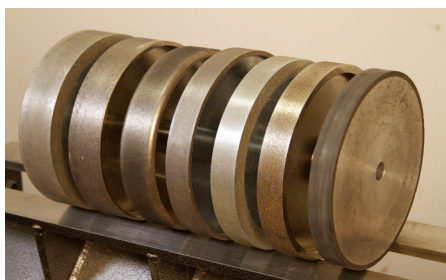


## CBN GRINDING WHEELS ~ by Reed Gray aka Robo Hippy

Well, by now, most turners have heard about them, and they are taking the sharpening part of our world by storm. The reasons are many, and after a few years of answering questions on the turning forums, I haven't heard any new ones pop up. Well, at least not lately, so it is time for me to finish this article.

First, CBN stands for Cubic Boron Nitride. It is an abrasive material. The only thing harder than it that I know of is diamond. There are both diamond and CBN wheels available for sharpening purposes. The diamond wheels are fine for carbide, glass, and ceramics, but don't handle heat well when used to sharpen the hardened steels like we use for our turning tools. CBN is ideally suited for any hardened steels as there is little heat build up, so breakdown of the abrasive is very minimal.

I started turning almost 20 years ago. I got my first grinder, a no name model from the local Woodcraft store, which had pretty standard white aluminum oxide wheels. It didn't take long to wear them out as I was doing a lot of turning, and kept the wheels clean. I went back and bought some fancy pink wheels which were the next best thing at the time, and they didn't last any longer. Being frugal, I figured this just wasn't good enough, and there had to be some thing better available. Thus began the search. I had been reading about diamond coated router bits and saw blades, and that led me to search for diamond wheels. After calls to Norton and Amplex, they both said that my choices were diamond or CBN. They actually informed me that there was a place locally that could make them for me. So, I called them up and told them what I was looking for, and they told me that the CBN was better than diamond for my HSS tools, but very expensive. \$300 for an 8 by 1 inch wheel. I bit the bullet, and ordered an 80 and 320 grit wheel. This was one of the best investments I ever made for my shop, even at the cost. After over 10 years of using CBN wheels, I can not think one single advantage that the more standard wheels offer.



Left to Right, Optigrind, D Way Regular, D Way Radius Edge, Woodcut, Raptrot, Cuttermaster, NW Super Abrasive



Nibs in the wheel guard that I had to grind down

### WHY CBN WHEELS

Well, first off, the wheel itself. There are two types. One is a mix of abrasive and a bonding agent, that is applied to an aluminum hub in a layer that is about 3/16 inch thick. The other type is a machined steel hub with the abrasive material electroplated to the surface of the wheel. Both types are already balanced when you get them. This means they will spin true and will not wobble unless your grinder has a bent shaft, or an unbalanced wheel on the other side. With the matrix bond type, there is tiny wear factor involved as the matrix is not as hard as the abrasive materials. They do develop a tiny amount of run out over a year or so of heavy use. I would take mine back and have them reground. I would clean them by using a very hard aluminum oxide stick that came with the wheel similar to using a diamond dresser on the standard wheels. This wheel is very similar to the Woodriver Diamond wheel that Woodcraft carries, or used to carry. Cindy Drozda had a YouTube clip up about using an oil lubricated brush on the wheel as she sharpened, but I am not sure it is still up. It seemed to help, and may have at least reduced run out in the wheel as well as keeping the wheel clean. Electroplated wheels never change size or shape, or need cleaning. There is no need to ever balance these wheels. Generally when you order them, they will include a machined bushing to match the wheel with your grinder shaft, or are drilled to spec. No cheap plastic bushings.

There is another advantage in that there is never any risk of these wheels exploding. They will not chip or crack from tool dig ins. You can not crack them from over tightening the nut. If you drop them they will not break.

The other factor is how long they last. My older matrix ones had different wear rates. The 80 grit, after over 6 years of production turning still had half of the matrix left on the hub. The 320 grit wore out within a little over a year. I got another one and had the same problem. I got a 150 grit wheel, and it seemed to last much better. It got retired after I got the electroplated wheels. The electroplated wheels do have a break in period, which depends on how much you use them. It took me about a month. They are very aggressive when brand new, with the 180 grit cutting faster than 120 grit. The 80 grit wheels cut a lot faster than standard 80 grit wheels. After they break in, they still cut faster, but the resulting bevel surface is more polished looking. The biggest difference between the two types is that the matrix wheels will leave a more shiny bevel surface, and do not cut as fast. After 3 years, my electroplated CBN wheels are still cutting like they did after the initial break in period. They will outlast by far any comparable dollar amount of any other grinding wheels I have ever seen. I have 2 sets that I am now using, and expect that my birth certificate will expire before they will.

