Avoiding Common Problems in Saw Preparation

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This talk draws on the expertise of experienced sawfilers, and some research results to show practical techniques and possible problems to watch for when preparing high performance bandsaws and circular saws. Topics include tipping, grinding and plate preparation.

Welding

MIG welding of cracks is getting more popular because it is produces less slag, and there is less heat distortion so there is less benching later. However, the basics requirements for a good weld are just the same as for oxy-acetylene welding.

- Preheating in the clamps
- Cleaning of the weld area with a wire brush before welding to remove oxidation and dirt.
- Annealing is still the critical step to avoid cracking.

MIG, oxy-acetylene or stick welding are just the methods of moving metal. Bandsaw steel is subject to high stresses and fatigue cycling, so getting the weld area as close to that of the rest of the blade, in terms of metallurgy, is critical.

Automatic Levelers

Automatic leveling of bandsaws and circular saws has been around for a while. These machines are getting smarter, faster and easier to use, but it will be a while before there is a “hammerless” filing room because, by their design, they have limitations.

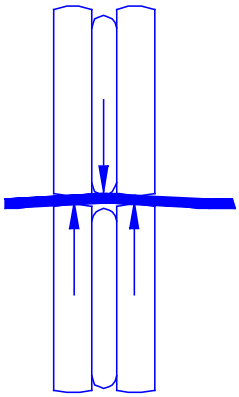

Figure 1. Three-point bending action of a dishing roll.

One of the biggest limitations is that they do not level the teeth, which affects the side clearances. Having straight teeth is critical when side grinding swaged bandsaws because the swage is centered on the tooth, but the side grinder references from the saw body.

Auto-levelers are basically bending machines. The sensor sees and deviation from flatness and the dishing rolls try to bend the plate to remove the bump. The 3-point bending action of the dishing rolls is shown in Figure 1. There are two things that can cause the leveler to not remove the bump.

1. The bump may be too short for the sensor to "see" it. If the computer control only reads the output from the sensor every 1 inch along the blade, a short bump, say from chips trapped between the wheel and the saw, will not be seen. Furthermore, if the reading is not taken at the top of the bump, the dishing rolls will not have their full effect on the bump.
2. The dishing rolls work best on bumps that run in the same direction as the rolls. See Figure 2(a), which shows a dishing roll running along a bump, and the hammer marks that would be used if manually leveling the bump. Figure 2(b) shows the dishing rolls working on a cross-lump. The auto-level does not do a good job on cross-lumps because the bending action is in the wrong direction, and the bending has to be done in several passes instead of one.

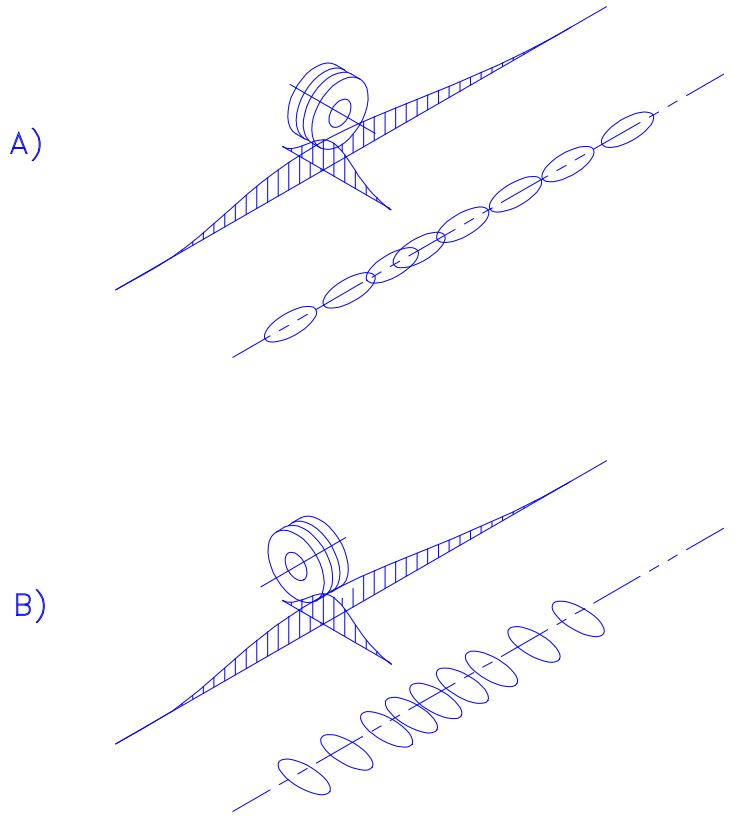

Figure 2. Effect of using a dishing roll A) along a bump and B) across a bump. The oblong circles represent the hammer marks the leveler would leave if the leveling were done manually.

