it "moderate." If it felt like very fine sandpaper, I rated it "minor."

To determine whether a finish was easy or difficult to sand, I sanded all three coats with varying grits of fresh paper. I not only looked at how easily the finish powdered up and how much it clogged the paper, but I also considered how hard I had to work to achieve a smooth, flat surface. Thankfully, all of the finishes I tested fell in the easy to moderate range. In fact, several of the finishes were as easy or easier to sand than lacquer and shellac. For a high-gloss, rubbed-out finish, I found that using 1000-grit and 1200-grit wet abrasive paper (available at auto-body supply shops) prior to rubbing out with pumice and rottenstone gave me the best results.

Appearance is the most subjective test—Because most of the finishes scored well in the kitchen-table tests, the deciding factor comes down to looks. Admittedly, this is subjective. Something that looks good to me may not look good to you. To give a fair evaluation, I showed the panels to a couple of other professional woodworkers and weighed their opinions as well as my own. I used solvent-based lacquer as the benchmark against which all the finishes were judged for appearance.

Lacquer imbues wood with a warm tone, what I call a light amber color, and the finish also has clarity, which adds depth, especially after three coats or more. The best of the finishes approached this look. I downgraded finishes if they had a slightly cool or blue cast and were dull or cloudy.

Overall, the new products tested well

If the color of the finish were not an issue, I would consider using any one of these products, with the exception of J.E. Moser's Cool-Lac. Although the Cool-Lac scored well on the tests (better than traditional shellac) and had a true shellac color, I found it difficult to apply. The product is very thin, nearly the consistency of water, and contains a low level of solids. As a result, the coats go on very thin and don't build well. Building a deep, protective finish requires half a dozen coats or more.

My two favorite finishes are the Compliant Spray Systems Enduro Wat-R-Base Poly Overprint and Target Enterprises Oxford Hybrid Gloss Varnish. Enduro and Oxford look virtually identical to solvent-based lacquer. They give wood a warm tone and highlight the grain because of their clarity. Both are easy to apply, but the Enduro requires only three coats to develop a good build. When I went to rub out the Oxford after three coats, I cut through to bare wood before achieving a nice shine. You need to apply at least five coats if you plan to rub this finish out to a high gloss.

If I had to choose between the two, I would opt for the Enduro, because it dries incredibly fast and because it passed the adhesion test. I think most people would be hard-pressed to tell the difference between Enduro and solvent-based lacquer. The Oxford finish—which, like the Enduro, has a nice, warm tone—didn't adhere well over an oil-based stain (it held fine over bare wood). You can solve this problem by using a water- or alcohol-based stain or by applying a sealer of shellac between the oil stain and the finish. Not to be forgotten, Eclectic Products Famowood Super Lac, a finish that tested well in the previous article, ranks right up there with the Enduro and Oxford. It's easy to handle and apply. It rubs out extremely well, has good depth and a color very similar to that of nitrocellulose lacquer. □

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The color of some water-based finishes can be improved. To bring more warmth to a finish, dewaxed shellac can be applied as a sealer coat to bare wood. Or you can add universal tinting color (tube) or dissolved dye (bottle) directly to a finish to change its tone.

TINTING THE WOOD

Using shellac for a first, or sealer, coat will impart a warm glow to wood. It will also raise and stiffen the grain, making it easy to sand. Use fresh-mixed shellac that is dewaxed. You can also color the wood using dyes. A thin coat of a highly diluted water-soluble dye should give the wood just the right hint of color.

COLORING THE TOPCOAT

In some cases, you may want to color the topcoat itself. What you are actually doing is using the finish as a toner, which can be a bit tricky.

Pigments should be used in small amounts: You can use universal tinting colors (UTCs), which are available at paint stores, to alter the appearance of a clear finish. A small drop or two of an earthy tone like burnt umber or raw sienna goes a long way toward giving an otherwise bland finish a sense of color and warmth. However, pigments are opaque and may give the finish a dark, cloudy or muddy appearance. If you use pigments to color a clear coat, use them sparingly and take great pains to apply the finish as evenly as possible.

Water-soluble dyes are preferred: A better alternative to pigments are water-soluble dyes. Dissolve a small amount of dye in water first and then add a few drops at a time to the finish until the color is right. Remember, water will thin the finish, so use it sparingly. Because dyes are transparent, they won't give the finish a muddy look. Dyes, however, will not penetrate the resins; they really only color the liquid part of the finish, which will evaporate, leaving the dye in place. This can cause some blotching.

Alcohol dyes are the best way to tint finishes: Dyes that have been dissolved in alcohol will actually penetrate the resins in a finish and change their colors. The resulting finish is even in tone and uniform in color. I like to use TransTint honey amber from Homestead Finishing Products (440-582-8929), which comes in concentrated liquid form. Add four to six drops per quart of finish as a starting point to impart a warm tone.—A. C.



Add dye sparingly. A few drops of amber dye added to a neutral or slightly blue finish will give it a warm tone.

Improving the color of water-based finishes

Although some water-based products have improved to the point where they appear comparable in color to traditional lacquer or shellac right out of the can, others still have a way to go. Some look a bit bland, and others suffer from a very slight bluish cast. If you happen to like everything about your finish except its color, consider toning the wood or the finish.

Some finish manufacturers tone their products for customers who prefer a warm look. The Enduro Wat-R-Base Poly Overprint has an additive that gives the finish a slight amber tone. Hydrocote offers an amber additive that can be added to its finishes. There are other products available to help you color topcoats. Whatever you do, don't thin the finish beyond what the manufacturer recommends.