## GRINDER CONSIDERATIONS

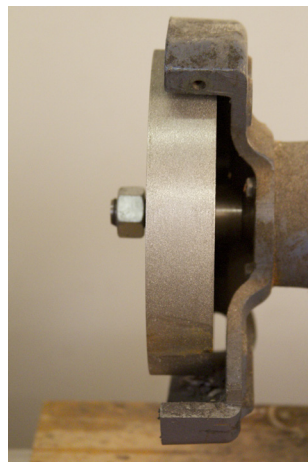
High speed or slow speed: Really, it doesn't make any difference. These wheels work fine on either grinder. They are probably safer than standard wheels on the high speed grinders because they are balanced and run true. With the high speed grinders, you will take off steel at a higher rate. If this is a problem, it is because we tend to use too much pressure when sharpening, and go back over the grind a couple of times rather than one pass right through. I prefer the slow speed just because that is what I am used to. If you are a beginner, and are not used to being around a grinder, the slow speed models would be less intimidating. Because the wheels are more aggressive than standard wheels, if you want your tools to last longer, a very light touch is the most important thing. Horse power: These wheels are heavy, with the Cuttermaster being the heaviest at around 8 pounds. There can be huge difference in actual strength of the motors. Both my no name and my Baldor Grinders have 3/4 hp motors. The difference in actual strength is about the same difference in actual weight, with the Baldor being twice as heavy. I can barely stall my Baldor, but the no name is fairly easy to stall. This does make the light sharpening touch important, and for sure you are more aware of pressure on the weaker motor, which might be a good point. A newer grinder on the market is the Rikon 8 inch grinder. It has a 1/2 hp motor. I haven't put these wheels on this grinder, but others have. There doesn't seem to be any problems at this point. My main concern would be that start up is a strain on the motor with these heavy wheels, and with the weaker motors, it could lead to early wear out/burn out. If one of these was my main grinder, I would hand spin the wheel first before starting the grinder up. This could be more than is necessary, and maybe not even a point to consider. I did concrete construction for 30 years, and prefer every thing to be over built rather than under built, so it is an opinion based on no actual facts that I have. To date, I have not heard of a grinder frying because the wheels were too heavy, so it may be nothing to worry about. In the same line of thought here, no, you should never run 8 inch wheels on a 6 inch grinder, ever.

Because of the extra weight of these wheels, when you turn your grinder off, they will continue to run for much longer than the standard light weight wheels. I just let them spin down and don't worry about it, because it is something I am now used to. If you have other people in your shop, it might be a good idea to stop the wheel. Since I round off the heel on both my scrapers and gouges, I use them as a brake by putting the secondary bevel on the wheel till it is stopped.

Grinder shaft length: They are all different. With my Baldor grinders, the shaft is 3 1/8 inch long. The grinder comes with nice flanges to support standard flat sided wheels. They do not work on the steel hub CBN wheels. I had machined washers made that were 5/8 inch thick, 1 1/4 inch wide, and with a 3/4+ bore (3/4 inch exactly would be too tight to put on and take off), and a slot cut for the cotter pin in the shaft. This spaces the wheel far enough from the motor so that the nut will tighten down onto the wheel. It needs some type of spacer here. I tried a bunch of the stamped washers from the big box store, and it worked kind of. When I started the grinder up, there was noticeable side ways wobble in the wheel. When the wheels got to full speed, the wobble was almost totally gone. The machined spacer was much better. With my no name grinder, the shaft is 2 1/16 long. this is kind of minimal. I got the nut on to secure the wheel, and while the shaft does not go all the way through the nut, it is 3/4 of the way through, and sufficient to hold the wheel on. I did have to grind down the screw indents on the inside of the sheet metal wheel guard so the wheel would spin freely. I was not able to get the Optigrind wheel to fit on with the side grind facing the outside of the grinder, which is how they are supposed to mount. It did fit on securely with the side grind towards the grinder.



