Sharpening Turning Tools

Sharp turning tools mean safer turning, better cuts and therefore a more pleasurable turning experience. A variety of tools and systems are available to keep turning tools sharp.

The foremost is the dual dry wheel grinder which is available with 6 inch or 8 inch grinding wheels. These grinders are available with rotation speeds of 3450 RPM, 1725 RPM and some with a variable speed control. The slower speed (1725) is generally preferred but not necessary. The most important factor is to have a grinder that runs smooth with little vibration. The desirable wheels are aluminum oxide with a hardness rating of J or K. These are usually found in white, pink or blue. The grey wheels are not aluminum oxide. The aluminum oxide wheels are referred to as friable since the particles are released from the wheel during the grinding. Therefore they don't heat the tool as much and don't get clogged with metal particles as readily. These wheels are not the only option for your grinder. Norton has a ceramic wheel and the newer CBN (Cubic Boron Nitrate) wheels are also available. Typical grits range from 45 to 150 for the aluminum oxide wheels. The CBN wheels are available in finer grits.

The slow speed wet wheel grinder is another system and the Tormek is probably the most prevalent although Jet introduced a similar system a few years ago. Wet grinding has the advantage of not heating the tool steel and is less aggressive. Being less aggressive, a tool that is getting dull can be sharpened quickly without removing a lot of steel. A two sided grading stone allows the Tormek wet wheel to be regraded from 220 grit to 1000 grit and back. Forming the desired grind on a new tool is faster on a dry grinder.

Sorby has a complete sharpening system that resembles a vertical belt sander. Available belts are typically 60 to 240 grit with some special belts that are available up to 3000 grit. Other than replacing the wheel with a belt the sharpening process is similar to the other grinders.

Setting up a Dry Wheel Grinder

Dry grind wheels are fragile and need to be handled carefully. Before you install a wheel on a grinder, hold the wheel in your hand and tap it. You should get a distinctive ring. If you don't hear that ring, check the wheel for a crack since a wheel with a crack can come apart and be very dangerous. Avoid overtightening the nuts on the wheel. Wheels that are not balanced create vibration and wheels that run with a wobble are also a problem. Some wheels out of the box are better balanced than others but seldom is a wheel perfectly balanced. Replacing the mounting washers with milled washers can reduce wobble. Another method of reducing wobble is to place paper shims between one side of the inner washer and the wheel. The plastic inserts that match the grinder shaft to the inside of the wheel may have a slight amount of play which can affect the balance. All stones need to be trued once they are mounted. The most common device for truing a wheel has a face covered with fine diamonds. Another tool contains a single diamond. The wheel is trued by holding the tool firmly against the flat platform and using a light touch to dress the wheel. *Avoid breathing the fine dust that is produced while truing a wheel*. Oneway has a balancing system that is very effective. This system replaces the plastic insert and both washers with a system that allows a set of weights on the outer washer to be adjusted until the wheel is in perfect balance. This system can only be used on wheels with a 1 inch hole. Some grinders come with wheels with 5/8 or 3/4 inch holes.

Safety

There are some safety issues when using high speed dry grinders. First the wheels will break so make sure wheels are handled carefully when installing. A crack in a wheel can produce a dangerous projectile when turning at 1700 plus RPM. The dust that comes off an aluminum oxide wheel is fine should not be breathed.

Sharpening Turning Gouges

Each turning tool presents a little different approach to sharpening but the spindle and bowl gouge presents the greatest challenge due to the more complex angles in the grind. We will concentrate on the gouge. There are three basic elements to be considered when sharpening a turning gouge, 1- the bevel angle, 2- the side grind or wings, and 3- the angle of the side grind.

It is entirely possible to sharpen a gouge by hand and many professional turners sharpen that way. It takes practice and knowledge of the desired grind. There are jigs to assist in sharpening turning gouges for each type of grinding system. OneWay makes the Wolverine system for a dry grinder and Tormek and Sorby have very similar jigs for their systems.