For the reasons above, the current design of auto-levelers do not do a good job of removing cross-lumps. For the most part, cross-lumps have to be removed by manual leveling. However, since the leveler makes the plate fairly flat except for the cross-lumps, they can be seen and removed very quickly. This is less of an issue for band levelers since most of the lumps run parallel to the length of the blade rather than across the width. For circular saws leveling is two-dimensional, so cross-lumps (spokes) are common.

Tipping Problems

At one time, 12,500 sfpm was considered a limit for carbide ripsaws, but not anymore. Rim speeds of 14,500 sfpm are now used for relatively thin plates and tipping procedures are critical to achieving this. Obviously, these techniques will help keep the tips on even for less demanding applications.

Two common problems with carbide tipping are:

1. Contamination. The brazing process is also a chemical, as well as metallurgical process. Anything that interferes with the bond will affect the joint strength
    a. Not tipping soon enough after gumming the seat, so that a layer of oxide forms
    b. Not cleaning off oils, including oils from fingers, grinding fluid, etc.
2. Annealing. Too little annealing leaves the steel in the horn brittle. Too much annealing, and components of the silver solder start to boil off or form bubbles in the joint.

Automatic annealers have the advantage of being very consistent. Once the timing is determined, tip loss problems are greatly reduced

Uneven swages

An uneven amount of side stock (see Figure 3) on swaged teeth causes the saw to have a cutting bias, which requires guide lead to correct. Although the amount of side clearance is determined by the setup and wear of the shaper, the amount of stock is affected by how the swage pushes out the steel. Obvious problems of worn dies or anvils easily seen. However, how square the teeth are ground before they are swaged also has an effect.

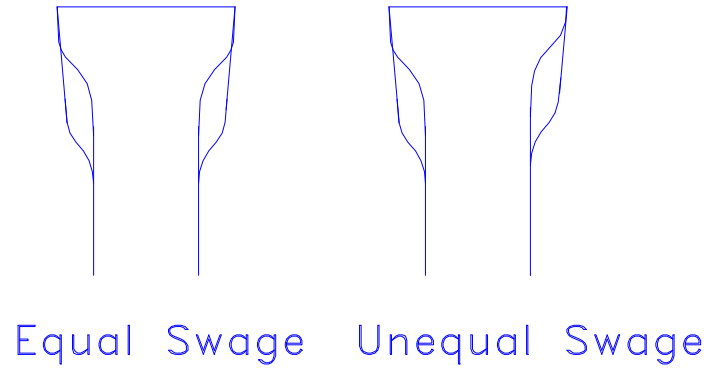

Figure 3. Uneven side stock on swaged tooth.

If the face or top of the tooth is not ground square, then the swage die will pull more steel to the high side of the tooth. Correcting this problem is done by adjusting the wheel alignment relative to the plate. See Figure 4.

- Wheel must be square to plate or the face will not be square
- Wheel must be centered over plate or top will not be square

Either alignment error will cause more stock to be pulled to one side of the tooth.

