

## Making a Vacuum Chucking System on a Shoestring Budget – an Adventure

The latest “must have” accessory for the modern wood turner now seems to be a vacuum chucking system. From my own perspective, I thought it to be of limited extra utility compared to conventional reverse chucking, considering the complexity and considerable expense.

However, there is much interest in our club in this, plus some “talking it up” as to the merits. Several articles have appeared in the woodturning press as well – “Creating Vacuum Chucks from Thin Air” (American Woodturner, Summer 2004), and “Vacuum Chucking is the Way to Go” (Woodturning Design, Fall 2005). The latter was subtitled “How to Create Your Own System at Low Cost” – even more interesting. Both articles contain useful information and construction detail.

Not wanting to appear an anti-progress curmudgeon, I decided to build one, with the dual goals of a well functioning system and minimum expenditure. This project approach comes from growing up during the depression in the 1930s, as well as working as a design engineer in industry (not on government contracts!).

The single most expensive item is the vacuum pump, at least \$300 for a suitable one bought new. The Woodturning Design article recommends a used unit for \$90 from [www.surpluscenter.com](http://www.surpluscenter.com); but that has a 230 volt motor; an extra problem. I searched the eBay auction site on the internet, found many available vacuum pumps, and wound up with a nearly new Gast DOA series diaphragm pump, which works great, for \$67 including shipping. A heady start, such a deal!

Never having experienced eBay, and having had some fun with the bidding process, I continued there with the purchase of an automotive vacuum gage, brand new, for \$18 including shipping, and for the rotating swivel joint, a sealed 3/8 inch I.D. ball bearing, also new, for \$14 including shipping. Grand total for non-locally available material was \$99.

The remaining expenditures were for tube fittings, copper and plastic tubing, ball valves, pneumatic quick connect fittings, an automobile fuel filter, hardware, electric power strip, and resilient facing for the chucks. Wood for the chucks came from the shop scrap woodpile, face plates were on hand, and plywood for wall mounting of plumbing and pump also came from the scrap pile. The total for the purchased materials was approximately \$70. Total system outlay then came to about \$170. Had ¼ inch pipe and fittings been used in place of some of the copper tubing and fittings, cost could have been \$10 -\$15 lower, and the assembly would also have been simpler and easier.

Local purchases were made at Lowe’s building supply (best price for ball valves), Ace and True Value hardware stores, Harbor Freight Tools (pneumatic quick connect fittings), Advance Discount Auto Supply (fuel filter), and Wal-Mart crafts material department for 2mm thick foam plastic self stick sheeting (thanks to John Gerald for the tip).

Photos, illustrations, and details are below.



The vacuum pump sits on a wall mounted shelf. The pump frame is fastened to a sheet of ¼” plywood, which in turn has a piece of ¼” sheet foam rubber underneath (a part of Phil Krym’s old wetsuit ) as a vibration damper. The on-off switch is at the top - in the outlet strip. At the pump inlet is an inline automotive fuel filter to prevent any wood dust from entering the machine.



At left is the plumbing and gauge. The quick connector to the rotating vacuum adapter is left, and the pump connection is at the right. The bleed valve at the bottom can be used to regulate the vacuum, if desired.

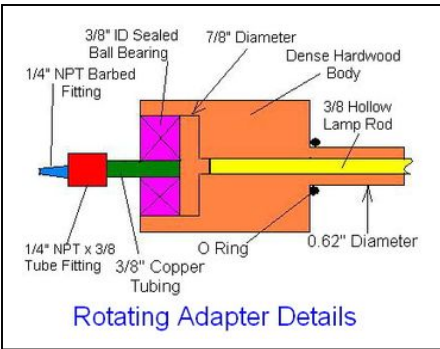


At left, the vacuum adapter assembly, suited for use in a Powermatic 3520 lathe, which has a hollow driveshaft with a 5/8 inch hole, and has no outboard threaded connection. For a lathe with a threaded outboard, the adapter connection would have to be made with a faceplate.

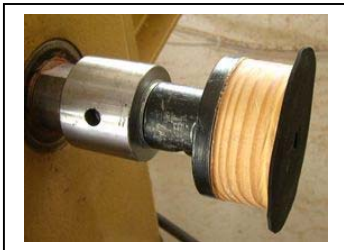
Following from bottom right onward – quick connect fitting, 1/4" vinyl tubing, barbed fitting, adapter head with O ring, 3/8 inch hollow threaded lamp rod, and tapered wood plug-O ring- washer and nut assembly to fit into the headstock tapered hole. As the nut is tightened, the O rings seal both ends of the assembly.



At left, adapter head snugged up against the handwheel, which has been extended slightly to allow the O ring to enter and the adapter face to seat against the wheel face. At right is the headstock end of the assembly.



At left, construction detail of the rotating adapter. The right hand portion fits into the hollow shaft. The outer race of the bearing and the lamp rod end are epoxied into the body. Likewise, the copper tubing is epoxied into the bearing inner race. To properly turn this piece to dimension you should use a micrometer caliper, which can be bought for about \$20 if you don't have one – it's a useful tool. (Source: [www.use-enco.com](http://www.use-enco.com)). The body was made of citrus wood, being dense, hard and strong. Hard maple should do the trick as well.



3 inch chuck on headstock



6 1/2 inch chuck on headstock



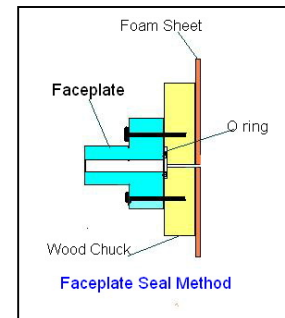
3, 6 1/2, and 12 inch chucks



Natural Edge Secured on 3" Chuck



12 Inch Bowl Secured on 6 1/2" Chuck



The woods and chipboard used for the chucks were porous, and some vacuum loss resulted due to the leakage. Four coats of lacquer on each solved the problem by sealing the pores. The seal between the faceplate and the wood was made by cutting a small recess as shown, slightly larger than the O ring and 1/2 its thickness, and tightening down the faceplate against it.

---Sy Plonsky 09/25/05. Questions? – e mail them to [fwoodturner@yahoo.com](mailto:fwoodturner@yahoo.com)