Achieving Balance for your Stationary Bench Grinding Wheels

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Now that you've got your new 6" or 8" stationary grinder assembled and are ready to start grinding and sharpening everything in sight, there are a few things you should know before you begin. There is a good chance that at least one of the wheels that came with your grinder is a gray, silicon-carbide (carborundum) wheel. While suitable for grinding lawn mower blades and handling lots of general grinding chores, a carborundum wheel can quickly overheat and ruin the temper found in quality tool steel. To grind and hone the edges on your chisels, plane irons and woodturning tools, you will want to have an aluminum oxide wheel. Aluminum oxide wheels are cool running & allow you to grind your high quality edge cutting tools with less risk of overheating & ruining the steel's temper (http://www.highlandwoodworking.com/bench-grinders-accessories.aspx)

We've also found that many of the bench grinders available today have some manufacturing short-comings that often make it tricky to mount a wheel so it will spin true. We'll explain those in a moment, but first let's talk about the two orientations of a wheel spinning "true". These include the outside face circumference of the wheel running true & round (concentric to the spindle) and the side to side "wobble" of the wheel.

The outside face running untrue can be caused by an off-center hub hole, poorly made spindle bushings, excessive play due to an undersized arbor on the grinder or a spindle that spins with excessive run out. As you might guess, if the wheel is not centered on the spindle, the outside face will not spin true. Grinders made to more exacting tolerances will have spindles exactly sized so a wheel's arbor hole or bushing fits snugly onto it with no play. In addition, the spindles on top quality grinders will typically have less run out than homeowner grade grinders. If the bushing or arbor hole fits a bit loose on the spindle, the wheel can be tweaked closer to the centerline of the spindle before you snug down the spindle nut. The face of the wheel can also be trued with a wheel dresser, which is the most common way to true-up the outside perimeter of the wheel to be round and smooth running.

For any side to side wobble visible in a wheel, we've discovered that a wheel's wobble is greatly influenced by the washer mounting flanges. On our 6" high quality Baldor grinders in our classroom, the inside washer flanges are immobile and both the inside and outside washer flanges are nice and flat, with milled faces that contact the sides of the wheel in a precise manner. Unfortunately, many low cost grinders have stamped steel cup washers, whose flange faces are far from flat. In addition, the spindle arbors on these grinders often have a very scant shoulder milled for the inside washer flanges to bear against. These factors can induce variability as to how balanced the wheel will position itself on the spindle when it is secured with the washers and arbor nut (said simply, the wheel is difficult to clamp perfectly square to the shaft and thus wobbles). Some grinder models have "butterfly" cam locks on the arbor nuts, which seem to put uneven point pressure on the outside washer, inducing wobble. Despite these obstacles, by being methodical and patient, you can usually reduce the side to side wobble in your wheels through a deliberate process when installing your wheels onto the grinder.

Mount a wheel on the arbor shaft and secure with the washer & arbor nut **(do not over tighten the nut on the arbor, it can induce wobble)**. Spin the wheel slowly by hand. Notice the amount of side to side wobble. If it looks minimal, turn on the grinder and observe the side to side wobble at high speed.

Turn off the grinder. Wobble is most notable at lower speeds, as the wheel spins up and at the end of spin down. Because of this, you can actually make adjustments and do a preliminary check with the grinder unplugged because slow hand-spinning reveals wobble. (A small amount of wobble is usually always present on spin up and spin down.)

You can also use a sharp and steady pencil point and put it right at the outside edge, on the side of the wheel. Spin the wheel by hand letting the high side touch the pencil and make a mark on the stone's side, right at the outer circumference of the wheel.

Now you can think logically of how you may begin to move and shim the washer to exert pressure to move the high spot of the wheel back towards the center line of the wheel. You could do this by random moves of the washer or applying shims, but the process goes quicker if you make some hash marks around the wheel's paper blotter label (NOT on the label underneath the outside washer or you will not be able to see them). With 12 stations marked around the hub of the wheel and a single visible mark on the outside washer, as you move the washer around to different positions, you'll be able to see where you've been and where you are going as you reposition the washer.

As you move the outside washer to a new spot, you'll retighten the nut (remember, not gorilla tight, just lightly snug) and spin the wheel by hand to notice the amount of wobble. Do your best not to turn the wheel on the spindle. It is best not to alter the wheel's position on the spindle or the position of the inside washer on the spindle, because this induces more variation to how the wheel is balanced once tightened. You just want to move the outside washer to a new clock position, snug up the nut and spin the wheel to note the wobble. If you go around the clock positions and cannot find a location for the outside washer that reduces wobble, alter the position of the inside washer by 90 or 180 degrees and go through the steps again.

It may take a number of tries, but you should find a position that reduces the visible wobble. You can also direct pressure to the wheel in a targeted fashion by slipping a small shim(s) (pieces of a business card can work, double or triple thickness if needed) under the outside washer's edge before tightening the nut.

Just remember, it can take some time to go through the steps. When we stuck to the process, we always found the "sweet spot" of the washers and eliminated the wobble. Sometimes it took us 10 minutes, but reducing the wheel run out makes grinding tool edges much more predictable and is worth the effort.

A few more items to consider:

- With a two wheeled grinder, the spindle nut on the right side of the grinder tightens clockwise. On the left side of the grinder, the spindle nut is opposite. It tightens turning counter-clockwise.

- Check your washer flanges (both inside and outside) on a flat surface like the cast iron top of a table saw. If the faces of the washers are not flat or seemed warped, you can dress them by sanding them on some silicon carbide sand paper on a flat surface.

- If you change wheels often, make note of the washer position for a particular wheel. This may help you get back to a balanced position more quickly during wheel changes.

- If the inside washers seem to be rotating as you go through the balancing steps, use a little CA glue to immobilize them to the spindle.

- Check for excessive play with the type of plastic bushings that nest into each other (that let you bush to spindles of different diameters). A drop of CA glue into the seams between the bushings will bond the nesting bushings together as a single bushing. Do this with the bushing removed from the wheel so you don't accidentally bond the bushings to the wheel.

- Upgrade the stamped steel washers to machined washers. Don't use completely flat washers: they should be recessed on one side, so the force of the nut is transferred to the outer area of the washer and not concentrated on the hub of the wheel.