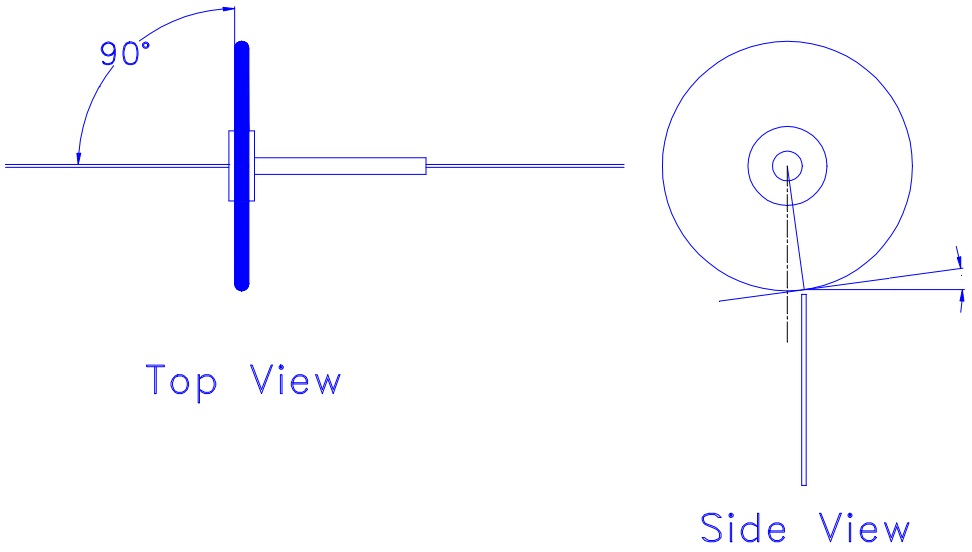

Figure 4. The grinding wheel must be at a right angle to the blade and the arbour must be centered over the plate.

Setting up Top & Face Grinders and Side Grinders

A common assumption when setting up circular saw grinders is that the faces of the clamping jaws are the reference surfaces. There are two reasons why this is not a good assumption:

1. The face of the jams are usually too worn to provide a good surface to measure from. The surface is also usually very small.
2. Most saw holders have a strong hold on the eye saw, which keeps the saw plate at a right angle to the support arbour.

The last point is important because even if the clamping force is large, it will never be enough to fully flatten the plate between the jaws. This means that the tooth will not be properly positioned for grinding, resulting in non-square faces or unequal side clearances.

Due to the rigidity of the saw holder the best reference for setting up a grinder is the saw arbour or the face of the saw holder, which can be assumed to be at a right angle to the arbour. Although most grinders have adjustments for the grinding head, a better place to start when tuning up a grinder is to check the saw support. A few common problems are:

- Carriage loose – worn or loose slides
- shaft is bent – too many saws dropped on it over the years.

Although squares and straight edges can be used to set grinding wheel square to the saw arbour, a fast, simple method is to use a small machinist's level, as shown in Figure 5. This method is also very accurate because the level can measure angles down to 0.005 degrees. Also, the symmetry of the grinding head rotation for alternate top grinding can be checked by using an angle block between the grinding wheel and the level.

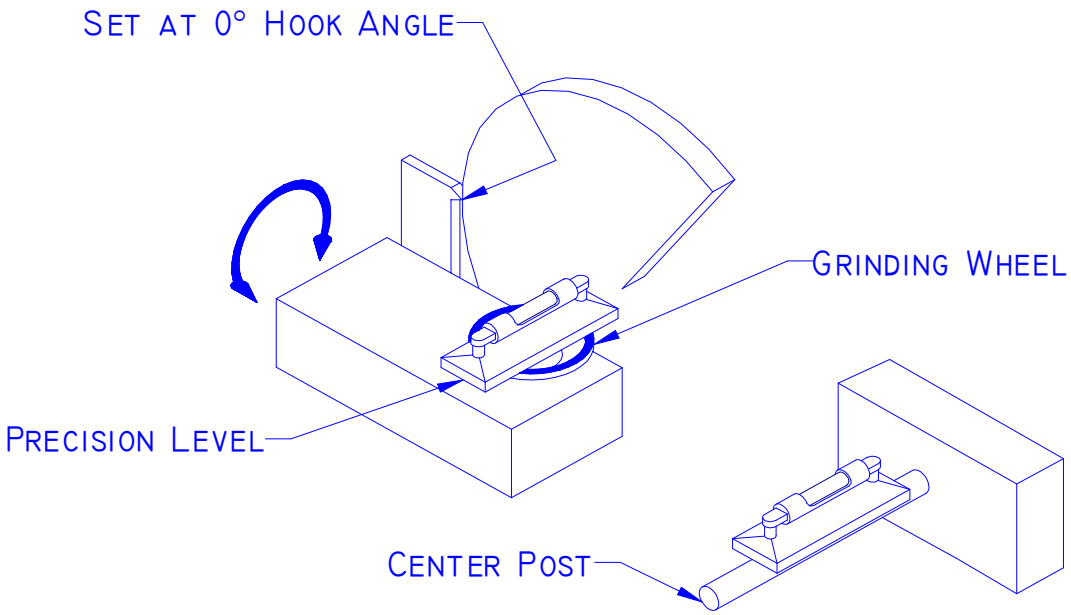

Figure 5. A quick and accurate for checking a top and face grinder.

For side grinders, the surfaces of a V-block mounted on the saw arbour, can be used as measurement references. See Figure 6, which shows a dial indicator, mounted on the grinding head, sweeping an angle gauge. If the dial does not move, then the grinding head angle is correct. If an angle gauge is not available, at least the zero setting can be checked by sweeping the face of the V-block.