Sharpening jigs are used to assist in maintaining consistency in the three variables in presenting the gouge to the grinder. Each jig maker may define these variables differently but they perform these three functions. 1- The **distance** adjustment from the anchor point of the jig to the grinding wheel, 2- The **jig angle** adjustment between the jig and the gouge shaft, 3- The **protrusion** adjustment of the gouge shaft from the face of the jig.

The Oneway Wolverine System

two bases which are mounted to a base directly and parallel to each grinder wheel of a user supplied grinder. A V-arm support and an adjustable platform slide into the bases.

The system consists of a dry grinder mounted on a table or some permanent base. This base is also used for mounting the two Wolverine bases. These based allow the V-arm Support and the Platform to be adjusted. It is important that these based be mounted with the slide directly under and parallel to the grinding wheel. A Vari-Grind Jig allows control over the jig angle and the protrusion.

The Tormek System

This system consists of a wet wheel grinder and an array of accessory jigs for sharpening a variety of tools. The Gouge and Turning Jig allows control over the jig angle and the protrusion.

Understanding Turning Gouges

Bevel angle – This is the angle of the bevel on the nose of the gouge. For bowl gouges, this angle is usually in the range of 45 to 60 degrees. For spindle gouges this angle is usually in the range of 30 to 45 degrees

Side grind or wings - A bowl or spindle gouge may have a significant side grind or wings.

Steepness of the side grind – The angle of the bevel on the side grind or wings will not necessarily be the same as the bevel angle on the nose but it may affect the shape of the nose.

Bowl Gouges

There is no one proper bevel angle for bowl gouges. Bowl gouges basically come in either a V-flute or a U-flute. Being able to continue to rub the bevel on the inside of a bowl may require a different bevel near the bottom of a bowl. Typical angles may vary from 45 to 60 degrees. Some of the more popular grinds are the Irish grind and the Elsworth grind. Both of these grinds have a 60 degree bevel and are typically found on V-flute steel. A V-flute tends to provide longer wings than a U-flute. The Elsworth grind has somewhat longer side wings than the Irish grind.

The amount of side grind is very much a matter of preference. Longer wings are useful for pull cuts where very short wings on U-flute steel may be safer grinds for removing a lot of material and also for finishing cuts on the inside of a bowl.

Spindle Gouges

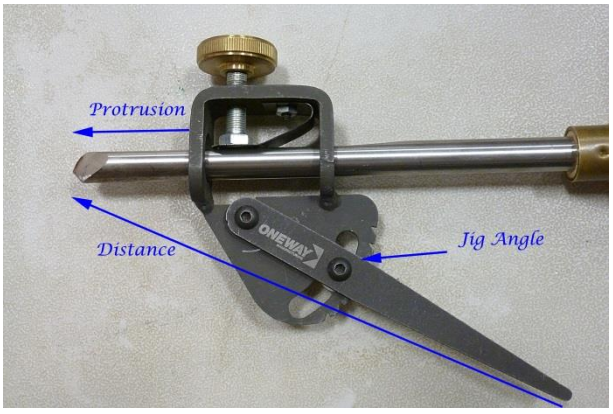
Typical bevel angles for spindle gouges are in the range of 30 to 45 degrees. A detail gouge generally has more steel under the flute which allows a sharper nose. A detail gouge for making fine cuts on spindles may require a bevel in the range of 30 degrees and have a longer side grind or fingernail grind.

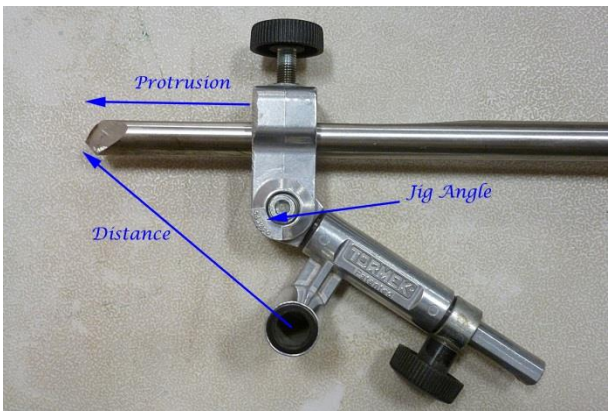
Now let's look at the Wolverine and the Tormek jigs and their settings.

