

## --A--

---

### **Abrasive**

Technically any material can be used to abrade another material. For industrial applications however, abrasives come from a select group of very hard minerals used to shape, finish, or polish other materials. In processes that grind, finish, polish, lap, or hone, abrasives are typically limited to synthetic minerals with the exception to diamond and garnet. Common abrasive minerals appear in various crystalline forms of aluminum oxide, silicon carbide, zirconium oxide, diamond and cubic boron nitride. As used in polishing or blast cleaning, an abrasive can be any substance used to remove material including ice, solid carbon dioxide, walnut shells, plastic, sand or aluminum oxide. Abrasives such as aluminium oxide, silicon carbide and Zirconia are typically called conventional abrasives due to their long history of use.

### **Abrasive Belt**

A closed loop of coated abrasive used on tools that range from small handheld equipment to very large machines that use belts five feet wide. Made by joining a strip of coated abrasive. Sizes of belts are specified firstly by width, secondly by the overall length of the loop. E.G 50 wide x 2745 long.

### **Abrasive Blast Cleaning**

A process that uses a high-pressure stream of air or water to propel abrasive particles at the surface of a work piece. Purposes vary from cleaning to removal of a coating or surface contaminants in preparation for painting or some other surface treatment. Abrasives range from silica, sand, garnet or aluminium oxide depending upon applications. Density, relative hardness, cost, and friability are important characteristics that determine the usefulness of a particular abrasive. Recycled materials such as glass beads are made from recycled glass have special applications. Other material such as dry ice (solid carbon dioxide) are used because they leave no residue on the finished part. Precision from abrasive blasting can range from process used to remove stencil lettering on semi conductor components to removing rust and paint from ships or bridge structures.

### **Abrasive Cut Off Saw**

A thin resin bonded, reinforced grinding wheel used to saw or cut off metal from bar stock.

### **Abrasive Grains**

The individual grits of abrasive mineral, also called grit, or abrasive mineral.

### **Aluminium Oxide**

The most common industrial mineral in use today. A synthetic form of the natural mineral corundum. Although natural corundum was important historically, modern industrial abrasives use aluminium oxide produced synthetically by refining bauxite ore in a variety processes. In one process crude aluminium oxide is made by melting bauxite to form a fused aluminium oxide, which is later crushed and sized. The various types of fused aluminium oxides are distinguished by levels of chemical impurities remaining in the fused mineral (Titanium and Chromium oxides are typical). Other techniques to make industrial abrasive start with treating bauxite ore with a sol gel process to create alumina that is sintered to produce with an extremely fine crystalline structure typical of the sol gel products. The many variations in products and related trade names arise from variations in the manufacture and processing of bauxite ore and crude fused or sintered minerals.

## --B--

---

### **Backing**

The flexible material to which abrasive grain is adhered to make coated abrasives and similar products. Typical backing materials are cloth, fabric, polyester film or paper. Other materials include sponges, rubber, and foam. Different thicknesses or "Weight" and also flexibilities are available.

**Blending**

A process of smoothing rough areas on a work piece to ensure that their entire surface has close to the same plane or roundness and/or the same surface finish.

**Blotter**

A disc of compressible material used to cushion the contact between the sides a grinding wheel and the flanges between which it is mounted to reduce slippage. Maximum safe operation speed, original wheel size and wheel formulations are typically printed on a blotter.

**Bond**

In grinding wheels the material used to hold abrasive grains in place giving shape to the grinding wheel, abrasive stick, hone, or similar products. Bonding materials can be resins, epoxy, rubber, metal, and vitrified materials. Bonds are critical component of grinding wheels that helps to distinguish one manufacturer from another. For coated abrasives bond refers to the resin used to attach abrasive grains to the backing material.

**Boron Carbide**

A very hard material close in hardness to diamond. However because boron carbide is very friable it has limited application in bonded and coated abrasive products. However it has application as loose abrasive for finishing very hard materials such as tungsten carbide in molds or dies and is commonly used in nozzles for abrasive water jet or sandblasting applications.

