

What you need to know about assembly of multiple pieces

Kurt Hertzog explores a wide range of tips and tricks linked to the assembly of multiple piece turning



PHOTOGRAPH BY KURT HERTZOG

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It is often advantageous for your turnings to be completed as multiple pieces and then assembled. One obvious reason could be that your lathe won't accommodate the entire length, width or weight in one go. Material costs can drive the choice to multi-piece. An intact large piece is usually harder to come by than smaller pieces commanding a price premium. Cutting away quantities of material from the larger blank to achieve the thinner sections is costly and wasteful. Final turned dimensions can impact on shipping costs. Weight is the main driver of cost to ship but packages outside the shipping companies norm need special handling, thus bringing additional charges. Shipping a project in manageable sizes with final assembly to take place at destination has advantages.

Being able to assemble and disassemble as needed can be your motivation. All of these are important but I favour assembly for the freedom it offers. I can mix and match components at will to determine the best fit or look before committing to the final project. That and free access to all areas prior to assembly offer advantages to me. Within this article, I'll explore a few of the concerns, tips and tricks of multi-piece assembled turnings. With no way to be all-inclusive, I offer these as thought starters to make a few key points to consider if you adapt the assembly concept to your needs.

Initial considerations

There are a host of things to consider when planning and executing turnings that are multi-piece assemblies. These can impact not only if a multi-piece assembly can be done safely, but also the methodology you can use in the project. Two extremely important considerations that jump out immediately are permanent versus temporary and structural versus non-structural. If it is going to be put together once and never taken apart, your design considerations are far different than a repeated assembly and disassembly approach. The other key consideration is whether the entire project or the various assembly points will bear load or not. A porch column that is just a façade needing to bear only its own weight certainly is created and assembled

far differently than columns bearing part of the roof load. Similarly, a cosmetic finial has different needs than a lidded box pull. We can't get into the aspects of varying versus static loads, peak loading, impact, environment, etc. Suffice to say that all of these are important with respect to safety and longevity. Indoor service use compared to outdoor service use demands different materials, design techniques and assembly methods too. Be certain that you consider all of these if you use assembly in your projects.

Access and choice

By designing and turning your project in several pieces, you can provide access to areas that would be difficult to reach in the final result. By creating the 'blocking' part as a separate piece to be put in place later, you'll have access to the area as needed. Once the area has been accessed, the assembly can be completed. For lidded boxes, ornaments and the like, pedestals, finials, pulls or other components can be fabricated again and again until you are content with the look. Because you aren't committed until the final glue up, you can mix and match until you are pleased. Turned as one piece, you are committed to the initial result. Don't be concerned about those extra pulls, finials and feet. If you standardise on a dimension, they are in reality pre-made stock for your next similar project.



Having access to get anywhere I want as needed is one of my main reasons for assembly



When all is done and you're content with the finish and overall look, the commitment to gluing makes it final



Pretty wood but I'm not wild about my pull. Not much choice at this point is there?

Internal components

There are occasions where you need to have access to the inside of a turning to insert something. It can be an artistic expression such as a captured glass bead or another piece of art being incorporated. That piece will be created and then installed into the finished turning with the enclosure being sealed up. Whether the assembly at that point needs to be reversible depends on the insert. When I make my desk pens, I need to be able to insert the inkfill. The replacement of the inkfill might be years down the road or never, hence there is no need for a threaded access. My method is to provide a glued assembly but one that is easily reversible. Fabricating the body and nib prior to tuning the fits allows for mix and match of components as mentioned previously. Once content with the components, the final tuning allows for proper fits prior to gluing. Because there are no springs or force on the nib trying to separate it from the body, only the lightest of glue joints is needed. With minimal glue engagement, the glue joint is easily broken when needed with only a quick twist of the pieces. Replacement of the internal component, here an inkfill, is accomplished and the reassembly takes place without re-gluing. The original glue retained in the joint allows for sufficient friction that no re-gluing is required.



The desk pen might last an entire lifetime on the same inkfill whether lightly used or on display



Planning for taking apart for inkfill replacement is wise thinking. My nibs are designed and glued for easy disassembly



Without springs, there is no need for excessive glue bonding the nib in place. Easily twisted free for inkfill replacement

Finish before or after



Finishing individual pieces as they are created has the advantage of not creating radii of finish in the seams

One of the stumbling blocks of assembled turnings is the finishing process. Friction polishes aside, finishing beforehand is far more convenient and usually better. It allows for easy handling, fixturing if needed, and application of the finish. The downside is that fits need to be considered so that the components still assemble as originally tested. Finishing after assembly certainly is doable but the issues often are corners and tight 'V's that will lose their crispness with finish in the tight spaces. Depending on your project, you may choose to finish

