# The Latest Abrasives

## Developments in abrasives and right angle grinder make for improved surface finishing.

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**In the metal finishing arena, the right-angle grinder is "king" of the hand-held power tools.**

***Over the last several years,*** there has been an explosion of new abrasives and more powerful right angle grinders on the market.Many of these products are providing impressive results in cutting, grinding and finishing tasks for many industries, including metalworking. Additionally, these products, when chosen correctly for the task at hand, can reduce both costs and finishing time.

### User-friendly improvements to the right angle grinder

The right angle grinder is generally the most widely used tool in any metalworking shop. New developments in the grinder itself include more powerful variable speed motors, improved ergonomics, and vibration dampening designs.

The newer grinders, when used to perform different tasks, allow the user to adjust the speed. This becomes especially critical when changing from grinding to polishing. Polishing at slower speeds allows the operator better control over the work piece and improves the aesthetics of the final surface finish. In addition, studies have shown that altering the speed of the grinder to the optimum level can double the working life of the abrasive in use.

For individuals who use the grinder for a significant amount of time each day, new ergonomic vibration dampening designs from companies such as Metabo, Fein, and Makita reduce repetitive use injuries and worker downtime. This is because the vibration from the grinder is absorbed by the handle and not transferred to the workers themselves. Also, the newer designs make the grinder lighter, thereby reducing operator fatigue, and allow for optimum hand position while grinding.

### For Your Information

Some factors that affect how quickly a substance is abraded include:

- Difference in hardness between the two substances: a much harder abrasive will cut faster and deeper. Grain size (grit size): larger grains will cut faster as they also cut deeper.
- Adhesion between grains, between grains and backing, between grains and matrix: determines how quickly grains are lost from the abrasive and how soon fresh grains, if present, are exposed.
- Contact force: more force will cause faster abrasion. Loading: worn abrasive and cast off work material tends to fill spaces between abrasive grains so reducing cutting efficiency while increasing friction.
- Use of lubricant/coolant/metalworking fluid.

*Source: Wikipedia*

**When choosing a flap disc vendor, the purchaser should look for two distinctions: the type of coated abrasive; and the manufacturer of the coated abrasive flaps, which are glued to the backing of the flap disc.**

## New abrasives for use with the right angle grinder

### CUT OFF WHEELS

When cutting with a right angle grinder, the latest advent of thinner slicing cut off wheels allows faster cutting with less material loss. The new, thinner designed, type 1 wheels minimize the surface area contact between the material and the wheel due to the reduced surface width of the wheel. The reduced surface cutting area provides the following benefits:

- Requires less force for cutting
- Reduces base material loss during the cutting operation
- Generates less heat
- Improves surface finish on the cut material

These higher quality wheels use a mixture of aluminum oxide and zirconia grains to improve cutting life, along with reinforced layers of mesh, which provide added strength to the disc.

When working with stainless steel or other high nickel alloys, the user should be sure that the cut off wheel issulfur and chloride free, which will prevent contamination of the work piece. It is important to choose a wheel from a reputable manufacturer and use the proper guards and flanges when cutting, as an inferior wheel can easily blow apart in the thinner design and present a hazard to the operator. The new cut off wheels can be found in diameters ranging from 3 to 7 inches and thicknesses of .035 to .045 inches.

**Clean and strip discs clean metallic surfaces without material removal** (LEFT)**.**

### FLAP DISCS

For material removal, including weld grinding, blending, and deburring, again the angle grinder is still the workhorse of most metalworking shops.

In most material removal operations, the old two-step process of grinding wheel and then fiber disc finishing has been replaced with the advent of the flap discs. Flap discs grind and finish in one step, thereby reducing both finishing time and finishing costs. In addition, by using a variable speed grinder and flap disc, the user can further extend by 50 percent the working life of the flap disc by keeping the rpm between 5000 and 8000.

Advantages of the flap disc include:

- Grinds and finishes at the same time, saving both time and money.
- Removes material aggressively. Its removal power is equal to that of the depressed center wheel, but it works more safely and offers a better-finished surface.
- Has a lightweight design to reduce operator fatigue.
- Is easy to use and requires very little surface pressure.
- Its especially cool cutting permits light contouring and avoids burning the work piece by overheating.
- Lasts up to 30 times longer than conventional fiber discs due to their overlapping flap construction.
- Assures consistent performance as new particles re continually exposed during the life of the product.
- Due to its tough construction, allows for aggressive edge grinding.