**Buffing**

The process of obtaining a very fine surface finish, having a "grainless" appearance on metal objects. Buffing typically uses a cloth wheel and very fine abrasive (often a natural abrasives such as tripoli, rouge, etc). A thin layer of abrasive is applied to the pliable perimeter of the cloth wheel using a compound which can be applied as a liquid or solid. For wax-based compounds, heat generated by friction melts the wax, exposes the abrasive grains and provides an adhesive to keep the abrasive in place. There are stages in the buffing process - typically coarse, medium and fine each using a style of buffing wheel and different types of compounds. Generally progressive steps of cutting, colouring and finishing in buffing follow the trend of using progressively finer abrasives and lighter forces. The term "buffing" is often used interchangeably with "polishing". Without a clear material science foundation, buffing continues more as an art than science and success often relies upon the skills of the operator.

**Burn**

Heat damage and physical changes in a work piece caused by excessive temperatures during grinding. Causes are typically improper use or selection of metalworking fluid, incorrect wheel formulations, or improper speeds for the work material are typical causes for work piece burn. Burning is usually associated with changes in metallurgical properties and other physical characteristics such as discoloration of the work piece.

**Burnishing**

A glazed surface finish usually resulting from using a dull or loaded grinding wheel or coated abrasive. Also a finishing process that relies upon ductile movement of work piece materials to achieve the desired surface characteristics.

**Bushing**

A soft metal like lead, babitt, or aluminium used to line the arbor holes of some grinding wheels. Also a removable ring, usually steel, used to adapt a grinding wheel to a smaller spindle.

**Chatter**

A situation that produces periodic marks on the work piece and sometimes associated with audible sounds during grinding. Caused by vibrations that originate with the rotating grinding wheel, spindles, slides or other components of the machine tools. Surfaces of work pieces often have regularly spaced patterns that can correspond directly to wheel rotation or marks on the grinding wheels produced by wheel dressers. Solutions include changing dressing processes, variation of wheels speeds, addition of damping materials, changing of process parameters such as infeed rates and excitation of machine components to cancel chatter causing vibrations.

## **Coated Abrasive**

Abrasive products made by adhering a thin layer of abrasive grains to a cloth, paper, or film backing. Produced initially as large "jumbo rolls" that are later converted into belts, sheets, discs, etc.

## **CBN**

"Cubic Boron Nitride" (also written as CBN). Boron nitride with a cubic crystalline structure which with diamond comprise the class of abrasives known as super abrasives. With a hardness second to diamond and no equivalent natural mineral, CBN is produced synthetically in a high temperature, high pressure process similar to synthetic diamond. Used as an abrasive mineral, a hard coating material, and machining insert, CBN's primary value in grinding is for machining of ferrous materials which chemically react with diamond.

## **Centerless Grinding**

A grinding process named for a machine tool on which cylindrical work pieces are placed between a grinding wheel and regulating wheels. The latter causes the part to rotate to produce precision cylindrical parts. Parts sit on a work rest rather than on centres for faster and easier insertion and removal of the work piece. Primarily used in high production applications, centerless grinding has various forms that include thru feed and plunge grinding.

## **Closed coat**

A characteristic of coated abrasives. A product is labelled as close coated if abrasive grains cover more than 70 percent of the surface. Contrast with an open coated which has 50-75 percent coverage. Closed coat products cut faster but can easily become loaded when used on soft materials.

## **Cone Wheel**

A small bonded abrasives wheel mounted on a pin or mandrel, typically cone or bullet-shaped, or a similar wheel made of a coated abrasive strips wrapped around a mandrel. Both are used primarily on portable grinders.

## **Contact Wheel**

An essential component of machine tools designed for coated abrasives belts. The wheels are typically made with a hard rubber wheel or steel which provides support of the coated abrasive belt at the point of contact with the work piece. Contact wheels may have surfaces divided into alternating grooves, slots, and lands in variety of patterns to alter grinding characteristics of the coated abrasive belt.

