



PHOTOGRAPHS TAKEN BY KURT HERTZOG

# What you need to know about inlays

In the next part of his new series, **Kurt Hertzog** looks at the various things to consider when you decide to integrate an inlay into your turning

If you are looking for ways to punch up your turnings, then using an inlay is certainly just one of the options you should explore. It can be as simple as using a Forstner bit of the appropriate size to create a recess to inlay a coin or as complex as a scene done in different species of woods – the complexity is up to you. Most turners think that doing inlay is difficult, yet it couldn't be further from the truth. There are a few rules that need to be followed, but these are things that you probably know already. As you work with wood, regardless of what species, what

finish, or what shape, the wood will always continue to take up and give off moisture as the humidity of that woodturning's environment changes. Also, each species of wood has three different coefficients of expansion, that are usually different – most of the time, markedly so. We'll discuss this and their impact on your inlay.

Depending on your definition, anything that ends up in, under, or on top of a turning provided the surface is level could be called an inlay. Let's take a look at the various things to consider when you decide to integrate an inlay into your turning.

## KURT HERTZOG



**About the author:** Kurt is a professional woodturner, demonstrator and teacher and writes for various woodturning and woodworking publications in the United States as well as writing for *Woodturning* magazine. He is on the Pen

Makers' Guild Council and is a member of the Board of Directors of the American Association of Woodturners (AAW).

**Email:** [kurt@kurthertzog.com](mailto:kurt@kurthertzog.com)

**Web:** [www.kurthertzog.com](http://www.kurthertzog.com)

## SAFETY FIRST

Just like turning, creating your inlay can range from your cutting of the inlay materials to preparing the areas for the inlay to reside. That said, eyewear and dust protection are always in order. We'll be exploring casting in a future column, but for now, proper ventilation and protective gloves for the chemicals and adhesives are certainly wise. Depending on your selection of tools for creating inlay areas, power cutting or carving protective gear, such as leather aprons or Kevlar gloves are in order.



Safety items should certainly include eyes and nose protection, but don't forget the chemical resistant gloves. Here, a Kevlar carving glove offers protection when using a power carver

## INLAYING WOOD INTO WOOD

Segmented turners learn to understand wood in a hurry. Because they use different species for their colourations, they are forced to deal with the corresponding expansion rates. If you don't understand the three different expansion directions and rates, visit your club library to review the topic in Bruce Hoadley's book *Understanding Wood*. Failing to understand and heed this will cause you problems pretty quickly. The method to reduce this problem is to avoid the multiple-species problem. Also, inserting the bottom as a floating plug can work. When working with

dissimilar species, allow for the varying rates of expansion and contraction. Don't cross grains between the turning and the inlay. Keep the grain orientation the same to minimise stress in the inlay and adhesive bond. One of the beauties of burl is that it has no grain orientation to speak of. Inlaying burl for a cover will tend to cause less problems.

Another method of inlaying wood into wood is to make it a component. Often a contrasting species is used for the rim or other detail. Because the species are chosen for their colours, you still need to be cautious

of expansion rates and grain orientation.

The base of the lidded box below was turned and an inset was glued in to provide the rim. Turned to become the rim for the top, it can be done for colour selection or threadability. The contrast can be a striking feature and turned as part of the process makes everything flow together nicely.

This is not extremely common, but inlaying end grain cuts is gaining popularity. The ability to dye materials and create striking looks is almost endless. Because the inlay is extremely thin and impregnated with the



A problem area for many segmented turners is the bottom. Because of the geometries, end grain glue joints and expansion rates, failures are common



The same species used as a solid bottom. Because of the glue joint it is more forgiving. Another method is to 'float' the bottom piece like a rail and stile door



Forgive the alignment error of the top to bottom for grain match. The point of the image is that the burl is more forgiving in the differing expansion rates. It is pretty uniform in all directions

Common to boxmakers, a contrasting insert is used in the rim detail. The insert can also be selected based on the ability to thread that species when desired



This burl insert is grain directionless so the orientation becomes irrelevant. Were it a grained dissimilar species, the orientation would be critical



The contrast of the inserted material adds to the look of the piece. The burl will be directionally forgiving and the top grain can match the bottom grain



**◀ INLAYING WOOD INTO WOOD (CONT.)**

epoxy adhesive, it is very tough and durable. The channels for the inlay can be cut on the lathe with a parting tool, or even done with a router and circle cutting attachment. The process for the edge treatment is cutting the end grain slivers with a die cutter. That allows for replication of any patterns that are created as desired later on. However, nothing prevents you from inlaying any other material as a rim treatment. The depth of rim channel might be different but you certainly can inlay colours, stone, metal, or other inlay materials.



