What you need to know about casting resins

Kurt Hertzog explains the basic techniques of casting resins

PHOTOGRAPHS BY KURT HERTZOG

KURT HERTZOG

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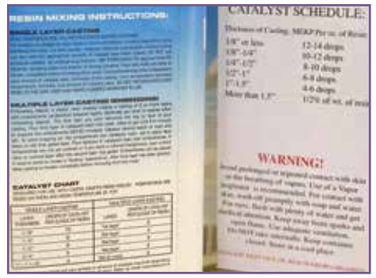
There are many castable resins in several family types. When I got started with casting many years ago, I researched the readily available, picked a castable resin from the polyester family and have stayed with it ever since. You may be using or have an interest in one of the various families. These include: epoxy, polyurethane, polystyrene, polyester, acrylic and more. I haven't had a need to experiment with them since my original choice has performed everything that I have need of from it. My purpose this month isn't to pick a resin for you or convince you to use mine. My intention is to offer the basics of casting and some of the techniques I have found useful. I think you will as well. Whether you are an experienced caster already or have hopes of beginning that journey, I think you'll find some of the ideas presented here helpful.

Resin basics

With the myriad of castable resins available even within any of the families, you have a wide field to choose from. Castable resins are most commonly thermosetting resins that change from a liquid to a solid with the addition of a catalyst. You can cast them into a mould, with or without colouration, fillers, or other inserted material, to create a solid in the shape and colour you wish. This can be the finished product or a raw material for you to continue working with. As you make your selection of family and choice within that family, the things I'd suggest you learn from the spec sheets are: clarity, colour tint, shrinkage, curing time, special handling or processing requirements, safety issues, price and availability, PPE required, long term degradation, hardness and others. This may sound daunting but it really isn't. Nearly every resin supplier will have a chart allowing you to compare these characteristics between the different resins they source. My suggestion is you select a resin that is as clear as you can get once it cures avoiding those that yellow or go somewhat opaque. That allows you the luxury of having it clear or any colour you may wish to tint it. The curing time is up to you but I favour a longer curing time since that gives me more working time. This is helpful if I am embedding things or need to process the casting with vacuum. The extra time lets me work carefully and have the time to get everything done that I need to with the material. It also leaves some time to remove air bubbles if needed. More on entrained air bubbles later. I recommend that you avoid resins that have special processing needs, require exotic PPE or will degrade over time. That degradation can be physical properties or colouration. Most will be looking for something that you can cast safely that finishes clear and stays there for the foreseeable future. Every vendor you deal with, including the castable resins found in the craft shops, will have a MSDS available that will at least deal with the safety issues. Good vendors will have a sheet that will speak to all of the other properties. If they don't have both readily available, I suggest you move on and find another source for resin materials.

Castable resins will not only let you create plastics of your chosen colour but will also let you embed nearly anything



Depending on your choice of resin, you should get clear use instructions and have an MDDS sheet available from your supplirt

KEY POINTS ON CASTABLE RESIN SELECTION

1. Different families offer different end results
2. Prioritise your key needs and typical application when selecting
3. There are many variations within each family
4. Research will help narrow your final selection and testing
5. Patronise reputable suppliers

Safety

Castable resins are delivered as two separate chemicals. There will be the resin along with the appropriate catalyst for that resin. Both chemicals are items to be handled properly. As always, when handling chemicals you should wear protective gloves and eye protection, and ensure you have plenty of ventilation. There may be specific additional needs spelled out by your resin manufacturer or supplier. If your choice of resins requires you to wear special active filter masks, do so or select a resin that doesn't require it. Your Safe Use and Handling Instructions for that chemical should detail all of these exactly. Do not ignore this information. It is important! Ignoring chemical safe handling procedures can cause serious health problems that may appear immediately or years down the road. Don't be afraid of casting resins but do follow the instructions for your own safety. Most resins exotherm when they are curing. Exotherm is a fancy word that means the curing process generates heat after you add a catalyst to the resin. Some materials generate a little and some generate a lot. Be aware of this and plan for it. The biggest caution I can share with you is to follow the mixing ratios as spelled out by the manufacturers EXACTLY. When they indicate 'X' amount of drops of catalyst for 'Y' ounces of resin at a specific thickness of cast, they mean it. Putting in more catalyst doesn't speed the process! It only creates a situation where you've violated the proper and safe mixing ratios for no real gain. The process is a catalytic reaction. The catalyst begins the process and only needs to be present in the proper quantity to begin the catalytic reaction. Follow the instructions exactly. Trust me. The manufacturer's chemists probably know far more about this than you do.