## **Conventional Abrasive**

A group of abrasives first introduced in the early 1900s to become the most common abrasive used in wheels and coated abrasives. These include aluminium oxide and silicon carbide as well as aluminium oxide-Zirconia abrasives. Ceramic abrasives, which are a recent innovation in abrasives, are sintered microcrystalline form of aluminium oxide. Conventional abrasives contrast with super abrasives (CBN and diamond), abrasives that were developed and introduced to manufacturing during the second half of the 20th century.

## **Converter**

A manufacturer that uses large jumbo rolls of coated abrasives as raw materials to make products such as belts, discs, sheets, etc. Also includes companies that make cones, plugs, and other specialty coated abrasive products.

## **Coolant**

A traditional name for metalworking fluids used in grinding. Once thought as primarily a means to cool a work piece to prevent burn, research showed that fluids have other functions such as lubrication, which may be equally or more important than cooling. Hence the preference for the use the terms metalworking fluids to refer to fluids used in grinding processes.

## **Corundum**

A natural mineral whose principle composition is aluminium oxide. Historically a mineral mined in the Middle East and India for use in grinding wheels, Corundum has been replaced by synthetic abrasive minerals, which offer more uniform and consistent physical properties.

## **Creep Feed Grinding**

A technique of plunge grinding with a specially designed machine involving very slow table travel speeds. The total amount of stock to be removed from the work piece is accomplished in one or two passes instead of numerous lighter passes with conventional surface grinding.

**Cup Wheel**

One of the standard wheel shapes standardized as types 6A and 11A in ANSI B7.1 Standards. With the shape of a cup, the products are designed for grinding on the rim or wall of the wheel rather than its periphery.

**Cushioned Abrasive**

Usually classed as a coated abrasive because it has a thin layer of abrasive on a flexible backing, this type of abrasive product contains a resilient layer of material added between the backing and abrasive grain. This highly flexible and conformable product is used in finishing and polishing metals and plastics such as Plexiglass. **CIBO** FiniTube polishing belts available.

**Cut Off Wheel**

A common thin reinforced grinding wheel made with resin bond used for quick and efficient sawing of metal or masonry products. Smaller wheels are made for small electric hand tools, while large diameter wheels are made for large stationary machines. The wheel, which is used for rough cutting of metals, is designed for quick and efficient sawing of bar stock or other materials. These wheels are typically made with conventional abrasives. **GLOBE & SUNFLEX** brands available.

**Cylindrical Grinding**

One of several standard grinding processes used industry. Grinding to remove material from the OD of cylindrical parts that have been mounted on centres. See also surface grinding, internal grinding, centerless grinding. Distinguished from centerless grinding which grinds the OD without centre mounting

---

**--D--****Deburring**

A process to remove burrs, undesirable protrusions and metal edges that result from machining operations. Methods include hand and automated processes that use files, rasps, bonded abrasives, coated abrasives, and other tools. Coated abrasives, non woven products and stones are typically used for deburring.

**Diamond**

A natural and synthetic mineral composed of carbon atoms in a specific crystalline structure. Industrial diamonds include natural stones for tools to dress grinding wheels. Synthetic diamond is manufactured in a special high temperature, high pressure process and subsequently treated to make a variety of abrasive grains for use in grinding of nonferrous materials and ceramics. In its polycrystalline form, diamond also has a variety of uses including cutting tool inserts.

**Disc Grinding**

Grinding machines and process using the face of a large wheel to produce flat and parallel surfaces in high volume production. Single wheel machines usually have vertical spindle. Double disc grinding passes parts between two independent grinding wheels.