Nib/key on Baldor grinder shaft



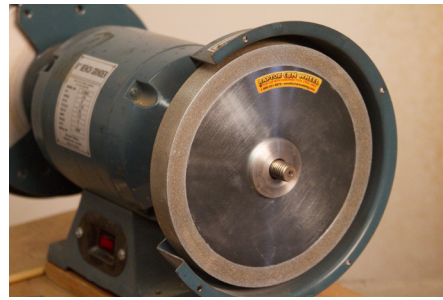
1 1/2 inch wide wheel on Baldor grinder with inside spacer



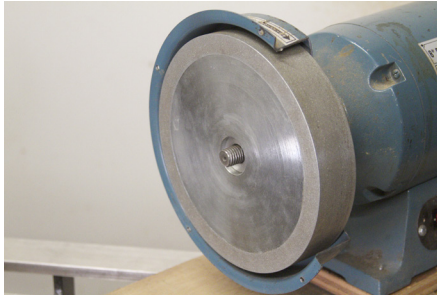
Cutter Master on Baldor grinder



1 inch wide Woodcut Wheel



1 inch wide Raptor



Optigrind with side grind to the outside. It would work with a custom fitted nut that would fit into the recess



Raptor on No Name grinder

## WHAT CAN YOU GRIND ON THEM

CBN is made for hardened steel, so for all of the HSS, M4, and V 10 and V15 powder metals, they are perfect. There are some who claim that you need the CBN wheels to get the best edges on the V 10, V 15, and M42 cobalt HSS steels. Doug Thompson does all of his sharpening of his tools on the more standard wheels. He does have an excellent sharpening video up on You Tube. Cindy Drozda did a blog spot about how the CBN wheels give a better edge on the V10 tools, and other turners agree. I have no experience with sharpening these more modern steels on standard wheels, so can't really say if one is better than the other. I use scrapers a lot, and they are my main bowl roughing and shear scraping tools. I noticed right away that the burr from the CBN wheels was by far superior to the burr from the standard wheels. It is much stronger, and sharper. I have experimented with burnishing a burr on my scrapers, and can't tell that the burnished burr has any real advantages. One note here, I use a triangle burnisher, and not the one that screws down to your work bench. I do sharpen them right side up as opposed to some who feel that doing it upside down gives a sharper burr. For sure, upside down on a CNB wheel leaves a sharp burr, but not as durable as the right side up burr. The actual sharpness is similar. I am going to have to question Jimmy Clewes about this at the AAW Symposium this year and get some feed back from him as he sharpens his scrapers up side down on standard wheels. I have tried carbide tips on them, and it does work, but is very slow. I guess you could get away with it for a bit, but I would not make a habit out of it. Diamond wheels are better for this.

The advice on what you can and can not grind on CBN wheels differs a bit from manufacturer to manufacturer, but general advise is not to grind non hardened steel or other softer, non magnetic materials on them. Main reason is that they can load up and the wheel might be damaged. I have ground my bench chisels on them, and they work fine, with no loading at all. I have ground cold rolled steel on them, and they do load up a bit. You will notice a ticking sound and slight bump as you sharpen. You can remove this fairly easliy by sharpening a HSS scraper on the wheel. It may take a time or two, but the wheels still seem to cut very well. I tried some aluminum on a wheel just out of curiosity. The interesting thing to me was that I could see little flakes flying off, which were a lot bigger than the metal dust that came off my other tools. I got a little silver line on the wheel. I took a scraper to it and it cleaned up very well, but took a couple of sharpenings to get it all off. To me, this means, save the old grinding wheels if you want to grind away some soft steel or other things. You might get away with it a time or two, but for anything but the lightest touch ups, keep it restricted to hardened steels, not soft carbon, or non magnetic materials.

I do turn a lot of sloppy wet wood. I do not get all of the sludge off my tools when I take them back to the grinder. This does load up the wheels and make them look dirty, and black. I don't worry about it. They still seem to cut just fine. I used to take them in to the kitchen sink and apply some Ajax and use a plastic bristle brush, which would clean them up almost as good as new. I haven't bothered in more than a year just to see how long they would continue to cut. My scrapers to seem to keep build up at low levels, but never clean them up to good as new condition.