Good practice is to always wear eye protection and appropriate gloves when dealing with any chemicals

I find that aluminium foil works very well as a work surface cover. When all is done, the entire accumulation of rubbish can be rolled up for disposal

KEY POINTS ON SAFETY

1. Always wear gloves and eye protection when handling any chemicals
2. Plenty of ventilation is always wise for any chemical handling and processing
3. Be certain you read and understand the MSDS and Safe Use and Handling Instructions
4. Dispose of processed and unprocessed chemicals in a safe and responsible manner
5. Be aware of and plan for the heat generated by the process
6. Avoid suppliers or materials that can't provide Safe Use and Handling Information or MSDS documentation

CASTING RESIN SOURCES

Because the polyester resins and catalysts that I use require special Hazmat shipping and the weight/distances would be cost prohibitive, I've identified my source in the US. I have gotten good recommendations from my friend and fellow caster, Walter Hall, for trusted sources in the UK. There are also many others that you can purchase from, the sources listed here are just our current vendors. Neither of us has any affiliation or financial interest in any of these companies. They are provided only for your consideration.

In the UK:

East Coast Fibreglass Supplies – www.ecfibreglasssupplies.co.uk

Easy Composites – www.easycomposites.co.uk

In the US:

Douglas and Sturgess – www.artstuf.com

Casting basics

The process in a nutshell is to measure sufficient resin for the casting pour that you wish to make. The measurement is a weight in ounces. The manufacturer will have a chart of the amount of catalyst needed for that amount of resin based on the thickness of the casting pour. For the resin I use, thinner castings require more catalyst per ounce of resin than thicker castings do. I suspect this is because thinner castings don't keep the heat in like thicker castings do. Because plastics are a thermal insulator, thicker castings create heat but are slower to conduct it to the surface where it is given off. This heat retention helps drive the process of curing. Thinner castings lose the heat generated more quickly so the additional catalyst is required. This is not license to mess with the resin to catalyst ratios. The casting thickness will indicate the number of drops of catalyst per ounce of resin. Follow it for safe and good results. Good practice is to limit your thickness of casting to the maximum limit indicated by the manufacturer. If you need thicker castings than the manufacturer recommends, perform multiple casts within the maximum cast limits to achieve your desired thickness. Simply process each cast pour to cure completion and then perform another right over the top. You can repeat the process as many times as needed. The melding of the materials at the casting interface has never been a visible or physical problem for me.

While pens are shown here, don't lose sight of the fact that there isn't a size limit for your castings. Clear, coloured or filled with your choice, make whatever you wish to turn

For embedded or overcast, you can use nearly anything provided you protect it if needed. This blank shows the plastic over the snakeskin

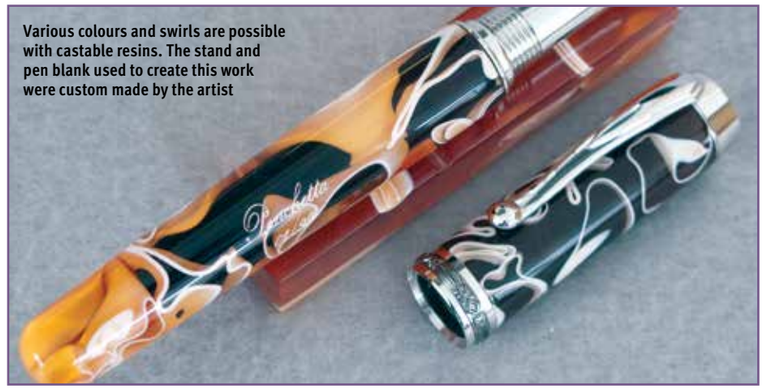
KEY POINTS ON CASTING BASICS

1. Plan your casting pour to know measurement needs and catalyst ratio
2. Thinner castings require more catalyst per ounce of resin than thicker castings
3. Be aware of and plan for the heat generation that the catalytic reaction will create
4. Have everything prepared prior to casting to avoid hurrying or problems
5. Work in an area with ease of clean up and minimal concerns of spill damage
6. Cover anything you wish to protect with disposable covers

Colouring

You can colour your resin with a variety of colours. Your resin vendor will usually offer an assortment of different dyeing agents that will work with your resin. These come in very small bottles and are dispensed by the drop. Since your colouration needs may be a tint or a completely solid, 100% opaque material, the number of drops per ounce varies considerably. Rather than ruin your project because the colouration isn't what you desire, mix and tint a small batch in a disposable cup keeping track of the ratio of drops of dye per ounce of resin. Once you've achieved the desired colouration, you can conduct your project mix and pour with the assurance your final casting will have the colouration you desire. If you decide to create coloured swirls with the various pearlescent materials available, you'll need to test how long to let your curing resin thicken before you add your pearlescent drops and then swirl. It is a superb eye-catching result when done well. The key is to practice in a test mode with small throw-away castings to capture the proper time delay to perform on your swirls.