Very thin end grain cuts lend themselves to dyeing for color enhancement. Because they are cut with a cutting die, they are repeatable and can be tailored to exotic patterns

**KEY POINTS TO REMEMBER:**

1. Consider the expansion coefficients for compatibility
2. Orientate the grain to prevent excessive mismatch
3. Use wood glue when possible for face grain to face grain bonds
4. Use CA to wick into tight fits when needed, being aware of brittleness
5. Use epoxy when suited to allow for flexibility of adhesive
6. Cut pockets with turning or woodworking tools based on shape/location
7. The insert can be created, traced onto the desired location and then the field can be prepared with woodworking techniques
8. For flat surfaces, a depth controlled Dremel or equivalent with a mini router bit works nicely
9. Leave 'breathing room' where possible to prevent breakage
10. Turn and finish with normal tools and finishes



The end grain patterns are cut with the Noden Razor tool. The beauty is the die creation and cutting, allowing for precise yet exotic patterns. The channel is cut with a parting tool or a router



After curing, these clock faces with the patterns for numerals can be turned between centres or just sanded with an orbital sander

**INLAYING COLOURED ADHESIVES INTO WOOD**

While the title says 'inlaying coloured adhesives', don't make it too restrictive. It really means anything soft and pliable that can be put into a cutout or recess to cure. I like to use epoxies to solve problem areas because they will fill nicely and take colour readily. Take this idea and run with it! Drill holes in bowls. Put numbers in clock faces. Fill cracks in turnings, whether they are original or newly created. Do swirl patterns with the colours. I can't think of a place where this concept doesn't lend itself. Whether right through, or in a shallow pocket, your limitation is your imagination. Some other examples are based on the debris from laser-cutting pen kits, to illustrate the points, but don't limit your thinking to pen parts. Standard five-minute epoxy works nicely as a filler for pockets, cutouts, flaw, bark inclusions, cracks, or other areas that you can fill. There is a host of items you can

use to colour the epoxy to your needs. In areas that are through holes, provide a seal to contain the epoxy. Don't rely on the adhesive strength of painter's tape to hold the weight of the adhesive. It will work nicely to seal the area, provided it has mechanical support for the weight. Dyed wood-dust, or wood-dust from any specific species will work nicely to colour the epoxy. The wood fibres are mixed in, to obtain the intensity of the colour needed. A visit to the craft store will yield a wide variety of agents you can use to create any effect you want. Sparkle powders will add considerably to any turning, or a simple black paint pigment will create a jet black for your application. Mix it with a toothpick, which also serves well as a filling tool. Even though it is advertised as five-minute epoxy, it really takes 24 hours to come to full strength. If you let it fully cure for the 24 hours, it will cut just like plastic. All of your standard turning tools

**KEY POINTS TO REMEMBER:**

1. Test your colourants and adhesives prior to a critical application
2. The cure time varies based on the filler and the ratio
3. Five-minute cure time is a misnomer, 24 hours to strength unadulterated
4. Multiple partial fillings may be better suited to deep cavities
5. Mix as needed minding the open time to avoid waste
6. Don't rely on the adhesive for original bonding strength after colouring without testing; colourants may reduce original properties
7. Use any of your woodworking or woodturning tools and techniques to create pockets for filling: through or partial will work
8. Your lathe makes a wonderful, indexible, locking workholder
9. You can create 'free-form' fields for filling with carving tools, Dremel tools, drills, saws, or other wood removing tools

**INLAYING COLOURED ADHESIVES INTO WOOD (CONT.)**

and techniques will work fine. You can sand and finish in a normal manner as well. Next time you have any crevice, crack, nook, or cranny that needs a little something added to it, you'll have a mechanism to make it as plain or as colourful as you wish.

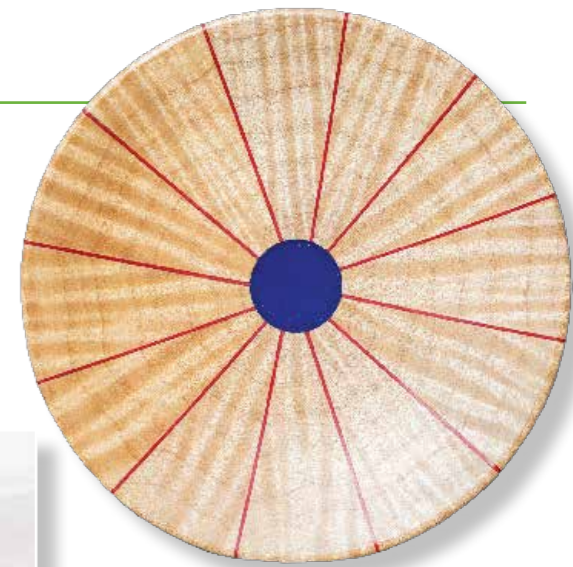


Did you ever wonder what happened to all of the wasted materials from the laser cutout stock? Called 'laser leftovers', they are becoming popular with pen turners

