The Journey from *Penturning to Penmaking*

by Kurt Hertzog

The Magic of Polyester Resins

The woods of the world—along with bone, antler, metals, and more—provide plenty of colors and textures, but one of the most versatile materials for penturners to explore is polyester resin (PR). Unfortunately, the other materials don't let you "create" your own special blank as you can with PR. What can you do with PR? The better question is what **can't** you do with PR? The possibilities range from color-tinted plastic blanks to creating a blank that is filled with almost anything you can imagine.

For this issue, my column is a primer about using PR. We'll explore using PR to create a blank that will be cut, drilled, and glued. PR can be used to encapsulate tubes wrapped with paper, pictures, snakeskin, or fly-tying feathers. There are a few tricks to weighting and suspending the tubes and sealing their ends, but for this issue, we'll skip those complexities and focus on working with the material.

SAFETY FIRST—ALWAYS

Before using any chemical, make sure you read and understand the safety instructions that are provided with the material by the manufacturer. Not only will the instructions allow you to use the materials in a safe manner, but following them will also yield the best results. Personal protection equipment is readily available and modestly priced (see **Fig. 1**). Pay attention and follow all the instructions, especially those pertaining to ventilation, temperature, and disposal. When the manufacturers say X number of drops of catalyst per ounce based on a certain thickness

of casting, they mean it. Using twice as much doesn't make it work twice as fast (see **Fig. 2**). Follow their instructions exactly for safe use and best results.

WHICH POLYESTER RESIN?

When you begin shopping for PR, you'll find that it is like cake mix. There isn't just one PR, but rather, there is a whole family of products—each being formulated to optimize certain characteristics. It might be clarity, color, hardness, castability, machinability, open time, or a combination of these. An Internet search will yield a wealth of information to help select a vendor and a product based on which characteristics are most important to you.

I suggest that you begin the journey through PR by visiting a local craft store and purchasing *Castin' Craft* Clear Casting Resin, along with the corresponding catalyst. That will get you started. Once you've dipped into the water, so to speak, you may wish to buy specific resins in larger, more economical sizes (see **Fig. 3**).

SAFETY AGAIN

Much like epoxy resin, PR has two parts: the resin and a catalyst that will cause the resin to harden. Unlike epoxy that usually uses equal parts of catalyst and resin, the amount of catalyst used is miniscule compared to the amount of resin used. It is generally measured in drops of catalyst to ounces of resin, all based on the thickness of the casting to be made. PR exotherms during the curing process. This is just a fancy word meaning that it gives off heat, and this helps to explain why less catalyst is needed for thicker castings. The heat generated during curing (and held captive temporarily in the casting) helps drive the process along. As mentioned earlier, using more than the recommended amount of catalyst DOES NOT mean faster curing, more hardness, or anything else.

ONE CASTING METHOD

There are many ways to cast resins and I'll share with you the method I use. It certainly isn't the only way, but I've found it workable and I'm positive it will work for you. However, if you find better ways of doing it, let me know so I can share them with others as well.

Preparation is key to working with PR. Having everything prepared and ready to go will make the casting session go smoothly. PR is sticky stuff, so spills need to be addressed immediately. Plenty of surface protection for the work area with easy-to-reach towels is a smart move. I cover my work area with a thick padding of old newspapers, so that the top layer can be rolled up and disposed of as often as necessary.

Polyethylene casting molds are available through craft and hobby stores as well as the PR suppliers. PR won't adhere to polyethylene and the molds have a built-in draft angle on the sides, allowing for easy release of the blank, once hardened. These work well, but I prefer to make my own casting molds. I use tinfoil to create the casting molds in the shape and size most conducive to the part needed. For example, if a pen blank is being cast, I use a pen blank of the size and shape that I want. Five sides of the blank are wrapped in foil without any seams, leaving the top open (see **Fig. 4**). Remove the wooden form and you have a low-cost, disposable mold exactly the right size (see **Fig. 5**). The beauty of this mold is that it doesn't have to be removed (or saved); it can be cut through, drilled through, and turned through with ease.

Another alternative to both polyethylene and/or tinfoil molds is a shaped ice cube tray, such as those used for freezer pops. They can be used to create a cast PR blank that is either round or square. These low-cost trays will allow you to cast a dozen or more blanks at a time, and they have a draft angle molded in for easy removal (see **Figs. 6** and **7**). They cut safely without the need for a V-block and are more easily held for drilling. Whatever mold method you choose to use, get everything prepped and staged prior to the casting session. (I, however, find working with the square forms from my tinfoil molds easier.)

Once you decide on the molds, you know what the casting thickness will be. Following the manufacturer's instructions, add the required number of drops to each ounce of resin. How much resin do you need, you ask? Trial-and-error works best, but if you are more scientific, you can crudely calculate the amount required and then fill a mixing cup with that equivalent volume of resin. The weight of the resin in the cup will let you know how many drops of catalyst are needed. This catalyst-to-resin ratio will hold true whether you are clear casting, adding colorants

Fig. 1

The use of proper personal protective equipment is wise when using any chemicals.