Inexpensive, but sufficiently accurate, V-blocks and angle gauges are available from most industrial or machinist's supply companies.

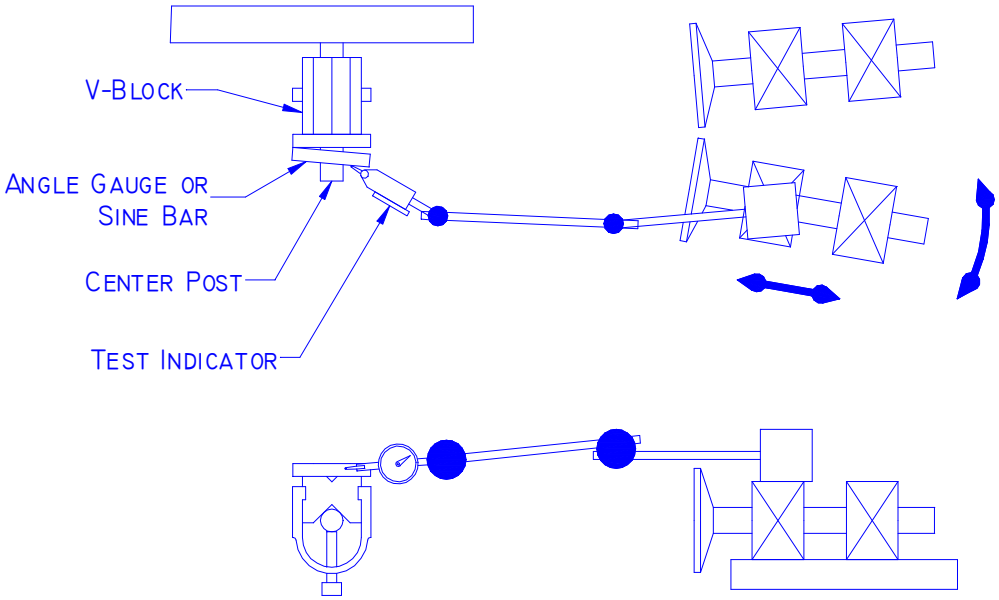

Figure 6. Using the surfaces of a V-block and an angle gauge on the saw support as measuring references for checking side grinder angles.

A common problem with side grinding is dubbing, usually caused by the tooth not being centered between the faces of the wheels. The result is that the tooth bends because one wheel contacts the tooth before the other. This is one reason why accurate centering of the tip on the tooth before brazing results in more accurate sharpening.

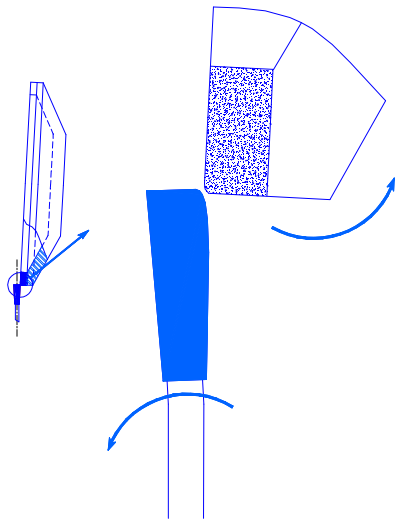

Figure 7. Dubbing caused by tooth bending. In the extreme case, the grinding wheel also bends.

Another reason for dubbing is one wheel is slightly ahead of the other, as shown in Figure 8. The result is the same: a dubbed tooth. This problem applies to cup wheel and peripheral wheel grinders.

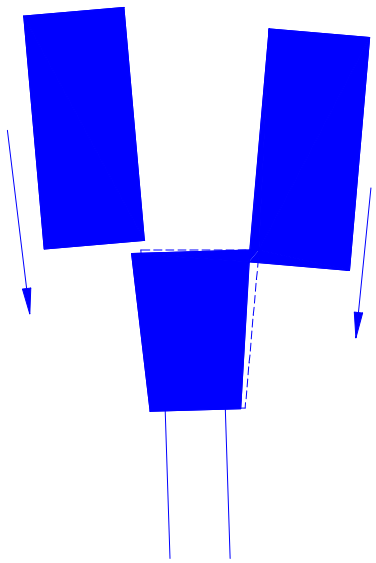

Figure 8. Dubbing during side grinding caused by one wheel being slightly ahead of the other.