Sharpening

Jerry Glaser 07/01/01

What follows is a description of the procedure I've developed for shaping and sharpening all the woodturning tools I make. These tools are made of steel selected for long edge life and are more difficult to work than the standard high carbon and high speed steel tools.

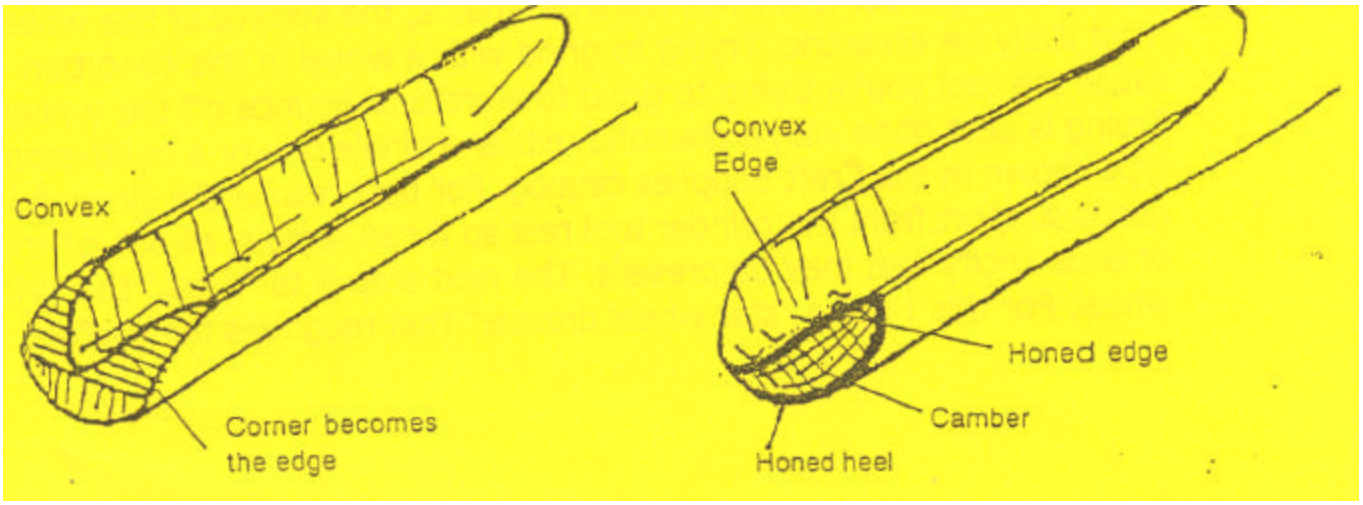
The beginning point is grinding the bevel on the end of a blank gouge or blank scraper. When I first stared to make tools I bought a white aluminum oxide grinding wheel since that appeared to be the wheel of choice in the tool rooms I was familiar with. I wanted a wheel that would grind fast, retain its shape and require minimum attention. The white wheel did work ok, but I kept looking for something better. The answer came a couple of years ago when Norton introduced their "SG" grinding wheels made of aluminum oxide grit. The difference between this wheel and all the others is in the way the aluminum oxide grit is made. Each grit particle in the SG wheel is made up of many smaller particles unlike the standard wheels that use large, single particles. In contrast, as the SG wheel is used the very small grit particles break off exposing fresh, sharp edges.

I use only one grinding wheel, an eight-inch diameter by one-inch wide, mounted on a belt driven arbor running at 3000rpm.The exact specification is: 5SG46-IVS.The number 46isthe grit size that's good for rapid stock removal. This wheel is sold by Craft Supplies in Utah and is available in 6 and 8 inch diameters and two grits - 46 and 80. These wheels can be used with a 1750 or 3450 rpm motor.

