

Grinding Wheels - A Basic Explanation

In brief review, the primary objective of precision grinding is the efficient and economical production of workpieces with a defined surface finish quality and required dimensional and shape tolerances. The tool which is most widely to accomplish this goal is the grinding wheel.

Grinding wheels are composed basically of bond and abrasive grain. Grinding wheels contain thousands of abrasive grains, each of which displays multiple cutting edges. A grinding wheel with proper bond and abrasive grain type for a given application will be able to constantly resharpen itself by grain fracturing and grain release. These processes continuously present new sharp cutting points on the grinding area of the wheel.

In order to select the best grinding wheel for your particular application, a general understanding of the elements of the wheel is necessary. The combination of abrasive type, abrasive grit size, hardness grade, grain structure and bond type determines wheel performance. By varying the volume and type of each of these elements, the effectiveness of the wheel can be adjusted. The following is a brief description of each.

ABRASIVE TYPE

The abrasive grain is the element of the grinding wheel that actually cuts the chips from the workpiece. There are four basic abrasive types:

Aluminum Oxide, Silicon Carbide, Diamond, and Cubic Boron Nitride (CBN)

ABRASIVE GRIT SIZE

All abrasive grains are sized according to an established worldwide standard and are designated as a numerical grit size. The larger the number, the smaller the grain size. Generally, large number, or coarse grain size will increase stock removal rate, but provide a less desirable surface quality. Fine grit sizes provide less stock removal, but improve surface quality. Most grinding wheel manufacturers utilize combinations of two or more grit sizes to produce various effects in grinding actions.

HARDNESS GRADE

The hardness grade of a wheel is designated by a letter (A to Z, soft to hard). This grade represents the amount of bond contained in the wheel, which regulates the ability to hold the abrasive grain in the wheel. Normally, harder grades produce better surface quality, but provide smaller chip removal rates than softer grades.

GRAIN STRUCTURE

The grain structure of a wheel refers to abrasive grain spacing within the wheel. This grain density is identified by a number 1 thru 16. The more open the structure within the wheel, the higher the number designation. A denser wheel will generally provide a better finish, but will generate more heat and slower metal removal than a more open structure wheel.

BOND TYPE

The grinding wheel bond, or binder, is the material which holds the abrasive grain. The essential properties of the best bond for any particular application are:

- The ability to retain the grain during the grinding, self sharpening and dressing application.
- Ability to allow the grain to be "pulled out" when the grinding friction becomes too high because the abrasive grain has become too dull to properly cut.
- The four major types of bond are: Vitrified (V), Resinoid (B), Rubber (R), and Metal (M).

For the woodworking industry, the vast majority of grinding wheels used are an aluminum oxide abrasive type with a vitrified bond. Within each category, there are numerous different types of aluminum oxide and bond types that can be supplied, depending upon the manufacturer.

As you can now see, the proper grinding wheel determination is not a simple task. Each change made in any of the five elements within the grinding wheel affects the others and can react in various ways. Other variables must also be considered in determining the best grinding wheel for your application, including the type of steel being ground, type of grinder being used, and grinding techniques.

Your grinding wheel supplier can best advise you on the proper wheel for your application after review of your specific needs. The Weinig Tooling Department has matched as closely as possible our wheel configurations to our steel products. If you have a special application or are simply confused as to what wheel you should be using, don't hesitate to contact the Weinig Tooling Department. We are ready to help.