**Dressing**

As distinct from truing, dressing is a process to remove bond materials and worn abrasive grains and expose fresh abrasive using a variety of tools. Though some coated abrasives have sufficient abrasive and bond to allow for dressing, dressing is primarily used with bonded abrasives. Diamond tools or a bonded abrasive stone of aluminium oxide or silicon carbide are the most common devices used for dressing grinding wheels. Dressing is important for maintaining control finishes, thermal damage and dimensional accuracy of work pieces.

**--E--**

---

**Emery**

A natural abrasive that contains aluminium oxide and small amounts of iron oxide and is noted for its red colour. Once used extensively by industry, it is used today only in coated abrasives for home workshops. Consistency a low hardness of the mineral limits its usefulness in industrial applications.

**--F--**

---

**Fine Grinding**

Machine tools and a grinding process for precision grinding of flat and parallel surfaces. A relatively recent development, fine grinding grew out of lapping technology and free abrasive machining with the replacement of loose abrasive and lapping compounds with a bonded grinding wheel. Like disc grinding cutting takes place on the face of either one or two grinding wheels. The grinding wheels may be monolithic bonded wheel or wheel composed of small pellets of bonded super abrasive grains.

**Finish**

A measurement of surface characteristics of a work piece. Historically a visual characteristic, finish has become also a functional property of the surface. In common practices finish is a measure of the average roughness "Ra" as determined with a surface profilometer. Contemporary metrology includes a large number other parameters that are statistically derived to describe peaks, valleys, lay, bearing area, etc. of the surface profile.

**Firing**

The last step in manufacturing a vitrified or resin bond grinding wheel. Heating clay-based bond materials in vitrified bonds over 2000° F or the resins in resin bonds over 500 °F fuses the materials into a single monolithic structure.

**Form Grinding**

Any grinding process where the surface of the grinding wheel is shaped by dressing to create a specific profile. By dressing an inverse profile of the desired component surface on to a grinding wheel, complex sequencing of multiple steps can be avoided. Form grinding is also possible with coated abrasives and non woven products using specialized accessories.

**Free Abrasive Machining**

Similar to a lapping process where loose abrasives are used to prepare precision flat surfaces. Abrasive machining uses coarser abrasives and harder plates to achieve greater stock removal. With advent of super abrasives, the process is being replaced by fine grinding when justified. Disc grinding is a similar but less precise machining process.

**Friability**

A characteristic of abrasive grains that describes their tendency to fracture or break apart when hit or placed under pressure. Highly friable abrasive cut more easily, but wear faster than other abrasives. Friable abrasives are usually chosen for soft, gummy materials or where heat produced by worn grits must be carefully controlled. Friability is usually related to the levels on impurities in the manufactured abrasive mineral.

**--G--**

---

**Garnet**

A natural mineral found in concentrated pockets of alluvial deposits of old river beds. Once a standard abrasive for grinding wheels and coated abrasives, garnet today is used in abrasive water jet applications and a few coated abrasives products.

## **Grade**

Part of the standard grinding wheel marking indicating the relative hardness of the wheel bond structure. Though a universal standard has been established by ISO, there is no generally accepted measure of hardness in the United States. Manufacturers indicate wheel grade with letters ranging from "A" for very soft to "Z" for very hard. Since grade depends upon properties of bond materials, hardness values for one manufacturer may not correspond directly with similar values from another manufacturer.

## **Grain Size**

The second element in standard grinding wheel marking system or, in a more general meaning, the average size of abrasive grains used to make a wheel, coated abrasive or other product. Traditional sizing is based on mesh sizes where a number indicates openings per inch of screening mesh. However, a number of other measurement systems are also common such as measurements for very small grit size in units of millionth of a meter, or micron. Special sizing systems established by ANSI, CAMI, FEPA and others are used for coated abrasives where the average size of elongated abrasives is difficult to determine.

## **Grinding**

Machining or removing material from a work piece by using abrasive minerals in a wheel, stone, belt, paste, sheet, compound, slurry, or other abrasive product.