Getting a good grinding wheel is just one step to successful grinding. The grinding wheel must itself be kept sharp! There are two distinct steps to be followed. The first is truing. When the grinding wheel is first installed o n the shaft of the grinder it will not run true, that is, the surface of the wheel will most likely be eccentric. Trying to grind with a wheel in this condition will cause the tool you're trying to grind to vibrate or bounce off the wheel surface. Truing is best done with a diamond, either a single one or a multi-stone of the type shown in the Craft Supplies catalog. For best results the diamond tool needs support from the grinder tool rest so it can remove all out-Of-roundness or eccentricity that may be present. The next step is to "dress"' th a grinding wheel. For this I use a "star wheel dresser" that roughens the surface of the trued wheel and makes it much more aggressive. The surface of a wheel that was trued by a diamond is smooth. It will grind more slowly and hot, but the ground surface of the tool will be smooth. For just retouching edges, a wheel dressed in this manner is acceptable.

A word of caution, grinding will get the tool hot and the temptation is to cool it by quenching in water. This is not good practice. A water quench cools the thin edges of the tool much more rapidly causing them shrink more than the bulk of the tool and the edges may develop small cracks as a result. See Leonard Lee's book on sharpening for a picture of why this happens. Even though considerable care is used to keep a tool from getting hot during grinding, sometimes it does get hot enough to discolor to a blue or brown. If the tool is made of high-speed steel or one of the CPM steels this heating will not likely affect the hardness of the steel. All of these steels are tempered at 1000 degrees F. or higher. The straw color you see occurs at a temperature that's much lower. Again, Leonard Lee's book has reference to an experiment showing the effect of temperature on hardness. However, if the tool is made of a high carbon steel (most old tools and those made of files), a change in the color of the tool as a result of grinding means that the tool has lost some hardness and will wear more quickly. Grinding away the affected area or reheat treating is the only remedy.

All of the tools I make are sharpened before being shipped to m\1 customers. This means I grind an appropriate bevel and hone it to a good sharp edge. For grinding the bevel on gouges I use a jig I designed about ten years ago. Using a jig enables me to grind all the gouges to the same shape every time. Istart by grinding a convex profile, free hand, as shown below. This provides me with a target for shaping the nose and sides of the bevel. The inside corners become the edge of the bevel when the grinding is completed. After shaping the profile the blade is mounted o n a grinding jig.


Convex
Corner becomes
the edge
Convex
Edge
Honed edge
Camber
Honed heel

I use two jigs. One is set for grinding deep gouges and the other is set for shallow gouges. This is for my convenience; either jig could be reset for either tool. I start grinding the two sides of the bevel and stop after all th a reflected light from the top grind disappears. At this point I need to stress the need for a strong overhead light focused on the area where the grinding is taking place After the two sides are ground to a rough, but sharp edge, I shape the nose. Because the nose of a deep gouge is small, I grind with a gentle touch against the grinding wheel. If you're heavy-handed you can easily remove too much metal in a moment and the result is a misshapen and generally unusable bevel. This is why a grinding jig is so good. The jig controls where the tool bevel is placed against the grinding wheel and there is no difficulty getting the same exact contact with the wheel every time. The result is a uniform bevel and not a bunch of facets trying to look like bevel. If it's done properly, you will now have a bevel that can be easily honed because the edge and heel are clearly defined. You will also have a tool that behaves the same through all its sharpening cycles. And the tool life is extended. As a maker of tools I should encourage you to grind away, but I really want you to get the most out of any tool you might be using.

At some later date I will describe the grinding jig I use and show you how to make one of your own. Now there are a number of grinding jigs/fixtures available. I've used several, but the model I use which pivots off a point on the floor is more versatile than the short models. More later

After grinding the bevel the sharpening is completed by honing the flute with a medium grit slip-stone and honing the bevel with a very fine EZELAP (blue handle). This takes only a few seconds and the result is a very sharp edge. There should be no burr left in the flute or on the bevel. Try the gouge on a scrap piece of wood. It should cut effortlessly.

A good test of sharpness and your turning technique is to turn scrap pieces of Douglas fir, pine, etc. I use 2 x 4's cut into square chunks that I attach to a screw chuck and then I turn them round from the square. I d o this with the lathe running at 2300 rpm. If the tool edge is sharp, it's possible to get a very smooth surface right off the tool that needs little or no sanding. You benefit in several ways: the shape is crisper and rounder, there is less sanding dust, and the time spent sanding is reduced. And that's about it.