

A good choice for vacuum veneering. The author likes polyurethane glue because it saturates the veneer and fills the voids. A scrap of plastic laminate and a foam roller spread the glue into a thin, even coat.

Polyurethane Glue

This one-part alternative to epoxy fills gaps and sands easily

by Niall Barrett

I tried polyurethane glue for the first time a few years ago when I was making some laminated, exterior doors. I had used epoxy in similar situations in the past. Epoxy is a great glue, strong and waterproof. But laminating takes a lot of glue and epoxy can get very messy—to say nothing of the fumes it gives off as it cures.

Although I didn't know much about polyurethane adhesives, I thought they'd be worth a try. When I looked into it, I found that polyurethane glue has some real advantages over both epoxy and yellow glue. But these adhesives do have some characteristics of their own, and it takes some practice to get the hang of using them. Experimentation is a must.

Two brands, Gorilla Glue and Excel, are available as woodworking glues in the

United States. These glues have an impressive list of qualities. Like epoxies, they are waterproof. Unlike epoxies, they're one-part glues, ready to use out of the bottle. Clamping pressures required to bond parts are low.

Polyurethane glues expand as they cure. This expansion, actually a foaming, forces the glue into wood fibers and forms a fine, closed-cell structure. The expansion also provides some gap filling, enough to fill the joint cosmetically and keep moisture out. But be careful, the glue that fills gaps doesn't provide structural strength.

When cured, these glues don't creep. They retain enough elasticity to eliminate the glue fatigue that results from shrinking and swelling joints. And these glues sand easily. When sanded, the hardened glue becomes porous and takes stain readily. Instead of melting from the heat of friction, like polyvinyl acetate (PVA) glues (yellow and white glues) and epoxies, polyurethane glues turn into a powder that won't clog sandpaper or dull tools. These glues contain few, if any, solvents.

Where these glues work best

I originally thought polyurethane glue should be used only when I needed a waterproof bond. But I find myself reaching for it more often. Except for instances when I need structural gap filling, I feel confident replacing epoxy with polyurethane glue in my shop.

In situations where it's difficult or impossible to use clamps, polyurethane glue is ideal because it requires low clamping pressure. You can literally hold things together with tape or string while the glue sets. Edge-gluing with this adhesive is a little easier because when correctly applied, the glue doesn't allow boards to slide around much.

I like this glue especially for veneering. It saturates the veneer and fills any voids, practically eliminating any splintering and lifting of wood fibers. I pour some in the center of the substrate, scrape it out to the edges with a scrap of plastic laminate and then go over the glue with a foam roller. If it looks as if there's not quite enough glue there, it's probably just right (this is generally true of polyurethane glue—you'll use a lot less glue than you're used to).

If you're using a vacuum press, make sure to wrap the workpiece well in plastic to protect the bag. The glue may not come off a vinyl bag, and it absolutely won't come off a polyurethane bag. Remember, too, that polyurethane glue expands as it cures, so you must have pressure over the entire veneer surface as the glue dries.

It's not yellow glue

Manufacturers claim cure times that range from one to 12 hours. Although this is faster than most epoxies, in practice polyurethane adhesives take considerably longer than yellow glue to set up. Claims for shelf life range from one to four years in a sealed container, and six to 12 months after opening. My advice is to store the glue in small, tightly sealed containers. Squeeze out as much air as possible from the container after use, and buy only what you can use in a few months.

Isocyanates, the key components of polyurethane glues, are highly reactive to moisture. Exposure causes a cross-linking of the molecules in the adhesive. Because these glues cure in the presence of moisture, the optimum range for wood moisture content is between 8% and 20%. If your shop is like mine in the winter, wood moisture content drops below 8%, ideal conditions for glue failure.

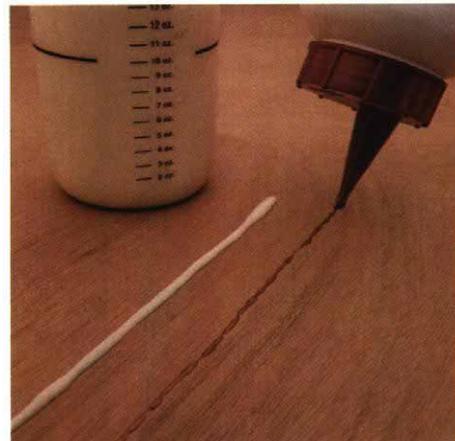
To remedy this, I mist one side of the joint before applying glue and bringing two surfaces together. When veneering, I wipe the substrate with a wet rag and wait until the surface looks dry before applying the adhesive. I can't stress enough that you need moisture to activate this glue. Trying to glue bone-dry material with this glue just won't work.

Polyurethane likes a slightly roughened surface, a little tooth. This is quite different from using yellow glue, where two mating surfaces are, ideally, clean and smooth. If the surfaces to be glued look too smooth, rough them up a little with sandpaper.

One thing yellow glue excels at is plate joinery. Polyurethane glue doesn't. The reason is that yellow glue swells the pressed-wood biscuits, locking the biscuits in place. Because polyurethane glue isn't water-based, the biscuits won't swell, and the joint may not be as strong.

Labels can be misleading when it comes to cleaning up wet polyurethane glue. I find that mineral spirits are too weak, and I question the use of denatured alcohol, which could react chemically with the wet glue. I've found that acetone or lacquer thinner works fine. This glue is so easy to remove when cured, however, that I wonder how often wet cleanup is really necessary. The exception is your hands. The glue leaves a stubborn brown stain, so I use disposable latex gloves when I'm working with it.

Some people will be sensitive to the isocyanates in the glue. So before using it, it would be prudent to get a copy of the Material Safety Data Sheet from the manufacturer, and read about potential hazards.



Apply less than you're used to. A common mistake when learning how to use polyurethane glue is using too much. If you're used to applying a healthy bead of yellow glue (left) in your shop, cut back when applying polyurethane glues (right).



Sources of supply

Excel polyurethane wood glue
Distributed by AmBel Corp., PO Box 819, 125 Cottonport Ave., Cottonport, LA 71327; (800) 779-3935

Gorilla glue
Distributed by Gorilla Glue, PO Box 42532, Santa Barbara, CA 93140-2532; (800) 966-3458

It costs more, but it's all relative

Most people that I've talked with about polyurethane glue complain about its high cost. Excel is about \$17 for 25.4 oz.; Gorilla Glue is \$19.95 for 18 oz. To me, though, this criticism seems unjustified. In my experience, a little bit of polyurethane glue goes a long way. And I think we need to rethink our attitude. Even if the glue was a lot more expensive, you have to ask what percentage of a job is really tied up in the cost of glue. Not much. If polyurethane glue helps you move faster or allows you to do jobs you wouldn't ordinarily tackle, I say it's well worth the investment. □

Niall Barren is a furnituremaker in Narrowsburg, N.Y., who recently went to work for AmBel, the distributor of Excel glue.