**--H--**

---

## **Honing**

Historically, honing meant to achieve fine finishing. Though no clear definitions exist to distinguish one type of abrasive process from another, honing is defined by common practices. In that sense, honing is a specific machining and finishing process usually applied to internal cylindrical surfaces using small bonded abrasive stones. Using a fixture that rotates and reciprocates, honing is used to correct the geometry and alignment of holes as well as apply a special surface such as that needed in automobile engines. Force per unit area vary from 10 to 100 times less than grinding with wheels, and the abrasive grains remain in contact with the work piece for considerably longer times. Comparable processes include super finishing where small stones and light pressures are applied on both ID and OD portions of cylindrical parts.

**--I--**

---

## **ID Grinding**

A grinding process and machinery for grinding the inner diameter of holes or profiles using a very small, high speed grinding wheel. A specialized grinding technology requiring special grinding wheels and machine tools.

**--J--**

---

## **Jumbo Roll**

The initial product from the manufacture of coated abrasives. A typical roll may be five feet wide and 50 yards long. These coated abrasive materials are used as raw materials by converters to manufacture belts, discs, sheets and other coated abrasive items.

## --L--

---

### **Lap Joint**

A type of joint used to make coated abrasive belts. The two ends of the belt material overlap and are attached with adhesives creating a joint with double thickness of the belt material.

### **Lapping**

A material removal process using loose abrasives and a fluid where parts are processed between two large flat lap plates to achieve very flat surfaces and extreme fine finishes. In contrast to grinding and honing, lapping has minimal material removal, forces are very light and parts move freely between lap plates. Finishes are measured in micron and nanometer ranges. The term is also commonly used for processes that produce very fine finishes using loose abrasive grains. Historically lapping means a process for the ultimate refinement of geometry or surface finishes using very fine abrasives to produce extremely accurate components. The process is being replaced by fine grinding.

### **Loading**

Deposits of work piece material on the surface of a grinding wheel or coated abrasives that reduces contact between abrasives and work piece. Loading typically leads to work piece burn from frictional heating and loss of cutting efficiency. Load is reduced or eliminated by altering parameters such as feed rate, wheel speed, type of abrasive, etc. Dressing also is used to remove material accumulated on the wheel or coated abrasive.

## --M--

---

### **Make Coat**

The first layer of resin or adhesive applied to a flexible backing in the manufacture of coated abrasives. The make coat gives a smooth, uniform surface for deposition of abrasive grains and provides the adhesive to bond abrasive grain to the backing. See also size coat.

### **Micron**

A unit of measure of length equal to one millionth of a meter.

### **Micro Inch**

A unit of measure of length equal to one millionth of an inch, smaller than a micron since one inch is approximately 1/39th of a meter.

### **Mounted wheel or mounted point**

A group of small abrasive wheels or cylindrical abrasive products whose shapes are defined by ANSI Standards. The abrasive products are made with a permanent a shaft or mandrel and are typically bonded products, though some can be made with cotton or non woven fabric. Typically mounted points are used in internal grinding or deburring processes.

## --N--

---

### **Non Woven abrasive**

A product made with fine abrasive grains dispersed throughout a non woven fabric and adhered with resin. Industrial non woven products are related to floor scrubbing pads but have greater uniformity and consistency in performance. Like coated abrasives non woven products are made in jumbo rolls that are converted by others into belts, sheets, pads, etc. Made into convolute or unitized wheels, the products are typically called surface conditioning products. See our **STRIPX** products.



## --O--

---

### **OD Grinding**

Grinding of the outside diameter of cylindrical parts.

### **Off hand grinding**

Using handheld tools to grind. Also called freehand grinding.

### **Open coat**

A class coated abrasive products with 50 to 70% of the product surface covered with abrasive grains. Open coats are less likely to load when grinding soft materials though they are less efficient in material removal.

## --P--

---

### **Pedestal Grinder**

A grinder with a motor and one or two grinding wheels on a floor pedestal.