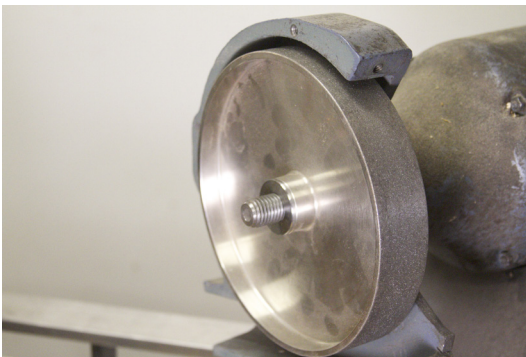
Wheel guards: I asked Craft Supplies, who carries the Optigrind made wheel in a 1 inch width (Raptor wheel) why they didn't go with the 1 1/2 inch width wheels. Their main concern was in keeping the wheel covered with the wheel guard, and some grinders will not take the wider wheels and still be able to keep the full guard on. There are some turners who have entirely removed the wheel guard. For sure, there is no risk of the wheel breaking, so that would mean that a guard is not strictly necessary. Giving consideration to 'liability' I can see that it could be a concern. I have left the inside one on my Baldor grinder, in part because they are part of the structure to seal the inside of the grinder, but I don't have the outside one on. With my spacer on, the outside part of the guard will not fit on.

Metal dust: One turner, as an experiment, who had totally removed his wheel guards, hung a magnet about 6 inches above his grinder. It picked up a considerable amount of grinding powder. I also made a recent discovery. I took a Moffat lamp down from a shelf that was about 30 inches above my grinder. It was still in the box it was shipped in, which was one with the 1/4 round dog ear flaps on the top/lid that slip into the sides of the box to close it but not taped shut. I opened up the box just to check on it, and found a ring of metal powder on the box that had the magnetic base. I had always thought that the metal dust was too coarse and heavy to float around like wood dust. I posted this discovery on the turning forums, and got a lot of different responses, but mostly it was yes, do wear your dust mask when grinding as well as when turning. I left my inside guards on both of my grinders, if for no other reason, just to confine the powder. After discovering this, I am thinking that I should put the full cover on my Baldor grinder to help contain the dust. Care must be used when hooking any type of dust collector to your grinders. There are some especially made for metal grinders and spark containment, but most of us will never have one. Some turners have put magnets in plastic bags under and behind the wheels, which pick up most of the dust. I do have a back splash, which helps contain things better, and have swept the dust on the bench into the shavings.

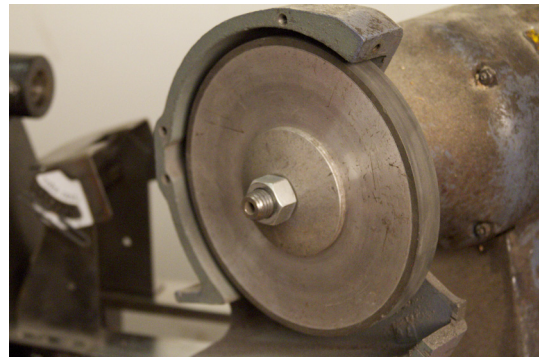
There have been a couple of reports of shavings starting to smolder from the sparks generated when sharpening. The sparks from the CBN wheels are very minimal, but it can happen. This happens with standard grinding wheels also. It is best to keep the area under the grinder free from shavings in the first place.

Fuzzy tools: When I sharpen, most of the time, I do a number of tools at one time, then turn till they are all dull, then sharpen again. I found that when I lay a tool next to the grinder, then pick it up after I have sharpened a few other tools, it tends to be covered with metal powder. I tap it on some steel bar I have, and that gets rid of most of it, or at least enough so that I don't worry about it. This has been old habit any way because I green turn my bowl to final thickness, then let them dry and warp. Any remnants of this powder will leave black specs all over my wet bowls. For finish cuts, I will actually wipe off the tool with shavings in addition to the tapping on bar stock. You can also pick up a 'demagnetizer' at the local big box stores.

Tormek/wet wheel grinders: While CBN wheels are not made to that same size (about 2 by 10 inches), I have heard that they have been mounted on this type of grinder. They do work, but at a slower rate.