Some epoxy adhesive with acrylic paint colouring makes for a problem-free bottom for a segmented platter. No points to match, no end grain problems in the bottom and no expansion problems



Pens are used as illustration to cover the points of colouring epoxy and filling any cutout or pocket. Here, coloured wood dust is used with epoxy



The intensity of the colour can be controlled by the density of the wood dust in the adhesive. Mix in more dust as needed



Another colourant for epoxy is acrylic artist colours. Mixed as needed for intensity or colour tone, any colour can be created. Mohawk colour powders are also a source of colours



For through holes, a backing is needed to keep the adhesive in place until cured. Painter's tape will work nicely if mechanically supported from behind



For round projects, the adhesive filling needs to be staged allowing for curing. Even after gelling, it will still run given sufficient time. Wait until cured before rotating to another spot



Don't be afraid to experiment although don't do it on a time critical or expensive project. Experiment on practice pieces of the same material. Here glitter is being used as filler for sparkle



After the epoxy cures, it turns just like plastic. Use your standard woodturning tools and practices to cut and shape as desired. Sanding and finishing is also the same as usual



Examples filled with acrylic paints, sparkles, ground turquoise stone, retoucher's colourants, paint pigments, and more. Experiment when you have time to see where you can take it

◀ STONE AND METAL POWDERS

You probably have seen enough bowls with cracks or rim treatments done in turquoise to last a lifetime. I won't belabour it here, but I will cover the methodology so you'll know how to work with stone and metals. Depending on your planned application, you can buy crushed stone, different sized metal powders, or other solid fillers to inlay. If you want a radial type feature, you can cut it with your turning tools. Other shapes can be carved in with hand carving tools, power carving tools, drills, saw blades and more. The goal is the creation of a pocket to deposit your particles of filler, before hardening them in place. The aspect ratio of the cut or created channels do need to be reasonable, or there is a likelihood of material separation over time. When the channel or pocket is prepared, the granules of stone or metal is deposited and hardened in place with very thin CA adhesive.

Use something to catch spilled materials for reuse, as both crushed stone and metal powders are in the range of £4.80 to £10.20 per ounce. Work only in a portion of the curve, filling the channels with particles. Work in partial rotations, hardening the particles with the CA adhesive. The very thin is used to be certain it will wick through the particles uniformly to the bottom of the pocket. Standard viscosity and thin may not work with the finer powders. Purchase the very thin CA for this type of application. Once the application of adhesive has hardened all of the deposited particles, the turning can be accomplished. Standard woodturning tools will work, but will dull very quickly. Carbide cutter tools used in a scraping mode will remove the stone down to the surface where you take over with abrasives. Metal powders can be cut well with standard HS steel tools in a normal cutting orientation.



These examples are just a few of the crushed stone fillers that are available. Depending on the material and application, you may need different size particles



A pocket to receive the dry particles is created in one of a variety of ways. Here the parting tool is used to create parallel channels to be filled with turquoise



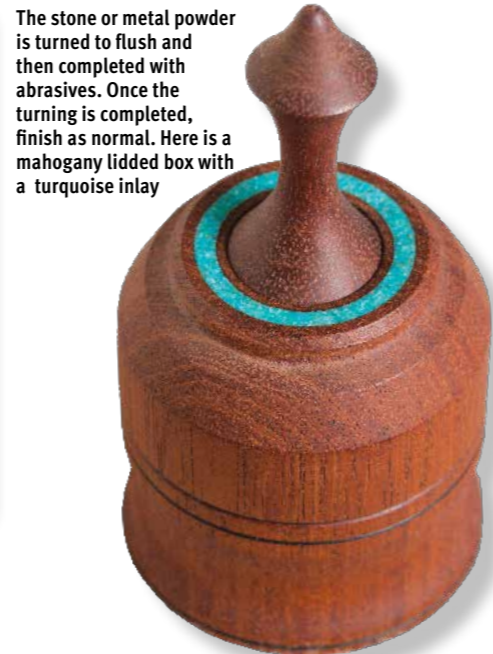
An artist's palette knife works nicely to deposit the granules into the channel on the top of the turning. Use a catch paper on the bed to recover the costly powders spilled



