

# Glaser Tunable Vibration Absorber for Lathes

by Lyn J. Mangiameli

It would be a rare turner, indeed, that has not wished to reduce vibrations arising from and/or transmitted through their lathe. Turners resort to all sorts of efforts to reduce these vibrations. Some efforts are applied to the lathe or its stand, such as making a more massive stand or adding weight to an existing stand, cross-bracing and otherwise rigidifying the lathe stand, coupling the lathe to floor, using link belts when possible, even buying a more rigid and massive lathe. Other methods seek to balance the turning wood as much as possible, usually by trimming it as round as possible prior to mounting. When dealing with wood you do not wish to be uniformly round (including off-center and eccentric turning), or wood with internal imbalance (usually due to voids or differing densities of wood) measures such as screwing or taping on weights, or even special spindle mounted balancers (such as the McNaughton balancer) may be used (with the associated problem that these weights must be moved or changed as turning progresses and the degree and distribution of the imbalance changes).

The typical turner has tried several of these methods, often with good, but only partial success. One of the problems with many traditional techniques is that they are only effective with vibrations in a specific frequency range, or simply transpose the vibrations from one frequency range to another. Faced with these same problems, but mindful of engineering principles described as long ago as the 1920's, Jerry Glaser developed and investigated the use of a tunable, dynamic approach to vibration cancellation (and hence, reduction) for lathes. Glaser, who is familiar to most turners for his superb turning tools, credits as the source of his own design an early invention by Den Hartog, an engineer who some believe wrote the definitive book on mechanical vibration. Interestingly, the same principle and a similar device is used to reduce vibration in Alaskan oil and gas pipelines, where wind-induced vibration can fatigue the welded joints. In this application, the tuned vibration absorbers (TVAs) can be set to match the natural resonant frequency of the pipe span.

Glaser developed his TVA on an old Oliver lathe around 1987. Even with no idea at that time of how to tune it, he found an immediate reduction in vibration when turning unbalanced wood. It soon became clear that with a little tuning, the TVA would allow a turner to run a lathe at higher and usually more optimum speeds. Jerry was impressed enough to consider commercially manufacturing his TVA, but was deterred by the thought of having to respond to a barrage of technical support questions. So with changes in lathes and activities, Glaser's TVA eventually saw less use and never became an item of public knowledge. To my surprise one day, Jerry offered the device to me, in exchange for my report on how it worked on my Nova. A few weeks later, a 41 pound package arrived on my doorstep.



The Glaser TVA is shown here bolted to the bed of the author's Nova 3000.

The Glaser TVA is composed of three major parts: an 18 inch long, 1.5 inch square steel bar; an 18 inch long, 3/4 inch diameter heat treated chrome/moly all-thread rod (importantly, with the area between 8 inches from the top and 4 inches from the bottom turned smooth and shot peened); and a 20 lb weight (in this case, composed of two 10 lb, 8 inch diameter barbell weights). The bar is drilled a short ways in from each end. On one end, a bolt is inserted and runs down to a plate that, when tightened, allows the bar to be locked to the bed (much like the plate used to lock your tail stock to the ways). The hole on the other end of the bar accepts the 3/4 rod which is locked into place both above and below the bar with large flanged nuts and washers. The other end of the rod penetrates the holes in the center of the barbell weights, with the weights held near the top of the rod with flanged nuts and washers above and below. This allows the weights to be locked in position, but at any location along the upper six inches of the threaded rod. All of this can be more easily grasped by an examination of the accompanying photos.

As can be seen in the photos, I've located the weights and rod to the rear of the lathe, with the cross bar perpendicular to the ways, and up against the headstock. This keeps the weights out of the way and should anything fail, the assembly more likely will fall away from both the turner and the turning. Jerry suggests that locating the rod and weights below the square bar (as opposed to above the bar as I have done) might make

any failure of the rod spring less likely to cause a problem. The unlikely, but potential, risk is that with extended use the vertical rod could fatigue and break from the flexing which occurs as the device counteracts the vibrations transmitted into it. To minimize the chances of this, the rod is made of heat treated chrome/moly steel with the center "spring" area of the rod turned smooth and shot peened. Jerry is adamant that the "spring" rod meet these specifications. In his early investigations he used the cheap steel all-thread that is commonly available, but, as he puts it, "the thread is nothing but a bunch of stress risers wanting to break" And break for him they did, usually in a matter of a few hours. However, I would point out that with the rod Jerry decided upon, his TVA has had an approximately 15 year history prior to coming into my hands, and has since been used with my lathe for over six months, all without any sign of failure.

With the crossbar placed alongside the headstock, it is out of the way of the usual positions of the banjo, and being located directly under the spindle it does not reduce the maximum swing of the lathe. With the swiveling Nova headstock, this position of the bar does not interfere with small rotations, but for larger rotations I have needed to reposition the bar a couple of inches down the bed.

So, how well does it work? In brief, extremely well. Frankly, I had no idea how habituated I was to small vibrations in my lathe until the TVA removed most them, as well as greatly attenuating mod-

erate to large ones. Moving the weights up and down the length of the rod allows one to fine tune the frequency at which the vibration absorber is most effective. However, even a fairly coarse approximation can be quite effective, and I've found the TVA to be effective over a very wide range of rpm. You can judge the effectiveness of your tuning by both the amount of vibration felt at the lathe itself, and/or the (sometimes fairly large) swing of the weights on the rod as they move to cancel out the vibrations coming from the lathe. Jerry has written that the whole idea behind the use of a vibration absorber is to enable a turner to run their lathe at a higher rpm than normally would be permissible with an out-of-balance piece of wood mounted. In my case, that usually translates into a 500 to 700 rpm increase (though this is somewhat relative to the normally satisfactory speed, with lower required speeds showing a lesser increase while high speeds allowing for greater rpm increases). This increased speed, of course, can allow quicker stock removal, less tendency to drop into voids, and an overall cleaner cut. Furthermore, on a moderately priced lathe like the Nova, the TVA appears to suppress small natural vibrations arising from the lathe itself, likely coming from slightly out of balance pulleys and motors.

Assembling a TVA of your own should not be very difficult, if you have an even moderate amount of metal working skill and equipment. A couple of woodturners who post on the rec.crafts.woodturning news group have described making something similar, on their own. The shot peened, heat treated chrome/moly rod is the only item that is unlikely to be found readily, but should be a project easily accomplished at a machine shop. (Glaser strongly warns against substituting the typical 3/4" all thread rod, which can be destroyed by the flexing which is inherent to the TVA function). In use, the only real drawback is that the method of turning the nuts up and down a shaft to tune the height of the weight stack can be tedious. It would be nice if a means of quicker movement and locking into place could be found. Still, as I mentioned earlier, precise tuning is not necessary and even very coarse tuning of the height of the weight stack will allow for quite meaningful reductions in vibration.

I know for me, I am ever so happy that Jerry has not asked me to give it up. I gladly accept the slight difficulties in tuning for the major vibration reduction achieved. This TVA is an easy device to replicate and I hope this report may encourage some of you to experiment with one of your own.

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