



Machining

## Choosing the Best Abrasive Machining Technique for Portable Grinding Applications

Kip Hanson | Mar 24, 2020

There are several critical components of a successful grinding operation: the grinding disc; its shape, bond and abrasive grain size; and the equipment that makes the disc spin at thousands of rpm. All these components play a profound role in production efficiency and a job's profit margin, so it's important to choose the best components for your needs.

For any shop that bends, cuts, forms or joins metal, determining whether it's using the best equipment to get a job done in the most cost-effective manner can prove challenging—particularly if some of its grinding technology remains stuck in the previous century.

Take abrasives, for example. Though their appearance hasn't changed all that much over the years, the sharp, tiny rocks bonded to the face of today's fiber discs and *flap discs* are far better at removing material than those found on the "sandpaper" that many of us grew up with.

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William Maher  
Application Engineer, 3M

So, it's worth looking at the factors to consider when selecting abrasive discs. Which ones matter the most, how do techniques align with abrasive choices, and what is the effect that tool power has on performance?

### What are Premium Abrasives and Are They Worth It?

Of the three primary abrasives used in any portable grinding application—aluminum oxide, zirconia alumina and ceramic alumina—it's the latter that's proving to be most effective in a wide range of applications.

## Three Common Types of Abrasives in Metalworking All Shops Should Know

There are many abrasives you may want to consider for your grinding operation. Here are three common ones you should know about.

**Aluminum oxide (GOOD):** Among the least expensive for portable grinding operations, aluminum oxide is a good choice for general purpose fabricating work, or maintenance and repair operations, especially where cost and inventory control are a concern.

**Zirconia alumina (BETTER):** Providing a compromise between the lower price of aluminum oxide and the performance of ceramics, zirconia alumina is a good option for many stainless steels as well as carbon steel alloys. It is often blended with ceramic alumina or aluminum oxide to provide different grinding characteristics.

**Ceramic alumina (BEST):** Suitable for a broad range of applications, ceramic alumina—though more expensive than the alternatives—provides the highest performance and abrasive life possible. For nickel and chromium-based superalloys, 300-series stainless steels, duplex steels, and other difficult metals, ceramic should be your first choice.

Each of the industrial abrasive suppliers interviewed for this article offers multiple product tiers, often with some form of ceramic media at the top.

*Norton Saint-Gobain*, for instance, touts its Blaze brand of ceramic alumina fiber and flap discs as its flagship. Stanley Black & Decker offers the *DeWalt* XP series, while *3M* has Cubitron II branded abrasives. All are considered premium products, and all come at a premium price. Are they worth it?

Jeffrey Simons thinks so. An application engineer with 3M's Abrasives Systems Division, he says top-shelf abrasives are aimed at people who can measure value.

"These are typically shops that are doing a lot of repetitive work, where it's fairly easy to distinguish the value in either their cut rates—that is, productivity—or abrasive life," Simons says.

Stuart Sellers, marketing manager at SBD, agrees.

"The industry overall has begun embracing ceramic abrasives, not only in flap discs but also in fiber and cutoff wheels," he says. "They last longer. They grind material faster. They're a better overall value. This is why we launched a new line of fast-grinding ceramic discs, and why more and more of our customers are moving up the food chain to higher-performing products, especially those shops that are competing with overseas suppliers. Here, maximum productivity is key."

**Read more: "What Are the Right Abrasives for Your Metal Removal and Finishing Work?"**

### High Abrasive Prices vs. Low Abrasive Prices: What's Best for You?

And what about manufacturers that aren't doing high-volume work? There are countless job shops and

fabricators that make 10 of this, or 100 of that, and feel it makes more sense to toss partially consumed discs into the trash rather than manage them. In this situation, are higher-priced premium abrasives still the answer?

Yes, says 3M Application Engineer William Maher.

“Let’s say you’re using a depressed center grinding disc and it wears to the point that it can no longer reach a fillet weld,” he says. “Instead of throwing it out, you might move the disc over to a chamfering operation, or another type of edge preparation where diameter is less of a factor. Or maybe you use another type of abrasive entirely—a belt product, perhaps, on a portable file tool. Figuring out which solution is most effective is all about operator training and exploring the wide array of abrasive shapes and media that are currently available.”

Operator training is important for other reasons. SBD’s Sellers notes that grinding operators tend to use a finer grit disc than they should, opting for an 80-grit disc (which they consider coarse) when they should be using a 24- or 40-grit disc instead. And those who do move into ceramic abrasives find that they cut more freely than others, an advantage that might require operators to adjust their grinding style.

They probably won’t complain, however, as freer-cutting discs mean less fatigue and a happier workforce—two outcomes that help explain the industry’s push toward high-performance abrasives.

Sellers also says a higher level of inventory control is advisable when using premium abrasives, just as it is with any shop’s more expensive or production-critical consumable items.

In all but field applications, he recommends using an ***automated vending machine approach*** when dispensing tools to workers, with the costs for those tools automatically allocated to the department or job. This provides greater accountability and cost tracking.

As he and others point out, the price of greater productivity goes beyond consumable cost—it could also mean investment in new grinding equipment.

Just as abrasives have improved over the years, so too have portable grinders, with lightweight but powerful devices widely available. This means shops can use larger discs without increasing the level of operator fatigue, further improving throughput. Adding a ceramic abrasive to the mix, which tends to reduce grinding forces and allow even small portable grinders to be effective, creates a best of both worlds solution.

## **How to Find the Best Flap Disc**

There’s also strong agreement on the styles of coated abrasive discs that are most effective. Patrick Carroll, product manager at Norton Saint-Gobain, notes that flap discs are now the preferred approach for many applications thanks to their wide-ranging capabilities.

“One of the advantages of a flap disc is that it can grind and finish equally well,” Carroll says. “There are some products that just grind, and others that just finish, whereas flap discs can cover heavy stock removal all the way to blending and finishing in one step.”

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Alicia Castagna, Norton Saint-Gobain product manager for thin-wheel abrasives, explains that there’s more to this story than the abrasive alone—there’s also density to consider, along with the disc’s backing.

"We and others offer standard and regular densities, which refers to the number of flaps you put on a disc," she says. "As a rule, higher density provides up to 40 percent greater life in addition to ceramic's fast cut rates. There are also different options in terms of fiberglass versus plastic backings, and conical versus flat disc shapes. Each provides different ergonomics and material removal capabilities, and like the choice of abrasive, should be evaluated based on the specific application and the shop's budget."

These are just a few small slices of the abrasive pie, of course. These companies (and numerous others) all have a broad assortment of abrasive solutions, including various blends of ceramic and more traditional media, different pricing tiers, and many other variables that make it difficult to offer generalized recommendations.

That said, ceramic-based abrasives, as well as those made of zirconia, tend to provide higher cut rates and greater durability, both of which lead to a lower cost per part overall. When combined with newer grinding equipment, shops can greatly improve their metal finishing and weld prep capabilities while making the job easier to boot. Maybe it's time for an abrasive upgrade?

***Which factors matter most to you when selecting abrasive discs? How do you determine the best one for your shop's needs?***

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