### **Plunge Grinding**

Grinding of cylindrical parts in cylindrical or centerless grinding where the infeed of the grinding wheel is limited to radial movements and no cross slide movement.

### **Polishing**

A process using very fine abrasive minerals for little or no material removal where visual appearance is the primary purpose. Typically, polishing is an art using special compounds and abrasive products, recent advancements in very fine grained coated abrasives can produce some polished surface. Force per unit area for polishing are the lightest of all processes that use abrasives.

### **Polyester Film**

A backing material for fine grained coated abrasives. The uniform thickness of synthetic films has made possible a group of micro finishing products that can effectively compete with bond products for finishing parts to submicron surface finish levels.

### **Porosity**

Open voids intentionally created in grinding wheels to provide pocket to carry swarf and metalworking fluids during grinding. Some wheels have induced porosity through the use of small hollow spheres of alumina or the use of chemicals (moth balls) that are easily vaporized during firing of the grinding wheel. Recently, porosity on vitrified super abrasives wheels has allows significant improvements in creep feed grinding processes.

## --R--

---

### **Resin Bond**

A synthetic resin that can be cured by thermal, ultraviolet light or other methods. Resin bonds are typically identified in the standard wheel marking by the letter B, derived from Bakelite, one of the first common resin bond materials. Resins are the most common type of bond for both coated abrasives and bonded abrasives.

### **Rubber Bond**

A bond of synthetic or natural rubber used for grinding wheels and identified by the letter R or B in standard wheel markings. It is used in regulating wheels for centreless grinders and in the manufacture of very thin cut-off wheels.



## --S--

---

### **"S" Joint**

A type of butt joint used to make a coated abrasive belt. The two ends of the belt material are cut in a "sine wave" pattern for more joint contact area.

### **Sandpaper**

A traditional name for coated abrasives that refers to early forms that used sand glued to paper. Most products now use synthetic minerals of aluminium oxide or silicon carbide applied to fabric backings. More appropriately called coated abrasive.

### **Segments**

Bonded structures that can be assembled on a special form to create a large grinding wheel.

### **Silicon Carbide**

A synthetic abrasive first developed in the late 1800s, which is harder than aluminium oxide. Originally thought to be a form of corundum many products were name carborundum, a name used by many grinding wheel companies. The green and black forms are distinguished by levels of purity, and silicon carbide is typically applied to nonferrous applications. The sharp and easily fractured abrasive grains are also used in non metal applications such as the wood, glass and leather industries.

### **Surface Grinding**

A process and machine tool to grind flat and/or square surfaces. In a common machine tool, the work piece is mounted to a table that sweeps back and forth in a pendulum-like motion.

### **Size Coat**

A second coating of resin or adhesive applied during the manufacture of coated abrasives to improve adhesion of abrasive grain. The size coat may include grind aids such as cryolite.

### **Specialty Coated Abrasives**

A group of small converted coated abrasives that include cylinders, cones, pugs, flap wheels, etc. Typically these items are applied with hand held tools for a variety of finishing and deburring applications.

### **Super Abrasives**

Diamond and CBN abrasives, so called super because of the extreme hardness, "super" performance, and long life. These premium abrasives contrast with more traditional "conventional" abrasives. The name, however, does not denote superior abrasive that can applied universally. Conventional abrasives are clearly better for some applications.

### **Surface Conditioning Abrasive**

Products made with non woven abrasives. Formed into cleaning, unitized, convolute wheels or surface conditioning abrasives can be made with various hardness and grit densities. See Non woven

## --T--

---

### **Truing**

A process to correct the concentricity and shape of a grinding wheel. As distinguished from dressing, which removes bond material to expose fresh abrasive grains, truing is designed to reduce vibration and produce a uniform cutting rate for the grinding wheel.

## --Z--

---

### **Zirconia**

An oxide of zirconium that has use as an abrasive. Rarely used alone, it is usually applied in 40% or 60% mixtures with aluminum oxide.