

## Glossary of Grinding Terms

**Arc of Cut:** The part of the wheel that contacts the workpiece.

**Aspect Ratio:** The ratio of an abrasive's grain length to its width.

**Cermet:** A heat-resistant alloy formed by compacting and sintering together a metal and a ceramic material.

**Continuous Dressing:** A process where a diamond dressing roll sharpens the grinding wheel by removing dull grits all the time the wheel is machining the workpiece.

**Creep-Feed Grinding:** A process where a very soft and porous grinding wheel takes a deep cut in one slow pass. Well-suited for difficult-to-machine materials, the process offers a high stock-removal rate with accurate form retention.

**Cylindrical Grinding:** A process for machining round components.

**Dressing:** Removal of undesirable material from a "loaded" grinding wheel by using a diamond tool.

**Dry Machining:** A metal-removal operation where coolant is not applied to the cutting tool/workpiece interface.

**Friability:** The ability of an abrasive to fracture.

**Hard Turning:** Turning hardened metal on a lathe to eliminate grinding it.

**ID Grinding:** A process that removes metal from the inside diameter of holes or profiles by applying a very small, high-rpm grinding wheel.

**Reciprocal Grinding:** A process where the workpiece is mounted on a table that moves back and forth beneath the grinding wheel.

**Swarf:** The mass of chips and debris remaining after grinding.

**Truing:** Application of a diamond tool to a grinding wheel to ensure roundness and concentricity.

are impervious and have no porosity.

Care must be taken to apply the grinding fluid properly to plated and metal bond grinding wheels to prevent them from hydroplaning. Significant hydrodynamic pressures in the arc of cut can lift the wheel from the workpiece surface, resulting in poor surface finish and high wheel wear.

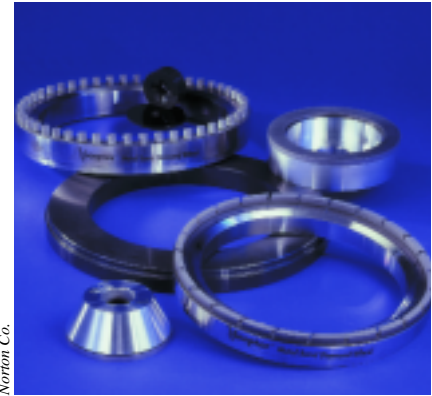
The choice of bond and abrasive go hand in hand. For example, CBN might be the abrasive of choice if the wheel form is to remain exactly the same over the life of the wheel and it will stay on the machine spindle until spent. Since CBN conducts heat so well, a metal bond is advantageous. This combination provides a cool-cutting wheel, since the heat flows into the grain and wheel and away with the coolant rather

than into the workpiece.

There are two types of metal bond: plated and sintered. Plated wheels are never dressed; they are made to the exact form and grind until spent. Sintered wheels are generally dressed by the electrical discharge machining process while off the grinder, and then are mounted like a plated wheel.

Both sintered and plated wheels need to be set up to minimize spindle runout: 0.0005" or less. Minimal spindle runout is especially important for metal bond wheels. Because the grains protrude a short distance above the bond, runout of 0.001" might cause excessive wear to one portion of the wheel while another section's grains remain sharp.

Some plated applications can form very tight radii (0.005" or so), but this



Pictured are various metal-bonded diamond wheels for ceramic OD and ID cylindrical grinding.

bond is generally reserved for more open forms with radii greater than 0.020". Often, plated wheels are applied in high-speed grinding applications and sintered wheels are used on ceramics.

Solid metal wheels have little forgiveness for vibration, runout and fluid flow. If the grinding machine, part and/or fixture lack rigidity and/or the machine is old with less-than-perfect bearings and without an on-machine balancer, then the unforgiving plated wheel may cause wheel-life, surface-finish and surface-integrity problems. A resin bond would be a better choice, based on the condition of the machine tool and vibrational instability. Resin bonds have excellent vibration-damping capabilities. However, the wheel would need to be trued and dressed, and there are costs associated with dressing devices and dressing time.

Vitrified bonds are the most popular bond, as they make for a porous wheel. Vitrified bonds allow effective application of the grinding fluid to the arc of cut and provide ample chip clearance for the grinding swarf. Vitrified bonds are easily dressed to shape and sharpness with diamond dressing tools.

*This concludes the first part of "Abrasive Lessons." The second installment will appear in the April edition.*

### About the Author

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