Strait Turners Chapter – AAW

Sharpening concepts

Biggest psychological challenge most turners face – sharpening – is just confusing. There are many, many, many solutions – and it's not the grinding machine that sharpens. It's the user! To really benefit from "keen" tools you have to understand and manage two other concepts – vibration and the reference plane that you are "sharpening toward".

Objective: You leave here understanding all of the important points for smooth cutting , including "**sharpness",** in wood turning and then can develop your own preferred system to achieve your goals within a budget that you set … there is NO ONE RIGHT WAY OR MAGIC SOLUTION

Understanding vibration, the reference edge, grinding and honing

I. **Vibration**! The smoothest, keenest cutting edge is irrelevant if there is vibration. Get rid of vibration before you worry about sharpening to perfection, or you are wasting your time and $$$… Sources of vibration:
   1. Motor quality and mounting; Drive belts; Headstock bearings; Alignment – headstock & tailstock
   2. Chuck (or any mounting device) – "true and balanced"
   3. Workpiece (THE WOOD)
      a. A secure mounting
      b. Balance (slow first – then faster)
      c. Checks/ Cracks (danger and difficulty) – become even more important toward the finish
      d. Voids (keep the speed down, use a very light touch)
      e. Centrifugal force (show white board) – especially in vessel hollowing
      f. Structure of the support to outer edges (on white board)
      g. Failure to use tailstock (on white board) -
   4. The lathe tool rest – smoothness, mass, distance, grip
   5. The cutting **tool shaft** (diameter) and **handle** (weight), and **distance** from tool rest to workpiece
   6. The **pressure and keenness** of the cutting tool –> sharper = less pressure to achieve cut = less distortion from centrifugal forces = less vibration = smoother surface.

II. **The "Reference Plane"** toward which you sharpen is ***critical*** (white board and on screen)
   1. Chisels – easiest to understand – intersection of a beveled plane and a very smooth, flat reference plane toward which the bevel is shaped (ground)
      a. Examples – demo and on the white board
      b. Microscope photos – on the screen
      c. How to smooth the reference plane – grinding and honing
   2. Reference planes for Gouges (to be demonstrated live and camera views on screen)
      a. Spindle and bowl gouges
      b. Scrapers (it's all about the bead!)
      c. Parting-like tools (scraping and "slicing" – like a chisel)
      d. Skews (scraping and "slicing" -also like a chisel)

III. **Grinding** toward the reference plane.
   1. The cutting tool material (just as background info)
      a. Carbon steel (temper and heat issues)
      b. High Speed Steel (HSS)

c. Carbide (tip) cutters (some are “cutters”; most are “scrapers”

2. Grinding Machines – what functions they need to do – options, options, options
    a. A flat glass plate and sandpaper
    b. Your lathe itself – many options
    c. A specialized grinder (don’t forget about vibration here too!)
        i. Medium-speed (1750 rpm) bench grinder with two wheels (each of different grits)
        ii. A slow speed (60-120 rpm) wet grinder
        iii. A flat surface grinder (several variations)
        iv. Considerations for any grinder
            a. Motor must be smooth (vibration free) and well mounted (height, stability, convenience, safe location)
            b. Wheels must be balanced (dressed flat and smooth)
            c. Wheels must be clean of debris and ground-off metal particles
    d. The grinding medium (on screen) and steels
        i. Grits 60-80-120-200-1000-2000-4000)
        ii. Grinding hardness vs tool steel hardness (on screen)
        iii. Traditional bonded abrasives – wide range of grits and materials, width is important, as is maintenance, in general, quality counts big time!
        iv. Wet stones (again a very wide range)
        v. CBN wheels (advantage of always being well balanced; long lasting with care; always sharp cutting particles available if maintained well)
        vi. Diamond wheels (low speed only!)
    e. Repeatability of angle
        i. Preferences and skill levels – acute angles and moderate angles (white board and screen)
        ii. Use a marking pen (demo)
            a. freehand
            b. with a platform
            c. with a jig
    f. But **what is “the angle”?** (on screen and white board)
        i. If using a grinder that produces a “flat surface”
        ii. If using a grinder that produces a “concave surface” (10”, 8” or 6” wheels)
        iii. Undercutting the heel, using intermediate bevels
        iv. Using a micro-bevel – especially inside a bowl - why?
    g. Grinding to the angle you want…
        i. On the flute side
        ii. On the bevel side (do’s and don’ts)
        iii. Slides and demo of Tormek
        iv. Cutting/shearing versus scraping action –
            a. When to raise a bead or not – by grinder, by hand, and on the honer
            b. Slides and demo