Dispense very thin CA adhesive to solidify the granules in place. Leave a working area without adhesive to continue after rotating for the next area



After completing the deposition and hardening of all of the materials in all of the channels, the stone or metals are cut back to level. A scraping cut with carbide cutters works well



The stone or metal powder is turned to flush and then completed with abrasives. Once the turning is completed, finish as normal. Here is a mahogany lidded box with a turquoise inlay

KEY POINTS TO REMEMBER:

1. Create your pockets or channels using your favourite woodturning or woodworking tools but keep the aspect ratio reasonable
2. Straight side walls will fill easily, yet provide good retention. Avoid 'V' style shapes if possible
3. Use very thin CA adhesive for your bonding agent. Standard thin may not wick to bottom when using finer particle materials
4. Accelerator can be used sparingly
5. Carbide cutters work best for stone used in a scraping attitude. HSS in normal cutting manner for metal powders
6. Be cautious when sanding as there will be a big difference in sanding rates between stone or metal and the surrounding wood
7. Wear appropriate PPE! Cutting stone and metal inlay can create dust and debris hazardous to eyes and lungs



Drill your desired holes with only about 0.06mm clearance. This will allow sufficient adhesive to be wicked into place



Clip the wire close to the surface and then bond in place using thin CA adhesive. The small clearance will wick in the CA and cure quickly



File until flush and then move to abrasives. All of the turning and rough sanding is done prior to precious metal addition so final finish sanding is all that is required

PRECIOUS METALS

Often there is a desire to accent turnings with precious metals. We'll avoid the gold leafing here, but will cover the inlay of silver wire. The technique works for gold wire as well as any standard wire, as long as it is very soft. Usually the wire is inlaid into a drilled hole. I've never seen it inlaid into a channel as is done in engraving adornments in metal. Most likely, because of the parent material sidewall characteristics of wood. For our example, we'll use silver wire. Silver wire is available through the jewellery supply houses. You specify the metal, purity and diameter. They will sell it to you based on the daily spot market price for the metal you are buying. When you receive the wire, gauge the diameter so you can select a drill with only sufficient clearance for the adhesive to wick by. Drill your holes in the wood where you would like them. In turnings with a hollow

beneath, try to not drill all the way though as you'll waste wire if you don't bottom out. You do need to have sufficient depth to accept the wire and bond in place. Insert the wire to bottom out or, if a through hole only project, minimally on the inside. Clip the wire close to the surface with a pair of diagonal cutters. Jeweller's size and grade work far better than those from the garage. While you can apply adhesive one at a time as you cut, I find it easier to apply CA to them all at once. Standard thin CA will work well providing the hole is a reasonable fit. I allow about 0.06mm diameter difference. Once cured, use a file to remove the metal down to flush. DO NOT try to use woodturning tools. You will never be successful getting them all cut flush without pulling some of them out of the hole. File them flush and then move to abrasives for sanding and finishing.

KEY POINTS TO REMEMBER:

1. Don't insert precious metal until all of the turning, shaping and rough sanding has been done
2. Drill holes sized 0.06mm over the actual wire size
3. Go to a reasonable depth to allow for maximum retention of the wire. This is reasonable based on how little is used
4. Insert wire and clip with electronic or jeweller's diagonal cutters. Avoid the large bulky automotive grade cutters
5. Use standard thin CA to bond the wire into the holes
6. Sand sparingly as the two materials will sand at different rates. Even soft, the silver or other metal will sand differently than the wood
7. Experiment with silver, brass, bronze, aluminium and other soft metals

TOOLS

For the most part, everything done with inlay can be done with your woodturning tools or the common workshop tools such as saws, files, rotary tools, etc. You can certainly bring your carving tools, power carving equipment, laser cutters and anything else you have access to or service you can purchase. The two tools that I find very helpful when clearing a field on a flat or slightly rounded surface are the Dremel base with either the Dremel tool or the flex shaft. This allows for view when cutting out a traced pattern as well as for a flat bottom or uniformly deep pocket. An alternative to the Dremel is a die grinder in a luthier's base. Used by instrument makers to cut channels for purfling, it is much easier to control and has better adjustability controls.