Disassemblable versus reversible



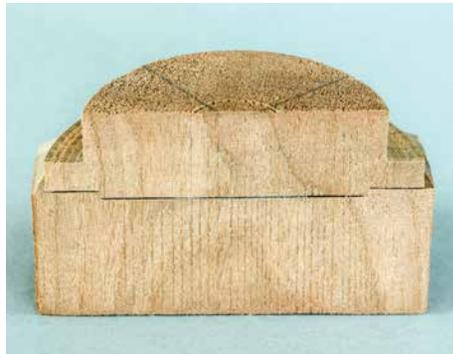
When the adhesive needs are only to keep things in position with strength from the joint, hot-melt can be a choice

There are two items to come to grips with. The assemblable and disassemblable functions of artworks to be shipped in smaller pieces, assembled and then disassembled for shipment or storage. The frequency of the process as well as the skill sets of those doing the work will impact your selection of methods. Threading, slip fits, pinning and compression grips all lend themselves to items requiring this multiple times. Additional information on creating threads in your turnings is available in issue 262. Reversible is quite a different story. I use reversible to mean perhaps taken apart for repair or the rare disassembly for relocation. Of course, the threading, slip fits, etc. will work here but there are also the



Other advantages of finishing prior to assembly may be the environment where assembly will occur.

individual parts as you create them or wait until the final assembly. For any of the friction-type finishes, they are by process best done right on the lathe. Other finishes might be done anywhere. If you are creating an item that will be disassembled, either once or repeatedly, my experience is that finishing individual pieces works far better. For the one time assembly forever, your choice may be driven by where the final assembly will take place and the ease of finishing based on location(s).



With compressive loads relying on the joint design, hot-melt is reversible with denatured alcohol

reversible adhesives available. For hundreds of years, hide glue has been used for precision woodworks that have need for disassembly for repair. Steam and heat will allow for disassembly of hide glue joints. Modern day hide glue formulations are available right from the dispensing bottle, thus eliminating the glue pot. Another simple adhesive that is easily reversed is hot-melt adhesives and most can be released with denatured alcohol. Because the hot-melt adhesives are available in various 'strengths', including industrial versions, always test the adhesive and the reversal before committing to the final use. There is additional information available on what you need to know about adhesives in issue 269.

Grain match

There is no need to forgo grain match when doing assembly. The planning of the material orientation can be accommodated by design and material processing. If you are working from a single piece, cutting and turning based on final visual grain match can be planned. Even with multiple smaller pieces of the same species, consideration can be given during the material selection to allow for best matching. The best recommendation I can offer is to sit with a sketch pad for a moment before cutting. Figuring out where the visual needs are the most obvious can assist with your processing. Sometimes it can't be accomplished 100% but a bit of pre-thinking will solve most of the needs.



Made from a single block, the cutting was planned to allow for grain match of each of the faceplate pieces

Workholding ease

Mention was made of the ability to do projects larger than your equipment can handle by using assembly as part of your project. This certainly has value but what about the difficult workholding issues even when the work will fit? Long spindles can be a challenge so perhaps multiple shorter pieces will work. Turnings with thick and



This ceremonial tea set, yet to be Japanese lacquered, was far more easily accomplished as three pieces rather than two

Joint strengths

For the cosmetic or no load interfaces, the task is pretty easy. Pieces need to fit together well and provide for the fastening mechanism you choose. Without safety or load considerations, you'll have a multitude of choices. The threaded and adhesive work well – both are straightforward to accomplish. For many of my low need interfaces, I've used a simple friction fit and have many ornaments with interchangeable lower finials. Each of them will remain quite nicely based on the friction alone. Since they only bear their own weight and it is minimal at that, this choice works well

for assembly, display choice and disassembly or change. Of course, always keep safety in mind when you consider any consequences of joint failure regardless of the mechanism. Lately, I've taken to using rare earth magnets for many of my shell ornaments, especially where shipping is involved. The ability to ship the ornament body and separated finial packed appropriately, then have the end user simply slide the finial into place, is extremely helpful. With more secure packing and less breakage in transit, the end user requires no tools or special skills to assemble the piece – just slide in the finial and it will take care of itself.



I've been using rare earth magnets glued inside my lower ornament body. A finishing nail head is embedded in the finial before turning

thin sections can present difficulties from workholding to tool reach based on toolrest location difficulties. One that may escape immediate thought is offcentre turnings. Assembly can often assist with needs that might present difficult holding and even potentially forcing you to turning outboard.



