

## Sharpening Tools for Woodturning an Overview

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Sharpening: The process

Basic concepts:

- a. We are looking for a cutting edge that is a balance between cut quality (ie. No tear-out) and a cutting edge that lasts a reasonable amount of time before needing to be resharpened.
  - b. The goal of sharpening is to create an intersection that has a ZERO radius. Basically we are looking for an intersection that is ONE molecule wide!  
This is not physically possible with current material technology. So we must settle for the smallest radius we can get.
  - c. Since we can't reach the ideal we must find a way to tell when we are as close as our material will allow. In steel when we approach the smallest radius it can't support the intersection and becomes very weak and flexible. The intersection rolls away from the pressure of the abrasive creating what is called a **burr or wire edge**.
  - d. A sharp tool is a safer tool because the force necessary to create the cut is lower causing less fatigue. Less fatigue means better control.
2. Steps to sharpening:
- a. Creating an intersection (Bevel).
    - i. The first step in producing a cutting edge is to rough shape the steel into an intersection. Producing this intersection creates an angle between the back of the tool and the surface ground on top. This is called the grinding angle.
    - ii. In woodturning this angle is produced with a grinder.
    - iii. This angle can change depending on
      1. The density of the material that is to be cut.
        - a. Softer woods => smaller angle.
        - b. Harder woods => larger angle.
      2. The amount of material to be removed.
    - iv. In woodturning this is less of a problem and many wood turners tend to choose one angle and stick with it for all species of wood.
    - v. Grinding wheels in this application should be tool room wheels designed to grind hardened tools steels.
    - vi. Grinding wheel grit size typically range between 36grit and 120grit.
  - b. Refining the intersection (Honing).
    - i. Initial refinement of the intersection is done by honing.
    - ii. Smaller and smaller abrasive particle sizes produce smaller and smaller scratches or "teeth" (on a microscopic level) at the cutting edge. This reduces the intersection radius.
    - iii. For woodturner's who hone, a fine India slip stone or a 600grit diamond pad are typically used.
  - c. Finishing the intersection (Polishing)
    - i. The final step in sharpening. Polishing creates a smooth mirror like surface at the intersection.
    - ii. This reduces the friction, thus reducing the energy you need to cut.
  - d. In woodturning you can either do both honing and polishing or skip either, but you can't skip both without diminishing your ability to produce a good enough cutting edge to do what you want (that is to cut well).

- e. How far do you have to go?
    - i. Originally when I first started turning, the material I read said to just “bash it into the end grain of a softish piece of wood to remove the burr”.
    - ii. As I walked this path (tool sharpening that is) that all turners must, I discovered that this was not the best method for getting and keeping a good cutting edge. So I began to experiment with other techniques. I began to adopt some of the techniques that woodcarvers use. That’s where this process comes from.
      - 1. So, how far do you go? Adopting the woodcarvers techniques completely is too time consuming. However, some judicious use of some of the techniques can buy you a much improved cutting edge without much cost in time.
      - 2. On most tools I grind and then jump straight to polishing to remove the burr. However, for the skew, honing and polishing really turns the skew into a formidable weapon.
3. Tools used in sharpening:
- a. Power tools.
    - i. Dry grinding is the main method.
    - ii. Wet grinding is rarely used due to its slow nature.
  - b. Hand tools for honing.
    - i. Natural stones.
      - 1. Arkansas stones.
      - 2. Japanese water stones.
    - ii. Man-made stones.
      - 1. Crystolon stones, India stones
      - 2. Diamond stones.
      - 3. Aluminum Oxide Ceramics.
  - c. Tools for polishing.
    - i. Hand stropping is typically done with polishing compound impregnated leather.
    - ii. Power stropping
4. Typical Grinding angles for different tools:
- a. There are 4 classes of turning tools
    - i. Scrapers.
    - ii. Skews.
    - iii. Gouges.
    - iv. Parting tools.
  - b. Grinding angles for Scrapers.
    - i. Scrapers are typically flat topped single bevel tools that depend on the burr to cut.
    - ii. Some scrapers have a ground angle on the top making them negative rake scrapers. However the main bevel remains the same. The top bevel grinding angle can range between 5deg – 30deg.
    - iii. Typical grinding angles range anywhere between 45 deg – 80deg with fine finishing done using the thinner angles, sometimes without a burr.
  - c. Grinding angles for Skews.
    - i. Skews are either straight cutting edges or curved cutting edges sweeping back at approximately 70deg
    - ii. The cutting edge is double beveled with an included angle typically between 35deg and 40deg.

- d. Grinding angles for Gouges.
  - i. There are three subclasses of gouges.
    - 1. Spindle roughing gouge.
      - a. Typically ground either straight across or with a slight dome shape.
      - b. Typical grinding angles range between 35deg – 45deg.
    - 2. Spindle gouges
      - a. Defined by a radius shaped flute.
      - b. They can be either milled from round bar stock or forged.
      - c. Typically ground in a fingernail shape.
      - d. Typical grinding angles range between 30deg -40deg.
    - 3. Bowl gouges.
      - a. Defined by a parabolic or deep U shaped flute.
      - b. Typically ground in a fingernail shape or straight across.
      - c. For the fingernail grind nose angles range between 55deg – 65deg.
      - d. For the square across grind angles range between 45deg – 70deg.
- e. Grinding angles for parting tools.
  - i. There are several designs of parting tool which can be classified in two ways.
    - 1. Double bevel.
      - a. Typically ground in a diamond shape.
      - b. Typical grinding angles range between 45deg – 70deg
    - 2. Single bevel.
      - a. Typically ground at one angle with the cutting edge held on the tool rest.
      - b. Typical grinding angles range between 45deg – 70deg