1. **Distance** – This is the distance between the jig support and the wheel. This distance controls the angle of the side grind.
   Wolverine – Determined by position of the V-pocket in which the control leg is positioned.
   Tormek – Determined by the position of the Universal Support Arm.

2. **Jig angle** – This setting varies the angle the portion of the jig that holds the tool shaft to the portion of the jig that is anchored to a base. The angle setting of the jig controls the bevel angle on the tip of the gouge
   Wolverine – Setting of the Control Leg on the Vari-Grind Jig (7 notches)
   Tormek – Setting of the Universal Gouge Jig (0 to 5)

3. **Protrusion** – The protrusion is the distance the gouge shaft extends beyond the jig. The protrusion affects both the tip bevel angle and the angle of the side grind.
   Wolverine – Distance from the Vari-Grind Jig to the tip of the tool.
   Tormek – Distance from Gouge Jig to tip of the tool.





The interaction between these three settings makes learning to use jigs more challenging. I have found

that using a standard setting for the jig angle and varying the other two will provide most of the grinds I need. Adjusting the jig angle on most jigs involves loosening a screw and is more time consuming and is more difficult to repeat a previous setting. The left photo is the Wolverine Vari-Grind Jig and on the right is the Tormek SVD-180. For the Wolverine system, either commercial or hand-made jigs provide more precise repeatability for setting the distance to the wheel (1) and protrusion of the tool (3). Two protrusion distances of 1 ¾ " or 2" are commonly used for the Wolverine. A simple block can be made to set these distances. Commercial tools are available for setting the distance to the wheel are available however it is possible to make jigs for setting these distances. Tormek provides the TTS-100 Turning Tool Setter which provides 3 protrusion settings and 2 distance to the wheel settings.

The bevel angle on the nose of the gouge can be easily controlled by the jig arm angle. The shape of the side grind can be controlled by the distance from the V-pocket to the wheel on the Wolverine or the distance of the Universal Arm to the wheel on the Tormek. The amount of side grind is primarily controlled by how far the jig is swung from right to left. The Veri-Grind Jig has 7 notches to serve as a reference in setting the angle of the arm. The Universal Gouge Jig of the Tormek has 0-6 reference numbers for setting positions. A line can be scribed along side the arm of the Vari-Grind for easier repositioning. The Universal Gouge Jig is a little harder to return to a previous setting. With the interaction between these three settings, there is an advantage to having a fixed setting on one or more of the variables. Since the angle of the jig is harder and takes a little more time to reset exactly when it is changed, this is the first setting to be fixed.

The new Tool Setter TTS-100 from Tormek has simplified the setting as it provides 3 standard settings for protrusion and two for distance to the wheel. It would be easy to make some jigs to facilitate these setting the Wolverine. Many people make a jig for the Wolverine that sets the protrusion to either 1-3/4 or 2 inches. There a number of jigs available for setting the distance to the wheel (moving the V-pocket in or out) for the Wolverine. Once you establish the position of the V-pocket that produces the desired bevel angle, it is easy to make your own jig from thin plywood to repeat that setting.

Given a gouge where the settings when the gouge was last sharpened are unknown, this method will yield settings that are close. Position the gouge in the jig and adjust the angle so the nose angle matches the wheel. Next check the side grind and adjust the V-pocket distance so the side angle properly addresses the wheel. Now recheck the nose angle and readjust the jig angle. Recheck the side angle and readjust the V-pocket distance if required. This should enable the sharpening the gouge to a grind very close the the original.

Doug Thompson (Thompson Lathe Tools) provides a guide with his gouge sales for a suggested Vari-Grind Jig setting of the 4th notch and a protrusion of 1 ¾ ". With the notch to wheel distance set to provide a 60 degree bevel a typical Irish grind will be obtained.

You hear references to M2 or 2030 steel. Just what does it mean? According to Doug Thompson –

CPM 15V	15% vanadium		
CPM 10V	10% vanadium		
2060	7% vanadium	*	
2030	5% vanadium	*	
M4	4% vanadium	*	
M2	2% vanadium	*	*imported steel

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