“An alternative to the Dremel is a die grinder in a luthier's base”



Handy tools for inlay, especially for flat areas. The depth base for the Dremel style tools makes tracing much easier. A die grinder with a luthier's base is also a welcome tool when inlaying

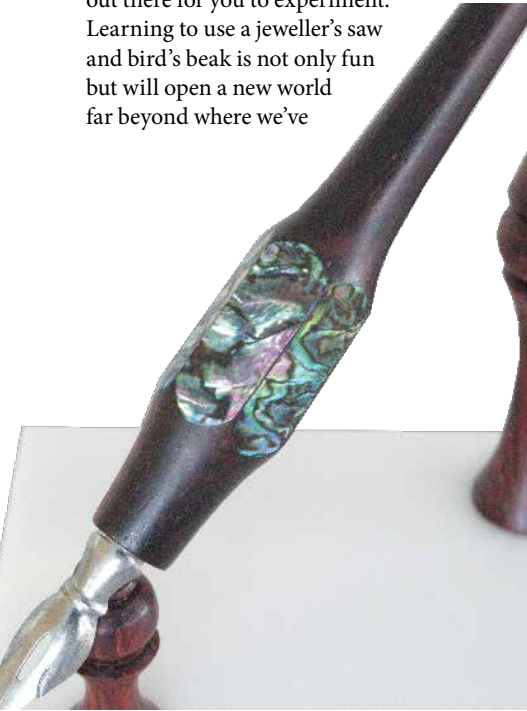
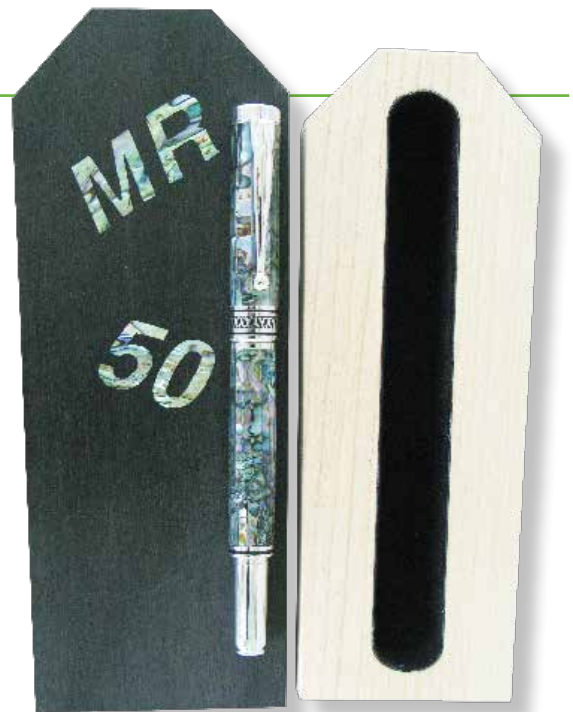
◀ **INLAYING CHALLENGES FOR YOU**

The basics that have been covered here should have you off and running experimenting with inlay. You'll be able to do round, flat, through and dead end spaces. You'll be able to inlay mirrors, cabochons, coins, keys, metal dust, precious metals and crushed stone. Space and interest precludes getting into cutting inlay in shell or other materials, but it is out there for you to experiment. Learning to use a jeweller's saw and bird's beak is not only fun but will open a new world far beyond where we've

gone here. Do not stop here if you have had your interests tweaked. You can adorn your turnings in many other ways once you head down this path.

**A collaborative effort of pen and presentation case for a friend's 50th birthday. An example to plant seeds for ideas**

**A simple desk dip pen that has a bit of uniqueness. Another thought starter to get your own creative juices flowing**



**Cutting mother of pearl, abalone shell and ablam to your desired shape is another facet of inlay. Preparing the field to inlay it is also a challenge, particularly with inside and outside connected script**

**CONCLUSION**

The case could be made that casting polyester resin is inlaying. I don't think I'd dispute that. The topic is so massive that it will need to be dealt with in another column. The opportunities there are boundless for application to woodturning. While it is commonly applied to pen turning and the examples I'll show are pens, don't think for a moment that there aren't far reaching applications for the entire spectrum of woodturning. Not only can you cast just about anything inside the resin but it launches us into putting pictures, cloth, and other items into our turnings. It is a plastic and what can't you encapsulate in plastic? Might it be your breakfast cereal, your daughter's pompoms, dyed rice, or party toothpicks. Perhaps a snake or snakeskin. Start thinking about it. It won't be long in coming. We'll do an entire section on casting in one of the upcoming articles, so get ready.



**With the ability to cast, all fillers are fair game. Breakfast cereals, party toothpicks, remembrances and even snakeskin**



**With the ability to encapsulate photos and other items in plastic, you'll have the ability to turn items that have a personal aspect. Not a photo but a snakeskin under the resin**



**Here's what the snakeskin looks like when done up properly. When you venture into casting, you'll have another opportunity to take your inlaying ability to new levels**