IV. <u>Summary - General workflow for sharpening.</u>

i. Grind/hone the reference side – make as flat and smooth as you can; this result should last a LONG time unless you are clumsy!

ii. Use either “marking pen method” or a jig which is “repeatable” to adjust the relative bevel angle on the grinder
iii. Grind the desired angle on the bevel side – if doing a bowl gouge try to get “wings” even.
iv. “Touch up” (your finest grind) on bevel side
v. Hone the bevel side (or not – your preference and experience)
vi. “touch”-polish the resulting bead on the reference side
vii. Once your tool is “sharp” only steps iv/v are needed during a turning session; when tool dulls repeat steps iii , iv, v only
viii.

Handout on Sharpening from AAW book on sharpening

From a woodturner’s perspective, there are a number of conclusions to be drawn from the examination of tool edges and the wood cut with those edges.

• All of the different steels got sufficiently sharp to cut the wood cleanly and that is what it’s really all about, rather than some mystical concept of sharpness. The method of preparing the edge is the key to tool sharpness. Clearly, an edge that is not honed produces a torn surface when cutting poor- quality wood, regardless of the steel. Some woodturners believe that there is no need to hone, as the burr will simply strop o in the wood; however, experience with HSS and especially the higher wearing steels (10V, 2030, 2060, 15V) is that the burr is tough and does not readily strop o in the wood.

• Diamond honing materials can easily cut all of the steel alloys on the market. Traditional stones (Arkansas, Washita, India, crysolon, ceramic) are ineffective or require an inordinate amount of time to achieve an improved edge on HSS and also on the high-wear steels we tested. This is because the common HSS, like M2 and M4, super HSS such as PM 2030 and 2060, and the high-wear steels such as CPM 10V and 15V, contain significant quantities of hard carbides. These tungsten, molybdenum, and vanadium carbides far exceed the hardness of traditional sharpening stones. Jerry Glaser, who championed the use of highly alloyed PM materials, referred to traditional honing materials as “old methods” and diamond as “new methods” of honing—we have to learn to work with diamond. All of the different types of diamond (synthetic mono
and polycrystalline, as well as natural) on the market will hone contemporary turning tools. However, the type of diamond, smoothness of plate, and how diamond is attached to a plate determine the longevity of a diamond hone.

• A cutting edge is the intersection of two planes—and both of those planes should be smooth to produce an edge. On skew chisels, this is not an issue once you have honed both surfaces. However, with gouges, the bevel is produced by grinding and honing, while the inside surface is a product of the manufacturing process. Honing does smooth inner flutes when done with a slipstone or cone, but for those who don’t hone, or those with flutes that have very deep grooves from the milling process, there is a problem of sharpness.
• A well-manufactured flute, free of deep milling marks, is a big plus and can speed the honing process. Polishing the flutes is an option, but it would be admirable if was already done by the tool makers. Honing with diamond will, to a large extent, cut through most of the milling marks sooner or later, so polishing may not offer a huge increase in edge sharpness over regular honing.

To be fair to all of those who have argued that honing is a waste of time or that certain steels do not get as sharp as others, it seems as though those viewpoints are based on the honing material being used. Traditional honing materials work well on HCS tools but poorly, slowly, or virtually not at all on HSS and high-wear steels, so if you don’t hone HSS and high-wear steel with a diamond hone, they will not be as sharp as HCS that has been honed.

For an excellent discussion of scrapers and how to sharpen and hone them, and why they work, go to: **www.docgreenwoodturner.com** and look at his 3 chapters on scrapers.

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