The quality of flap discs varies greatly from manufacturer to manufacturer. When choosing a flap disc vendor, the purchaser should look for two distinctions: the type of coated abrasive; and the manufacturer of the coated abrasive flaps, which are glued to the backing of the flap disc.

## TYPE OF COATED ABRASIVE

Characteristics of different types are appropriate to different applications:

**good** Aluminum oxide is suitable to most general purpose applications and is specified for use on wood and most metals.

**better** Zirconia Alumina grains are both sharp and durable, providing fast stock removal and longer life. They are used to greatest advantage in coarse grits on heavy-duty metalworking stock removal applications. Zirconia will generally last twice as longs as Aluminum Oxide material.

**best** Ceramic grain series are special products for aggressive and cool grinding. These abrasives ensure faster grinding while at the same instance offer better surface quality and excellent stock removal rates. The cool grinding properties ensure an extension of the service life and prevent surface discoloration. Ceramics are specifically applicable for grinding high alloyed steels, titanium, nickel alloys and all extremely hard materials. Ceramics will generally last 50 percent longer than Zirconia material.

## COATED ABRASIVE FLAPS MANUFACTURERS

For all intents and purposes, there are no longer any U.S. companies manufacturing coated abrasives. The best material is supplied by leading European companies such as Norton (French), VSM (German), and Klingspor (German). Caution is advised when purchasing coated abrasives,as there are inferior products being manufactured in the Far East that might cost less, but will not last very long when put into use.

Other factors that figure into the life of the flap disc include the durabilityof the backing (either fiberglass or nylon) and the number of flaps laid on the disc. Higher quality discs use extra layers of both fiberglass backing and coated abrasives flaps.

Clean and strip discs, surface conditioning discs, unitized wheel

Finally, due to the prevalence of right angle grinders in the workplace, a number of newer abrasive products tailored to cleaning and finishing have been adapted for use on the grinder. They include:

■ ***Clean and strip discs*** — These discs clean metallic surfaces without material removal. They are a safer alternative to wire brushes. The primary applications for clean and strip discs include:

- Removal of paint and adhesives
- Cleaning of weld seams
- Removal of welding scale and discoloration
- Surface preparation for auto body work

■ ***Surface conditioning discs / surface conditioning flap discs*** — Surface conditioning discs are composed of open nylon webbing, impregnated with abrasive grains. They offer a continuous and controlled finish with minimal material removal. Also, they are flexible in nature and allow polishing of contoured surfaces. Surface conditioning products are used heavily in the stainless steel fabrication industries for providing a satin finish to the base material and welds. Additional applications include:

- gasket removal
- coatings removal
- cleaning weld splatter
- removing heat discoloration

■ ***Graining stainless steel sheet***

Type 27 unitized wheels are an excellent choice for the final polishing step on stainless welds as they blend tool marks, remove surface imperfections and leave a bright clean finish on stainless steel, titanium, and aluminum. The unitized wheel is composed of layers of non-woven material, impregnated with abrasive grain and pressed together into its final shape. The unitized wheel design allows for edge grinding and access to weld joints that sometimes cannot be reached with a flap disc.

The advent of new abrasives and changes to the right angle grinder allow the user to accomplish most finishing tasks with a single right angle grinder. Newer abrasive materials last longer, provide an improved surface finish, and get the job done faster and at a lower total cost. And finally, the newer angle grinders are more powerful and safer due to improved ergonomics.

The latest developments and improvements allow the right angle grinder to maintain its role as the king of the hand held power tool in the metal finishing arena. ■


**About the Author:**

**Chris Stone is owner of Lehigh Valley Abrasives, supplier of abrasives and power tools for metal working.**

**Lehigh Valley Abrasives originated in 1967 as a fabricator of stainless steel tanks, vessels, and hoppers for the food, pharmacuetical, and chemical industries. The demand from customers for improved surface finishes led to the company's development and manufacturing of flap discs, belts, and cut-off wheels.**



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