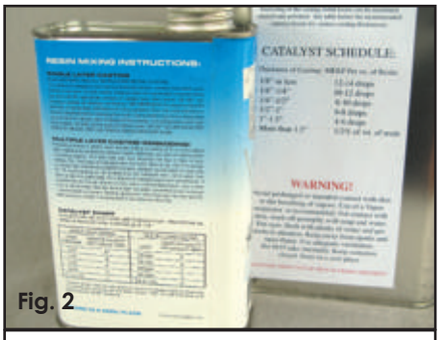

Fig. 2

Following the manufacturer's safety instructions will yield the best results.

Fig. 3

There are a variety of manufacturers of PR and colorants in hobby sizes and larger.

to the casting, or doing a material-filled casting, because the weight of the initial resin is what the amount of catalyst required is based upon.

Molds ready? Table covered? Plenty of paper towels handy? Safety glasses and gloves on? Mixing tubs and stirrers? Scale? A scale? Where did this come from? I use a small inexpensive digital scale for weighing the resin (see **Fig. 8**). You can get one from any discount tool store for $15.00 on sale, and it is more than accurate enough. I cover the scale with a small piece of sandwich bag material (to protect from the inevitable drips), and "tare" that and the mixing cup.

When preparing to cast, I prefer to mix sufficient material for one blank at a time. This allows me to do things in a less hurried manner. I can mix, color or fill, pour into the mold, level, and still have time to "debubble" if necessary.

COLORANTS OR FILLERS

Though clear cast resin might be a great "color" over a photo or snakeskin, it really leaves much to be desired as a pen blank by itself. There are a wide array of colorants available from the resin suppliers, and they range from light tints to swirls and candy colors. But don't let the small bottle deceive you; like the catalyst, a few drops are all that is necessary. For the example here, I'm using a filler of dyed rice. Obviously, this needs to be done in advance so that it is dry and ready for casting. My first foray into castable PRs began with a dyed rice pen, and after nearly ten years of use, it has held up well (see **Fig. 9**).

DYING RICE

A simple, inexpensive way to experiment with fillers is to use raw white rice and color it for effect. Put it into a ziplock bag and add enough water so that the rice is completely wet, yet not awash. The food coloring is then added and swished all around until you get the color intensity desired. Once done, the excess air is squeezed out and the bag is sealed (see **Fig. 10**). Prepare as many different colors as you wish—each in a separate bag. Allow the rice to absorb the water and colorant overnight, and then empty the rice onto a cookie sheet and allow it to dry. You can either let the rice air-dry or put it into the oven on a low heat. Once totally dry, the color is set and it can be stored for use as a solid color or blended with other colors for variety. By varying the colors and intensity, quite a palette can be created (see **Fig. 11**).

CASTING WITH FILLERS

The process is the same whether using a colorant, filler, or nothing at all. The resin is weighed, the proper number of

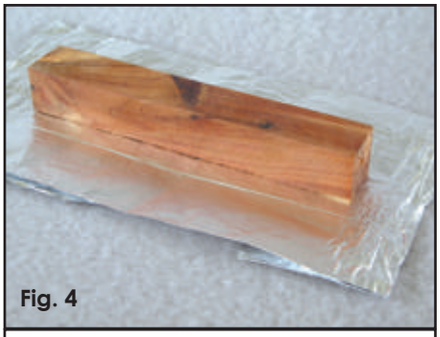

Fig. 4

An easily made, perfectly sized casting mold can be made from tinfoil.

Fig. 5

Not only is the mold perfectly sized for the end use, but it is extremely cheap.

Fig. 6

Freezer pop trays or commercially available polyethylene molds can be used.

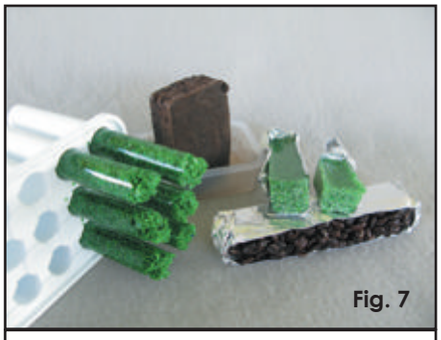

Fig. 7

Depending on the end use, one form factor may be better suited to you.

Fig. 8

A low-cost digital scale is a valuable tool if you do PR casting.

Fig. 9

My first PR casting that was made nearly ten years ago has held up well.

drops of catalyst are added, and the two are mixed. Caution is necessary when mixing, and the term *folding* might be more appropriate. If you stir or mix, you will entrain air and the little bubbles of air will be trapped in the casting as it cures. They are unsightly and troublesome, and it is easier not to create them than it is to remove them.

With the filler prepared, it can be added to the resin/catalyst mix at this point. Once completely wet, the resin/catalyst/filler mix can be poured into the mold (see **Fig. 12**).

