

## The Whole Story...

# Dressing for Success: Preparing Grinding Wheels To Be At Their Cutting Best

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To understand the importance of dressing a grinding wheel prior to surface finishing, you must simply consider the definition of the term. As the process of sharpening the abrasive elements within the wheel, dressing breaks down the bond and removes dull abrasive grains, thereby exposing new, sharp abrasive particles. Dressing also removes tiny pieces of material from the pores of the wheel face to prevent wheel loading, which can cause vibration and burn marks on the work piece. It is easy to understand why, without proper dressing, you cannot achieve the maximum quality, consistency, and adherence to specs from even the highest quality, diamond superabrasive wheel. In fact, when you invest in top-quality grinding wheels, it is especially important to dress them properly to reap the quality and performance benefits that alone can justify their higher prices.

Truing is a companion wheel-preparation process that is performed at the same time as dressing on conventional grinding wheels. With superabrasive wheels, the two processes are accomplished separately, with truing performed first.

### Good dressing practices

Before dressing, it is important to ensure that spindle bearings are as warm as they normally are during grinding. Bearing warmth prevents loss of part geometry and abnormal wear in the dressing tool and the wheel. Operators should handle tools carefully because diamonds are brittle and susceptible to cracking and chipping if dropped.

Since a diamond dresser is itself a cutting tool, it must be sharp to do its job. Dull dressing tools glaze wheel faces, producing dull wheels. To maintain a well-defined and sharp diamond point, an operator can rotate a single (or cone) point tool one-eighth of a turn at regular intervals. The frequency of these rotations will depend upon wheel use, but a daily rotation (minimum) is a good, rule-of-thumb. Chisel and form tools are typically rotated (flipped) 180° once in their life cycles.

Most cylindrical grinders are arranged so that the work piece and the grinding wheel are on the same horizontal plane. The point where the circumference of the work touches the circumference of the wheel is known as the work/wheel contact point. The diamond tool should dress the wheel as close to this point as possible. On internal grinders, the orientation of the diamond to the work/wheel contact point is even more important.

### Take light cuts

During dressing, operators are often tempted to take cuts that are too deep in order to reduce dress times. This procedure causes more problems than benefits. An infeed that is too heavy will overheat the tool, reduce its life and waste valuable abrasive. The outcome will be a dull tool that produces a dull or closed wheel. The objective of dressing is to restore a wheel's geometry and cutting capabilities while removing no more of the wheel than necessary. (Figure 1.)

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## Dos and Don'ts in Using Diamond Dressing Tools

### Do

- 1 Back off from the previous feed before inserting a new dresser. Many diamonds are damaged during initial touch-off.**
- 2 Set the diamond point at a 10- to 15-degree angle, pointing in the direction of wheel rotation.**
- 3 Tighten the dressing tool solidly in its holder without any unnecessary tool overhang.**
- 4 Use coolant whenever possible. Flood the tool's point of contact at all times during dressing.**
- 5 Start dress at the highest point of the wheel, usually the center.**
- 6 Take light cuts. Minimum depth for roughing: 0.001 to 0.002 in. For finishing: 0.0005 to 0.001 in.**
- 7 Use the correct traverse rate. The slower the traverse rate, the lower the finish.**
- 8 Dress wheel at regular intervals to prevent loading the surface.**
- 9 To maintain a sharp point, turn the tool in its holder one-eighth turn in one direction at regular intervals.**
- 10. When diamond wears dull and visibly flat, reset or replace it.**
- 11. Get the right carat size diamond for your wheel diameter. Bigger wheels require larger diamonds.**

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Figure 1

### SUGGESTED INFEEED AMOUNT PER PASS

Single Point and Cone Point Tools	.001" up to .0015" maximum
Chisel, HPB Blade Tools	.001" up to .002" maximum
Multi-Point (Nib) and Cluster Tools	.001" up to .005" maximum

NOTE: When truing and dressing ceramic (SG) wheels, reduce infeed amounts by 25% and 50% when dressing large (LG).