Base made from three pieces is commonsense based on ease of workholding and material cost savings. The finial is made from two

Interface surfaces

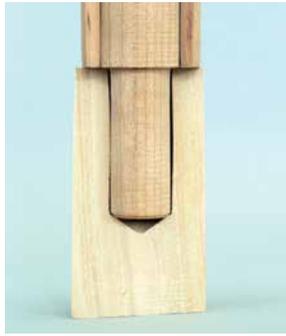
Let me use an example to get you thinking about several of the important issues. Assuming that the material thickness and strength is sufficient, an interface joint for a longer length might take at least two forms. One might be a bottoming contact while another might be a shoulder contact. Both offer column strength of the material but

present different issues in fabrication. The photos here show two different diameters but could easily be the same diameter. With the assumption that these might be bed posts or the like, they are to be assembled with adhesive once or with reversible hide or hot-melt adhesive. Either way, both should be plenty strong enough. Either

one can have the decorative sleeve created as a third piece to be added after the two are assembled. This makes multiples easily made identical as well as reducing turning away of stock and any critical measuring. Notice how they all provide plenty of face grain to face grain gluing surface.



Depending on your choice, you can shoulder on the bottom, shoulder or both to provide column strength



An added decorative ring can be turned separately and added as desired by sliding it over the diameter



Contacting at the bottom rather than any shoulder, whether present or not, will provide strength and can use the decorative sleeve idea

Thoughts on grain match

Good gluing practices are key to assemblies as they always are. Keep in mind the grain orientation between the various pieces and any differing expansions if using different materials or species. Orientate the pieces that will be bonded so they will expand and contract in unison rather than fighting. You will not be able to restrain grain movement with adhesive as the wood will move regardless, so be certain you don't put undue stresses on your adhesive bond. Regardless of your selection of adhesive, orientate the grain to minimise the variations in grain direction to improve the life of assembled components, whether load bearing or not.

Additional thoughts on grain

On occasion, you may be assembling components that don't really care about grain. Burl comes to mind not really having a grain

orientation and the dramatic differences in grain orientation expansion rates. While the burl may not care too much about varying rates of expansion, any substrate you bond it to might. Burl to burl might be fine but burl to a grain orientation sensitive species will. Some adhesives do have a bit of give but don't always count on it. There are some things you can do to help yourself, however. Much like a table maker might use 'breadboard ends' on a table to prevent potential for problems, you can help some situations by judicious gluing. If you are bonding a low stress application, particularly cosmetic attachment of burls, glue only the least sensitive area of the joint. Use one of the more flexible adhesives and apply it along the length of the grain. That direction will have minimal dimension change in comparison to other directions. In most instances, you can get sufficient bond by restricting the adhesive to this area.



Keeping grain orientation for joint and adhesive bonding will help minimise stresses over the life of the turning



Any misorientation will put undue stress on the joint. Even different species should be orientated as best they can for grain



While the burl may not vary in expansion rates based on orientation, any grained substrate will move dramatically



In order to minimise stress on any adhesive attachment, you can apply adhesive in the area denoted by the tape

Glue traps

If you are not familiar with glue traps, you should learn their value. Most of us use far too much glue as we believe that more glue makes a better bond, but this is not necessarily so. Adequate adhesive is required of course but surface cleanliness and preparation are absolutely key to success. When we mix glue, we feel the need to use it all up rather than throwing excess away. Glue traps are features that



A glue trap groove cut into a pen end cap replacement. Adhesive is only to be applied to the lowest flat ring

will capture glue as it tracks up the interface and this is especially helpful when using adhesive to insert a plug or other feature where the interface will show squeeze out. The depth and frequency of trap cuts can vary but applying adhesive in the proper area and in sparing amounts will go a long way in preventing the visual problems with glue squeeze out.



Because the wooden end cap can't be a hard press fit, it needs to be adhesively bonded but is susceptible to squeeze out

Conclusions

There are many reasons for using assembly as part of your turning process. It has so many advantages I find it hard to believe that it won't benefit you in some way. Whether because of the work envelope of your equipment, cost of single piece blanks, oversize or awkward shipping, mixed materials, assembly/tear down needs, access to difficult places, workholding ease, production processing, or the many more not listed, assembly is a very powerful tool. Like any method you might not be currently using, it may take a bit of thought and experimentation. My mindset used to be using assembly when I needed to solve a problem caused by using a

single piece, but I've since adopted the exact opposite thinking. Now I think about why I need to do a single piece and only follow through with that if the single piece adds more value. Please don't misconstrue using assembly as a crutch that 'real woodturners' wouldn't use. I'd suggest that it is the wise use of another tool in your arsenal to get to the most accomplished end point in the best manner. Best being defined as most time or cost efficient, achieving results not easily achieved otherwise, or just plain succeeding at your project. Give assembly a fair shake and I'm certain you'll find a home for it in your turning world. ●



If you aren't taking advantage of assembly in your woodturning, give it a try for all of the benefits it can bring