BUBBLES

My advice is don't create the problem. Gentle folding of the catalyst into the resin will minimize this problem. Adding filler helps, since the filler becomes wet and a highly filled mixture is being created where bubbles don't actually exist.

If there are bubbles in a clear or colored resin, what can you do about them? There is a limited time for them to come to the surface before the resin gets too viscous. If sufficient material is cast, the bottom and center should be bubble-free, since the bubbles will have risen toward the surface. Even if they become trapped, planning for enough material allows sufficient thickness that is bubble-free with which to work. If the bubbles are troublesome, it might be better to scrap that small batch with bubbles and mix another.

Some folks try to force the bubbles to shrink by putting the resin mixture into a paint pressure pot and pressurizing it. Since I have only a little experience experimenting with this, I didn't see a huge value in doing so. I have had better luck pulling a vacuum on the mixture, allowing the bubbles to escape while they can.

My homemade vacuum chamber is made from sealed 4" PVC pipe with a threaded clean-out fitting at one end (see **Fig. 13**). A *Milton* air fitting is installed on the end cap, so that I can hook up the vacuum pump that I use for vacuum chucking. The casting molds are placed into the chamber and sealed, and a vacuum is pulled on the chamber for a few minutes and then turned off. The result is that any bubbles that were entrained have completely escaped or are so close to the surface that they become insignificant.

CASTING AND CURING

All this may sound a bit daunting, but it actually isn't. Once you are set up and begin casting, it really goes quite quickly. I don't just cast a few blanks; when I start, I set up and cast a quantity of them, because there is no sense in

Fig. 10

Dyeing rice with food coloring is inexpensive and easy.


Fig. 11

A complete palette of colors can be created.


Fig. 12

Weighed, catalyzed, and filled, the blank is molded.

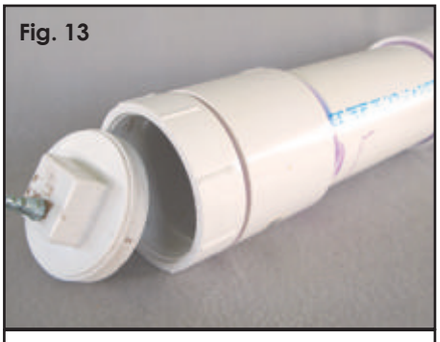
Fig. 13

My homemade vacuum chamber helps to extract bubbles.


Fig. 14

The castings are placed side-by-side in a shoe box to eliminate sidewall flex.


Fig. 15

Post-mold baking can help reduce surface tackiness.

making a mess for just a few.

My mixing vessels are plastic gelato cups and are thrown away after each mixed blank. They are far too messy to use a second time, and besides, the material in the cup is setting up. The only downside in using tinfoil molds is that the sides flex. Without some side support, the sidewalls will bow out a bit until the mixture sets. My solution to the problem is to place the molds side-by-side in a shoe box, thus keeping the sidewalls from flexing until the resin cures (see **Fig. 14**).

POST-MOLD BAKING

This step is unnecessary, but I do it anyway because I find the surface tackiness on the cured molds unpleasant when I cut, drill, and glue the blanks. Therefore, I perform a post-mold bake, similar to what is done with thermoset plastics, and bake the molds outside in my "shop-use-only" toaster oven (see **Fig. 15**). NEVER again use the oven for food and certainly do not do this indoors.

The cured blanks are placed in the oven, and the oven is set on the lowest temperature possible, since I am not trying to cook the blanks, but only warm them well. How long? It really doesn't matter. I put them in at the lowest temperature for thirty or forty minutes, or until they are warm. When done, the oven is turned off and I let things cool. Necessary? Probably not, but it does make the tackiness go away.

WORKING WITH POLYESTER RESIN

Once cured, PR works like any other plastic that you've worked with. Process it just as you would a wood or acrylic blank. It cuts nicely on the bandsaw and the drill equally as well. It will turn, sand, and finish like other plastics (see **Fig. 16**). As shown in the main photo on page 22, you can create something a bit different from the ordinary by your choice of subsurface materials or fillers.

Fig. 16

After curing, the polyester blank processes the same as any other plastic.

WHAT CAN YOU DO WITH POLYESTER RESIN?

A better question is "what can't you do with PR?" Think of anything you'd like to encase in plastic, including photos, newspaper clippings, currency, feathers, woods, or any filler imaginable. Over the years, I've used coffee grounds, eggshells, toothpicks, breakfast cereals, decals, foreign currency, photos, lapel pins, and more (see **Fig. 17**). Once you head down this path, you'll find more and more things to do with PR that will enable you to create a truly unique pen blank.

Fig. 17

Cereal, metal foil, cheerleader pom-poms, coffee grounds, dyed rice, party toothpicks, and snakeskin under PR are only thought starters.

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Kurt Hertzog is a professional woodturner, demonstrator, and teacher. He enjoys the continuum of woodturning—from making his own turning tools to photographing his finished turnings.

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