"The key is to practice in a test mode with small throw-away castings..."



Various colours and swirls are possible with castable resins. The stand and pen blank used to create this work were custom made by the artist

Most manufacturers will offer an assortment of dyes that will work with their product. If you stray to another, test a small sample colouring and cast before committing

KEY POINTS ON COLOURING

1. Small amounts of dye can have a big impact on the final result. Test on samples
2. Use the recommended dyes for the resin you are using
3. Measure in drops per ounce of resin and keep a log if you wish to repeat
4. When adding the dye colourants, avoid entraining air bubbles
5. If using other colouring agents, test on small samples and keep a log
6. Even though dyes are in a squeeze drop dispenser, wear protective gloves

Casting with fillers

It is rare that I cast a resin to be simply a coloured plastic, it is far easier to buy a block of densely coloured plastic in the size I need. I usually use my resin casting as a binder to hold filler materials in place and provide strength. The best analogy I can offer is that I am stabilising my filler. The cast plastic wicks into all of the nooks and crannies to make it solid and turnable. Over the years I've cast nearly everything I could think of in my resin pours. I started with rice and then progressed to dyeing the rice. Other materials include coffee grounds, coffee beans, crushed egg shells, leaves, seeds, wheat, tooth picks, pom pom swirls, bangles, jewellery and a host of other things. If you can get your filler into a mould, you can cast around it. Having fillers presents the problem of getting all of the air out of the areas where the resin won't seep in. Another method that works well for me is to mix the fillers right in with the resin in my mixing cup. Much like stirring your cereal to coat it all with milk, this wetting of the filler surfaces helps when I pour it all into my mould. Additional resin can be added to fill in any gaps, with or without using a vacuum to remove any entrapped air. One of the popular uses of casting is to encase pictures, coins, emblems or other memorabilia for display. The clear plastic after curing will provide shape and protection for the item. If the casting is to have additional processing such as turning to shape and size, be aware that sanding and buffing like other plastics will be required to get to optically clear again.

KEY POINTS ON CASTING WITH FILLERS

1. Test chemical compatibility before committing heirlooms
2. Have moulds ready to accept casting materials to allow maximum settling time
3. Pre-measure filler needs in actual mould prior to determine quantities needed
4. With submerged items, overcoat with protective material if needed
5. If your filler floats in the resin, allow sufficient depth in your mould

What you use to fill your resin with is your choice. If the resin will bond to it and it cuts decently, pick anything. This filler is winter wheat seed

You can certainly wind up with something unique that can't be found in your local woodturning supplier

Mixing your filler to completely wet the surface will help create a good blank. Longer open time materials help let any trapped air escape to the surface

Moulds

You can buy quite a variety of moulds for casting. Craft shops and online speciality shops will have specifically designed moulds. These are usually polyethylene so no release agents are required and for ease of casting extraction, they will have a slight draught angle on the sides. You can also press many other items into service for moulds. Many of the kitchen products from ice cube trays to frozen dessert treat makers will work nicely as moulds. They are usually plastic and are also equipped with a draught angle for release of their intended products. Depending on your desired end result, many have used plastic piping and other items from the home repair arena as moulds. I've tried many of these items and they all work well. There are also speciality moulds made by individuals to suit a specific need that are available directly from the individual via the message boards or eBay. The ones that come to mind are the moulds for pen makers who wish to cast directly around the brass tubes as opposed to creating a blank and then processing. These moulds will seal the ends of the tubes and are capable of casting multiple pen tubes at a time. When making snakeskin, picture or other types of castings with your 'filler' wrapped around the tube, these molds work superbly to position the tube, seal the ends and allow for easy release on cure. For the most part, I've used self-made moulds from aluminium foil. I create the mould I need in the size I'd like by using heavy duty aluminium foil wrapped around a pattern of the size I'd like. By folding without any open seams and leaving the top open to remove the pattern, I can easily form any sized or shape mould I need. Low cost, easily made and disposable. I don't even remove the foil when done. I just drill, cut and turn right through it. Depending on the size and the shape, support is often needed along the sides of long sides. This is easily done by stacking the moulds together in a shoe box or the like. Another trick that helps provide quick moulds at nearly no cost is to line any dish, bowl, storage container or other item that will provide form with aluminium foil. Cast right into the foil and lift it right after cure. The original container will be unharmed and ready for its intended service or repeat use as a casting form. Items can range from kitchen dishes to food packaging containers to shoe boxes. The amount of things that will work in this manner is almost limitless.