Figure 2

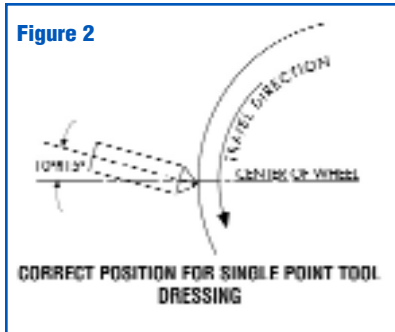
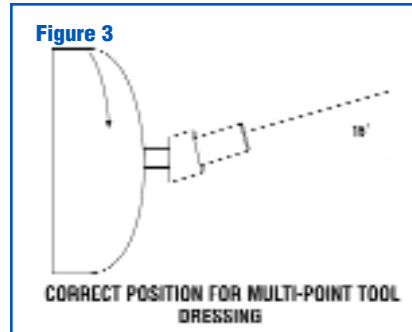


Figure 3



With single-point dressing tools, one should approach the grinding wheel at a 10- to 15-degree drag angle. (Figure. 2.) This will create a sharpening effect for the tool when it is rotated. Multi-point (impregnated) tools do not require a drag angle. Instead, when using this type of tool, the operator should approach the wheel with full-face contact. (Figure. 3) The traverse rate, which is the speed at which the tool moves across the wheel, is critical to achieving the desired part finish and metal removal rate. A traverse rate that is too slow tends to close up the wheel, jeopardizing part finishes and metal-removal rates. A slow traverse rate can also cause a wheel to vibrate and burn the workpiece. Faster traverse rates create an open wheel face, removing more metal and accelerating part finishing.

## Stay cool!

The proper use of coolant speeds dressing and makes it more effective. As a rule of thumb, use a three-eighths-inch diameter stream of coolant to remove excessive heat from the tool during dressing. This procedure extends tool life.

To accomplish effective cooling, operators should position the coolant nozzle to either flood the entire wheel face or follow the diamond tool as it moves across the wheel. They should never allow the tool to go in and out of the coolant flow while it is in contact with the wheel. That situation can cause extreme temperature changes, causing diamonds to crack or cleave.

Metalworking operations should filter coolant to avoid recirculating dirt or chips, which can load the wheel and lead to the need for more frequent dressing. Operators should dress dry only when they are going to grind dry. In such cases, operators should allow frequent intervals for the diamond tool to cool. Otherwise, burning and fracturing may result. After the coolant flow is shut off at shift's end, the wheel should be allowed to idle for a few minutes. This procedure will help prevent wheel breakage.

## Vibration is the enemy

It is crucial to minimize vibration during wheel dressing to avoid diamond marks, gouging, and damage to the tool. This requires proper balance, which begins with the structure of the grinding wheel itself and is beyond the control of the operator. Density variations and overall wheel geometry affect its inherent balance, so selection of a quality product, even if it's not the least expensive alternative, is essential. Nothing anyone can do will prevent a poorly made, out-of-balance wheel from vibrating.

Assuming a quality grinding wheel from a quality manufacturer, proper installation will keep the wheel in balance and minimize vibrations. Follow the manufacturer's directions. For example, one should follow the mount-up arrows on the wheel in order to locate the light point. Mounting the wheel with the mount-up arrow pointing upward minimizes imbalance after dressing. Also, even coolant distribution helps maintain balance.

Other steps to take in reducing vibration include being sure that the tool is tight in its holder and rigidly supported. Also, overhang should be kept to a minimum. A loosely held diamond tool will produce vibrations leading to chatter, gouging and tool damage.

It is impossible to overemphasize the importance of properly truing and dressing grinding wheels. In fact, a wheel that is not trued and dressed well should not be allowed to touch a workpiece. The quality of a company's finished products is at stake.



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