Why There Is No Such Thing as an Unbreakable Grinding Wheel

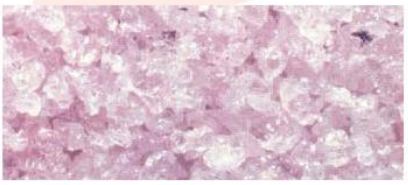
Novices to the grinding wheel industry have asked, "Why don't you eliminate all broken grinding wheel accidents by inventing an unbreakable wheel?" While this concept may sound ideal, it is impossible. To date there is nothing people have constructed that can't be broken.

Grinding wheels are made of different materials for different applications and have many different physical dimensions. The nature of an abrasive wheel is to break away a little at a time; during this action they are designed to re-sharpen themselves in varying degrees to perform their specific application. The need for different types of abrasive wheels for different applications means improper use can lead to wheel breakage.

Some of the major factors that affect a grinding wheel's strength are listed below:

- ***The type of abrasive grain used in the product.*** For example, zirconia alumina is a tough, block-shaped material used in applications that require heavy stock removal and do not require a high quality finish. This abrasive retains its shape when exposed to very high stresses and is commonly used in aggressive applications. On the other hand, a material such as white aluminum oxide is more friable, removes less stock and provides a more precision finish. Aluminum oxide is commonly found in tool grinding applications. Both types of abrasive have different strengths and functions. Both are designed to meet our customers' needs.

EXAMPLE OF TWO DIFFERENT TYPES OF ABRASIVES



Aluminum Oxide Grain

Seeded Gel Grain

- ***The size of the abrasive grain used in the product.*** Typical abrasive grain sizes range from a coarse grit of 4 to a micro-grit size 900+. As the size of the abrasive changes, the ability to form bond posts or to adhere the abrasive grains together changes. This change can impact an abrasive wheel's strength, but is essential for stock removal and product finish during use.
- ***The bond system or glue, which holds an abrasive wheel together, does affect the wheel's strength.*** For example shellac bonds commonly used in low-speed polishing applications cannot be used in the high-speed applications, which are more typical of resin-bonded wheels. Wheels that are required to do high-speed rough grinding applications such as steel conditioning wheels must be stronger than a wheel designed to do low-speed polishing or buffing applications. Different abrasive wheels for different applications.

continued

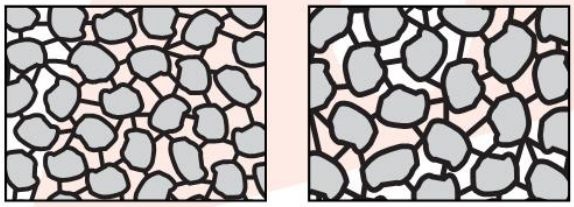
PLAY IT SAFE AT THE WHEEL

Why There Is No Such Thing as an Unbreakable Grinding Wheel

The wheel's structure is the relationship of abrasive grains to bonding material and the relationship of these two elements to the porosity (spaces or pores) that separate them. We use a scale with a 2 structure representing closed spacing (dense) and a 28 structure representing open spacing (less dense). Typically, products with high porosity are designed for less aggressive applications (for example, voids are considered bad in iron castings). Given this information, it is important to understand why abrasive wheel manufacturers design products with different structures. Imagine a rotating disc having abrasive points on its periphery. These abrasive points are a stack of cutting edges cemented one on top of another. Each time the disc revolves, the outermost abrasive grains (points) remove material from the work-piece. The amount of abrasive grain that is exposed to the work-piece and the space for the chip to be expelled is determined by the structure. Different applications require different wheel structures.

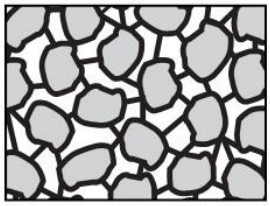
EXAMPLE OF WHEEL STRUCTURE

Sketches of two wheels of the same grain size and grade, but having different structures. Shaded areas represent abrasive grains, black lines are the bond, and white areas are pores.

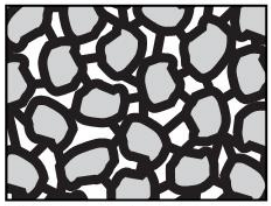


The wheel's grade indicates the strength with which the bond holds the abrasive grains. The scale ranges from the letter A to ZZ with increasing toughness as you move up the scale. Some applications require that as the abrasive grains become slightly dull, they must be released to expose new grains and in other applications it is desirable to hold the grains firmly until the abrasive is completely used.

EXAMPLE OF WHEEL GRADE



Abrasive grains with light bond coating and weak connecting bond posts, as in a relatively soft grade wheel. Light areas are pores, required for chip clearance.



Abrasive grains of same size, but with heavier bond coating and thicker, stronger bond posts, as in a harder grade wheel.

The abrasive wheel's shape (straight wheels or formed wheels) can be a major factor in a wheel's strength. For example, a cup shaped wheel does not have the same rotation strength as a straight wheel, but there are applications that require grinding on the side of a wheel and the cup shape is the correct tool for this type of application.

Over 250,000 uniquely different bonded abrasive products are marketed by Saint-Gobain Abrasives. While these abrasive wheels can be very strong, if used improperly, all of these abrasive wheels can be broken. Don't assume you know the safe operating speed of your abrasive wheel. Before mounting a grinding wheel onto any machine, make sure it is the correct machine for the abrasive wheel and the work to be done. Don't over-speed, drop or abuse an abrasive wheel. Mount the grinding wheel properly, use a wheel guard, and wear the proper personal protective equipment. Follow all of the wheel and machine manufacturer's warnings and instructions as well as ANSI and OSHA safety requirements. Don't wait for the impossible unbreakable abrasive wheel; use the available products as they are intended to be used and be safe every day!

PLAY IT SAFE AT THE WHEEL