Moulds can range from the hobby store polyethylene moulds to kitchen products to homemade with wood, plastic or even aluminium foil

Of all of the moulds I've used, I find my own homemade moulds with aluminium foil are the most flexible, lowest cost and easiest to use

Regardless of the size or purpose, foil moulds using a pattern can be made. Folding heavy duty foil to avoid any seams will create a serviceable mould

KEY POINTS ON MOULDS

1. Don't limit yourself to the shop-bought mould selection
2. Moulds will work better if there is some side wall draught allowing for easy extraction
3. Self-made moulds need to be without seams to prevent leakage
4. The weight of the resin will flex foil moulds unless supported on long dimensions
5. For repeat work, create a pattern or container and use foil for economy and ease of use

If there are long side walls needing support, stacking moulds side by side in a shoe box or placing blocks to prevent flexing will work

Having your work area layed out including table coverings, moulds, resin and catalyst, PPE and scale will help prevent scurrying and unnecessary spilling

Bubbles

The nemesis casters face is bubbles in their castings. Because they stir in the catalyst, it is nearly impossible to not entrain some air bubbles into the resin. With the high viscosity, these bubbles are difficult to coax to the surface before the resin sets up. Over the years, there have been two methods of dealing with the problem. The method that I've used as needed is to put my casting mould into a vacuum chamber and pull some vacuum. My lathes are all equipped with a vacuum pump so it is quite easy to put the casting into a chamber and pull some vacuum before the resin becomes so thick the bubbles can't move. Before I owned the chambers for stabilisation, I made a vacuum chamber from thick wall PVC plumbing tubing. It has served me well for many years. I continue to use it as needed for the highly filled castings that present many nooks and crannies that will hold bubbles. Another tack that some casters take is to use a pressure pot to reduce the size of the bubbles by pressurising the casting as quickly as they can before it sets up. I am not a fan of filling an inexpensive metal container with shop air pressures to squish the bubbles smaller. My suggestion is rather than figure out creative ways to remove bubbles, don't put them in to begin with. What works quite nicely for me is to mix my chemicals in a polyethylene bag. The higher quality food freezer bags are polyethylene and are ideal for mixing the chemicals. I simply tare my freezer bag and a support cup on my inexpensive digital scale, then add the desired amount of resin. To this I add the appropriate amount of catalyst based on the weight of the resin. I remove the bag from the support cup and knead the bag gently to mix the catalyst and resin. No stirring therefore no entrained bubbles. To dispense the resin, I simply snip the corner of the bag with a pair of scissors and pipette the catalysed resin into my mould. When completed, I put the freezer bag on top of my protective counter covering, usually aluminium foil, and allow it to cure. Once cured, it can be safely disposed of.

Rather than using pressure to minimise entrapped air, I'd rather use vacuum to draw the bubbles to the surface. Your chamber and vacuum source will work

Better than removing entrained air bubbles, don't introduce them. A polyethylene bag will let you mix the two by kneading and then pipette it out

KEY POINTS ON BUBBLES

1. Introducing bubbles through stirring presents time-consuming problems
2. If stirring is necessary, fold the materials slowly
3. Avoid introducing bubbles by using a polyethylene bag method to mix chemicals
4. If using a highly filled resin, be prepared to remove entrapped air if needed
5. Plan additional thickness of pour to allow for sufficient bubble free material areas

Conclusions

Why would you use polyester resin or another castable resin of your choice? Why not? It will give you opportunities to create shapes that you might not be able to create otherwise. It will let you work with plastics in the colours and sizes you wish rather than what is on your merchant's shelves. You can embed heirlooms, whether service patches or historical photos, for posterity. Whether you cast for pen blanks, bottle stopper blanks, paperweights, encapsulating items in bowls, bottoms of hollow forms, or some other idea that you might have, casting is easy and fun. It is a way to enhance your turnings and create something a bit different than your fellow turners. What resin should you use? You pick what best suits your needs. Most of them will give you something that turns like plastic since most of them are and are capable of being cast or finished to optically clear. If you haven't tried it, I highly recommend that you do. I think it will open new horizons for you. ●

Whether casting blanks for pens or bottle stoppers, or just burying some snakeskin, casting resin can be a fun and enlightening experience