D Way Standard wheel on Baldor grinder



NW Super Abrasive with standard flange on Baldor grinder

## WHICH ONE TO BUY

Well, to me, the main decision is do you want a 1 inch wide wheel or a 1 1/2 inch wide wheel. Most turners are used to the 1 inch wide wheels. The main problem I had with them was that no matter if I was using a jig to sharpen my gouges or doing it free hand, I would, on occasion, fall off the edge of the wheel and dig a big groove in the wing of my gouges. That has never happened with the wider wheels, so that makes them my favorites.

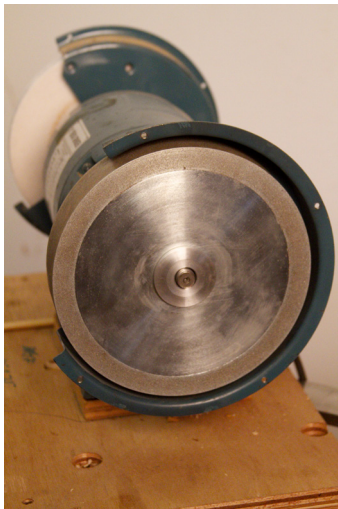
As far as over all quality of the wheels, there is almost no obvious difference. If I had to pick a 'best looking out of the box' winner, I would probably go with the Cuttermaster. I have sharpened extensively with it, the Optigrind, and the D Way wheels. I could detect no difference in how they cut for comparable grits. I would doubt that there is significant difference in how long they last under heavy use. I am still working very hard on wearing out the wheels I have. I will let you know if I ever accomplish this task.

One wheel with a difference is the radius edge version that D Way makes. I looked at it and scratched my head to wonder why this was done. It was some thing that David Ellsworth wanted, and after hearing the explanation, it makes some sense. The main advantage would be for sharpening hollowing tips. These are generally put in jigs, and it is easier to push them around the round edge than it is to rotate the jig to sharpen the edge. I had seen a John Lucas You Tube clip about doing it this way with a more standard wheel, and after thinking about it, it made more sense to me. I can't really see it being any better for standard tools, but they do seem to be popular. This means more experimenting for me.

The side grind option: This is one that I don't use. I really can't see any need for it. In chatting with Dave Schweitzer of D Way tools, he said the main appeal is to the carvers. Some turners seem to prefer no bevel on their skew chisels, which is the only other use I can think of, with the possible exception of some hollowing bits. If the side grind option was important to me, I would give the advantage to the Optigrind wheel which has a strip of abrasive, about 5/8 inch wide on the side of their fine grit wheel only. D Way and Cuttermaster have 1/4 inch.

Some turners can only afford one wheel. Understandable. If you can only get one, I would suggest the 180 grit. Main reasons for using the coarser 80 grit is because it is great for raising a good burr on scrapers, and some reshaping of your tools. The scraper burr raised from the 180 grit wheel is still very effective. The 180 grit is perfect for minimal reshaping and general sharpening. A number of turners have put one wheel on to try them out, and noticed how huge the difference was in how their grinder ran, and then put the other wheel on. You don't have to get 2 of them, but it is nice if you can afford it.

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1 1/2 inch wide Optigrind, mounted with side grind to the outside. Notice there is not much shaft left to thread a nut onto.



1 1/2 inch wide Optigrind reversed. Plenty of thread left on the shaft. Note holes drilled to balance the wheel.



NW Super Abrasive Matrix wheel



Machined washer with groove / keyway for fitting over the pin on the shaft

D Way Tools  
<http://www.d-waytools.com/>

Optigrind  
<http://www.optigrind.com/>

Cuttermaster  
<http://www.cuttermasters.com/>

Woodcut Wheels  
[http://www.packardwoodworks.com/Merchant2/merchant.mvc?Store\\_Code=packard](http://www.packardwoodworks.com/Merchant2/merchant.mvc?Store_Code=packard)

Craft Supplies  
<http://www.woodturnerscatalog.com/>

Northwest Super Abrasive  
<http://www.burtonsaw.com/contact.html><http://www.burtonsaw.com/contact.html>

These are the newest ones on the market that I know of. I haven't seen or used them.  
<http://woodturnerswonders.com/products/cbn-wheel-pair-80-and-180-grit>

Cindy Drozda Blog:  
<http://cindydrozda.blogspot.com/>



Sharpening a scraper with Radius edge D Way wheel



New 4 in 1 wheel from Wood Turners Wonder



Machined washer with groove / keyway for fitting over the pin on the shaft