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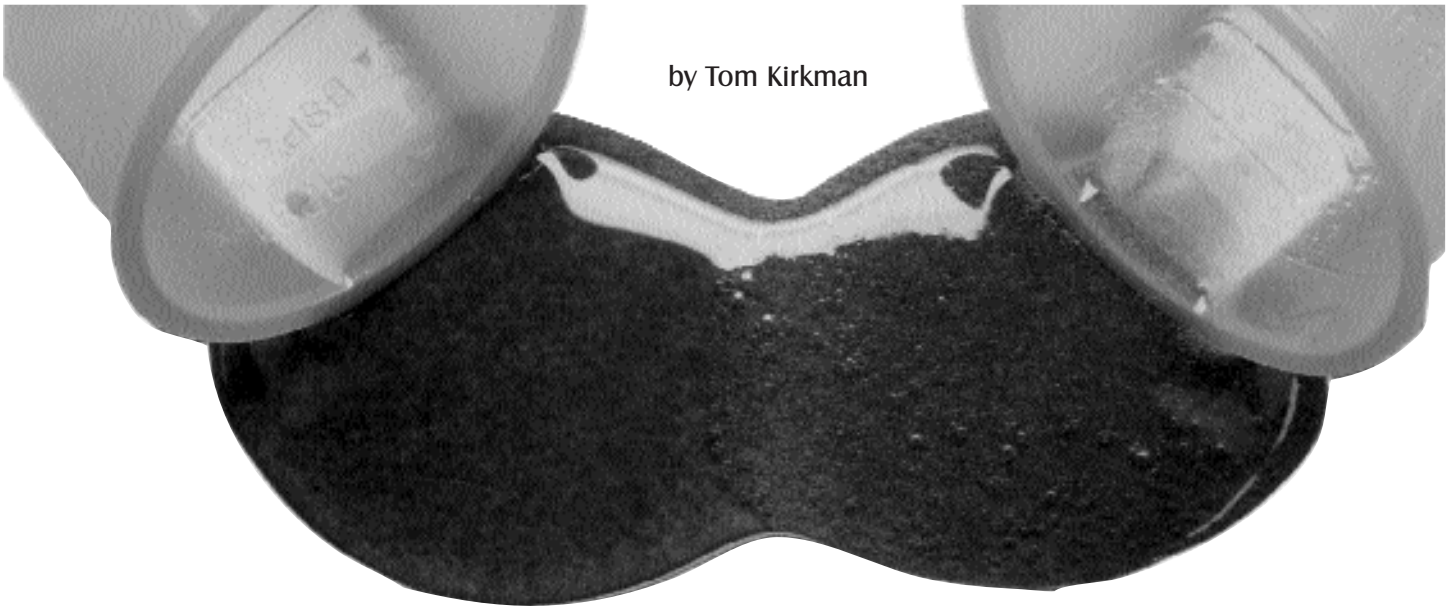

by Tom Kirkman

Motorized Epoxy Mixing

Automate your epoxy mixing/blending procedure and say goodbye to bubbles, forever!

Epoxy rod finishes can be regarded as the standard finish type for most custom rod builders of the past 25 years. Yet for all the advantages of modern two-part epoxy finishes, even the most ardent supporters and users of these finishes admit that they often have trouble with bubbles. Most have, by necessity, devised various methods for dealing with and ridding their finish of bubbles. Some builders heat their finish, some add solvents, some exhale through a straw on the finish surface. There are a myriad of ways of getting these troublesome and cosmetically damaging bubbles out of a two-part epoxy finish, but the very best way to deal with them and the one way that is hardly discussed, is simply to keep them out of the finish to begin with. Bubbles that you never introduce into the finish mix are bubbles that never have to be dealt with after the fact.

The very act of mixing a two-part finish introduces bubbles into the finish mix. It really doesn't matter if you use a wooden popsicle stick or a metal spatula, stirring introduces air, and thus bubbles, into the mix. Yes, you can mix more slowly and hopefully reduce the amount of air and bubbles that are created during the mixing phase. But wouldn't it be easier if you could mix your finish and not introduce any air into it to start with? Again, bubbles that don't get introduced into the epoxy during the mixing phase are bubbles that don't have to be dealt with later.

The Proper Tool

There are industries and trades which require that large amounts of two-part finishes and adhesives be mixed constantly. Most of these involve situations where it's just not very practical to have somebody standing around mixing two-part finishes by hand. Thus, special mixing machines have been fabricated which do the mixing automatically. In most cases, they are electrically powered, although some are simple manual devices that operate by being wound like a clock. A timer is employed to stop the mixing when the parts are completely and thoroughly mixed. Automating the mixing portion of the process ensures that the parts are being mixed properly and completely for the correct amount of time. And one of the other benefits of these mechanical mixers is that air is never introduced and thus bubbles simply don't manifest in the mix.

Most of these industrial mixers are relatively simple devices that rotate a container which holds the two component parts of the adhesive or finish. Some sort of mechanical mixing aid is then added to the mix to facilitate mixing the parts as the container rotates. In some cases this constitutes a stationairy container holding a steel wiper or blade across it's bottom. Underneath, a powerful magnet is rotated which turns the blade around and around through the mix. Another type involves a wide stainless flat that is lowered into a rotating container, or something as simple as a large and heavy steel ball which is simply dropped into the mix while the container spins. After the required mixing time has passed, an alert or alarm is sounded, the rotation stops and the technician knows his or her adhesive or finish is ready for use.

Most of these industrial type mixers are fairly large devices that would be far more cumbersome and expensive than most rod builders would ever be interested in. Nor would they be likely to give very good results considering the volume of epoxy most builders need to mix and use at one time. But the concept is well worth considering if you'd like to automate your epoxy finish mixing process and rid your finish of unsightly bubbles at the same time. Some years ago, there was at least one commercially available mixer (1) that was small enough to be useful for mixing rod building epoxies. I bought mine way back in the early 1980's and have used it quite a bit in the past 20 years. To my knowledge it is no longer being made. But such a mixer is so easy to make and so easy to use, that any rod builder who is suffering from bubble problems should seriously consider making and employing such a device before he or she builds that next rod.

Parts

A finish mixer is simple to make and use. One of the easiest methods of making your own mechanical mixer is to adapt some sort of rod finish dryer/rotator for the task at hand (2). It's also possible to acquire a suitable motor and start from scratch, if you wish.


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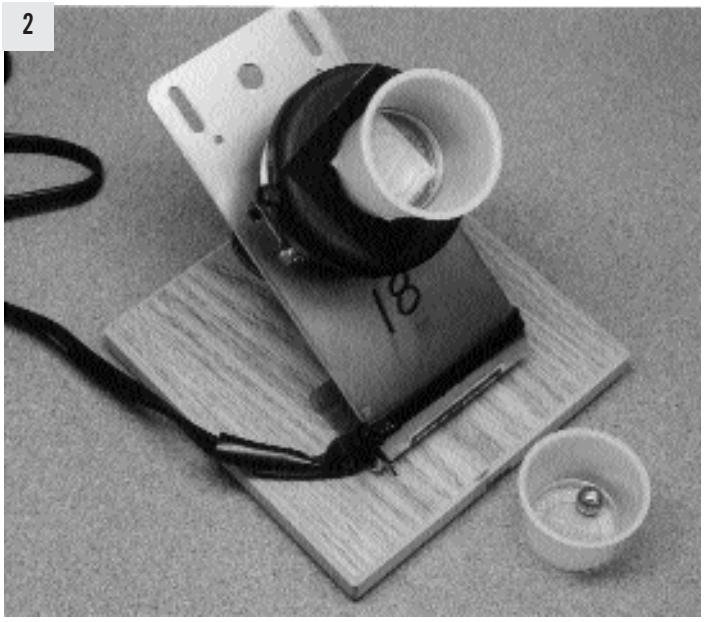
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3

The concept is simple - you want a container large enough to hold your finish components and a heavy steel ball bearing or two. The container needs to rotate and needs to be set so it is at enough of an angle that the ball bearing/s naturally and constantly seek a low point while the container is rotating. An angle of between 35 to 45 degrees is normally required. (Any less and the bearing will simply turn with the container, any greater and most of the finish components will bypass the bearing on the side of the container.) The action of the rotating container while the ball bearing/s attempt to stay at the lowest point of the angled container results in the swirling and mixing of the finish parts. Best of all, no air is introduced into the mix.

Rotation speed is critical. Too slow and you lose valuable working or pot life while the parts are being completely mixed. Too fast and the ball bearing/s are overcome and begin to rotate with the epoxy parts rather than effectively staying at the bottom or low point in the container and serving as an agitator to mix the two parts. Thinner finishes can be rotated faster, while thicker finishes must be rotated slower. For most practical purposes, a speed of 18 RPM has proven to work the best regardless of the viscosity of the particular epoxy being used. A slower speed will work, but takes longer. With some quicker setting epoxy finishes, this can be a detriment in lost pot life. A faster speed is usually not practical, particularly with the thicker epoxy finish brands. Again, the ideal speed is 18 RPM and if you're serious about pursuing such a mechanical mixer and getting the best results, this is the motor speed you'll want.

If you're adapting a commercial rod, lure or fly dryer, then you have only a few simple modifications to make before you can begin mixing bubble free finish. In the photo (2) you see a Flex Coat HT18 rod dryer that has been modified for use as a finish mixer. The metal support for the motor has been bent so that the attached mixing cup is now at about a 40 degree angle. A plastic mixing cup (medical pill dispenser cup) has been adhered to the drying motor drum with self adhesive velcro. One side to the drum, one side to the container. This completes the fabrication of a simple, mechanical finish mixer. With the addition of one more plastic cup and a clean, 3/8 to 1/2 inch steel ball bearing, the unit is ready for use.

If you aren't adapting a commercially made rod, lure or fly dryer and wish to utilize your own motor, you are only faced with the additional task of fabricating some type of support for the motor. One good source for motors is www.meci.com, or you can just ask your rod building supply dealer for a stand-alone drying motor. Most carry something that will work. A thick wooden block, cut at the appropriate angle, could serve as base and motor support all in one. Or you may wish to work with other materials and emulate something more along the lines of the commercial unit pictured earlier (1).

It is important to utilize the proper sized cup and ball bearing if you expect complete mixing of your parts. You want the mix and bearing concentrated into a fairly small area. A container which is too large or a bearing that is too small or light, will only offer you a partially mixed batch of finish. Utilize a container or cup that is certainly not more than 1.25 inches in diameter at the bottom. Your ball bearing should be no smaller than 3/8 inch diameter and a 1/2 inch ball works even better. This particular set-up will handle the amount of epoxy that most builders would normally be mixing for the average rod. This would be a total mix of from 6cc's to about 12cc's. **It's never recommended that you use less than 3cc's of each component part.*

Using The Mixer

Mixing finish in your mechanical mixer is straightforward and easy. For the best results, you should work in an area that would be regarded as room temperature (70F to 80F). Your finish should also be at room temperature, and if it has been stored in a colder area it should be brought into an area that is the proper temperature and allowed to stand until it has warmed. **Finish that is very cold can be very thick and will overcome the weight of the ball bearing and spin it along with the epoxy parts. An incomplete mix will be the result.*

Carefully measure and dispense both the resin and the hardener into the mixing container that is not affixed to the mixing machine. Drop the ball bearing into the mix. Now set the container or cup into the identical container or cup that is affixed to the motor (3). Check your watch, clock or simple cooking timer and start your mixer.

Normally, a mix time of 4 minutes will be sufficient to properly and completely mix the two epoxy parts. Depending upon your brand of epoxy, working temperature or the volume of your mix, you may have to adjust this time slightly. A clear mix that is devoid of swirls or cloudiness is one that is completely mixed. If you go for 4 minutes and can still observe either of these conditions, leave the mixer operating until the mix appears completely clear. It would be rare indeed that you would ever have to mix for more than 5 minutes and in almost all cases the aforementioned 4 minutes will be all that is required. Do make 4 minutes your minimum rotation time, even if the mix seems to clear before then.

Earlier I mentioned the use of more than one ball bearing. In a few cases when I was mixing large volumes of finish, I was able to speed up the mix time by dropping two ball bearings into the mixing cup. This can also be helpful if your epoxy is so thick that one bearing is overcome and set to spinning. Generally, however, if your epoxy is at room temperature and you're mixing less than 12cc's of finish at one time, a single 3/8 to 1/2 inch ball bearing will be sufficient to get the job done. But let experience be your guide. If you're not getting a complete mix in 3 to 5 mintues, then you must adjust the size of your cup and/or the number of bearings.

It's easy to see if you have enough bearing weight. Looking at the top of the mix cup as if it were the face of a clock, the bearing should ride between the 9:00 and 6:00 positions. If it begins to move upwards of the 9:00 position (4), and closer to 10:00, then you need to increase the size of the bearing, or the number of bearings, or consider if your epoxy viscosity is too thick due to being too cool.

When the mixing is complete, stop the mixer, lift out the top mixing cup and remove the ball bearing with a spoon or forceps. Drop the ball bearing/s onto a paper towel saturated with alcohol. Wipe clean and keep the balls handy for the next use. If you are in the practice of pouring your epoxy out onto a flat sheet of foil, or otherwise, do so at this point. Then proceed as usual.

Testing

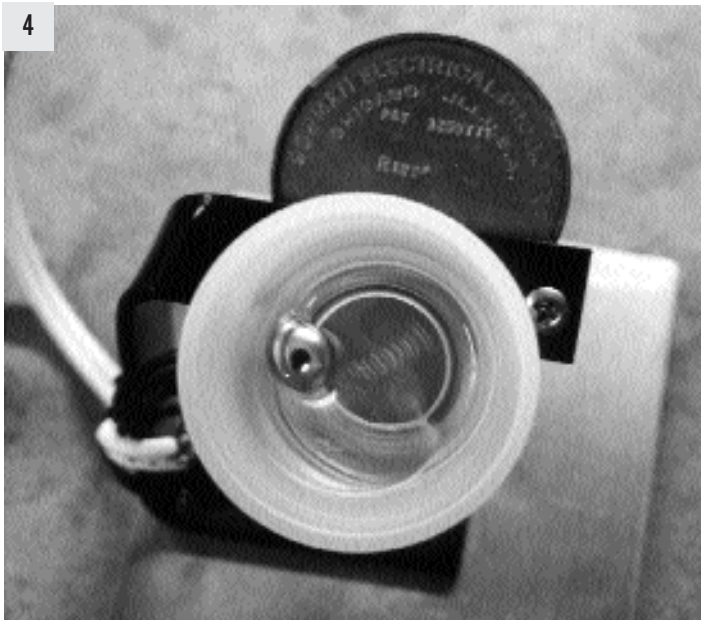
Before you use your mixer to blend finish for a rod, you should test a sample batch of finish in order to assure that your set-up will perform as expected. Working in a room temperature environment, dispense a minimum of 3ccs each of hardener and resin into your mixing container. Drop in the ball bearing and drop the container into your mixing unit. Let the mixer run for a minimum of 4 minutes. Remove the container, remove the ball bearing, and pour about half of the sample batch onto a hard smooth surface such as an old countertop or a piece of glass. Let that, along with the remaining mix in your container, stand for 3 days. After that time, test the sample you poured out for hardness. You should not be able to easily dent it with moderate pressure from a thumbnail. The surface of the sample should not be tacky in any way. Now crinkle the mixing container and pop out the sample batch left in the container. Feel the inside of the container for any areas that feel sticky. A properly and completely mixed batch will not leave any sticky areas behind.

The sample you poured out should exactly mimic what you can expect had you applied it to your thread wraps. If it is in any way suspect, or the inside of the mixing container is extremely sticky or gummy, you'll need to make some adjustments to your mixing apparatus, as mentioned earlier, before putting your mixer into actual use.

Advantages

Perhaps the most amazing thing about epoxy rod wrapping finish that has been prepared in a mechanical mixer, is its clarity! You simply won't find any bubbles whatsoever. Compared to a mix that has been prepared by stirring (right 5 & 6), even carefully and slowly, the mix prepared in the mechanical mixer will be noticeably clearer (left 5 & 6).

Mechanical mixers have been employed in industry for many years. I have no idea who was the first rod builder to make or adapt one for use with epoxy rod finishes, but I'm sure they found, just as you will and as I did so many years ago, that a finish that starts out bubble free is more likely to end up bubble free. ✍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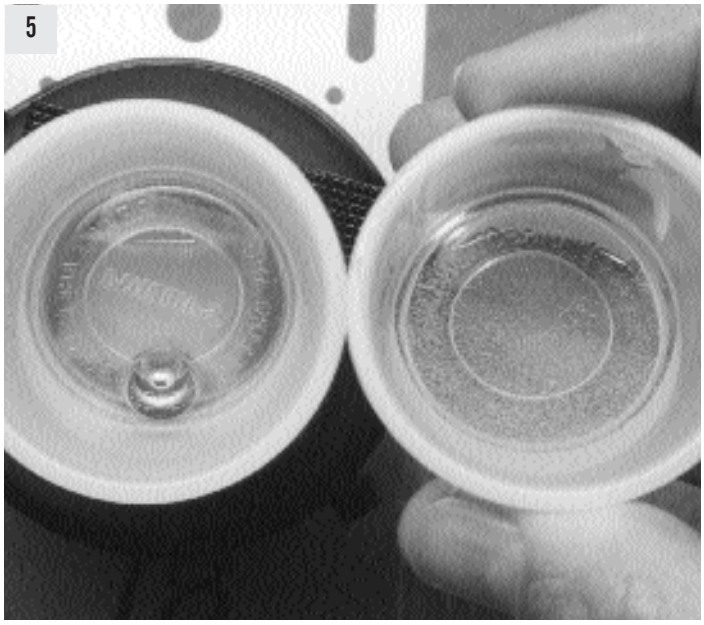
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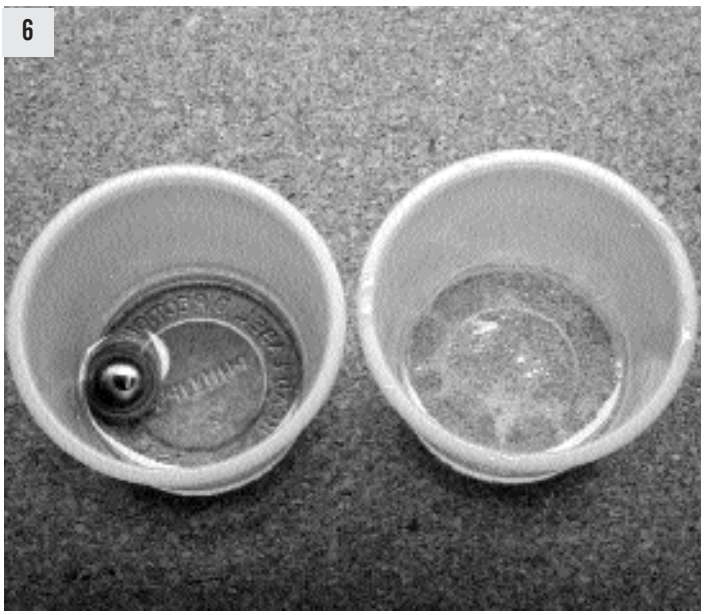
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