

How to boost productivity of Portable Grinding with “See Through” AVOS Technology..

Portable grinders are among the most popular tools in the metal fabricating shop. From grinding down welds to preparing the work surface for painting, these lightweight, versatile machines save the manufacturer valuable time and labor.

As the use of portable grinders continues to increase, abrasive manufacturers are keeping pace by developing new technologies to enhance the productivity of these tools. One of the most important recent innovations in this area is the development of “see through” abrasive designs, which give a complete view of the work surface during the grinding operation. Once available only in coated abrasive products, this technological breakthrough, called AVOS (for “Allows View of Surface”), has now been transferred to bonded abrasives – more commonly called grinding wheels. The availability of standard grinding wheels offering the benefits of the AVOS design – view of the work surface while grinding, cooler cut, longer product life – gives the manufacturer an important new weapon in the fight for greater productivity and higher quality finishes.

Portable Grinders -- Versatile and Efficient

Portable grinding is the term used for any operation where the grinding machine is actually held in the hands of the operator. It is a highly effective method of achieving desired metal removal and surface finish in a wide range of common applications, such as: grinding down and smoothing weld seams, cleaning metal before welding, removing imperfections, and smoothing rough surfaces on castings.

Portable grinders are available in a number of designs. Among the most popular is the right-angle grinder. A highly versatile product, the right-angle grinder can be used in locations ranging from automotive and aerospace plants to welding shops. In large production applications (for example, grinding fabricated metal parts on an auto assembly line), a typical plant may employ from 30 to 50 operators using electric or pneumatic hand-held grinders.

These products are easy to use and handle. Manufacturers have introduced lighter weight versions, some as light as 5 lb. And with a relatively small cutting area compared to large machine tools, portable grinders disturb less surface area on the workpiece. This results in less re-work and higher productivity for the operator.

In addition, portable grinders are becoming more affordable. Manufacturers can use more of them — and more often — on a wider variety of jobs while keeping their tool costs lower.

Abrasive Technology Boosts Portable Grinding Results

As the actual cutting tool on the grinder, abrasive products must keep pace in terms of performance. Manufacturers face several key challenges. Productivity of grinding wheels can suffer if the abrasives products either wear down too quickly or become clogged with ground metal chips or swarf. The reduced grinding ability requires the tool to draw more power, eventually leading to burn-out of the electric motor. This lack of productivity makes it difficult for users to lower their total grinding costs, and harms the final quality of the workpiece, while the excess heat causes the wheel to wear faster. What’s been needed is a new approach to grinding, one that results in longer abrasive product life and improved productivity for the user. Norton Company looked at this challenge by taking a “systems approach,” completely re-thinking the way grinding is done in these applications. The company developed an entirely new concept — the Norton AVOS System — featuring a product design with a unique silhouette and holes cut into the cutting surface. It is unlike anything previously seen on the market.

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Introduced in 1997, the AVOS design enables the operator to view the workpiece while grinding, allowing faster, more controlled stock removal. When it spins, the product offers complete vision of the grinding surface.

Surface finish is enhanced because AVOS technology allows the operator to monitor the work more closely. Because he can see what he is grinding, the operator can hold the grinder at a 5 – 15° angle, much less severe than the 30° angle commonly used with traditional products. By using more of the cutting surface in this way, the operator gets a more aggressive cut for increased stock removal as well as a smoother surface with less gouging.

The Engineering Behind AVOS

In addition, the holes located in AVOS products provide up to 25 percent cooler cutting with less power draw. There are two reasons for this. First, the holes engineered into the grinding surface allow for abrasive "rest time," the period when no cutting takes place on the surface of the workpiece.

Second, the airflow caused by the rotation of the wheel, combined with the "notched" design, enhances the flow of air, along with loose abrasive and swarf, away from the grinding zone. With traditional products, these waste materials would remain in the grinding zone, forcing the operator to re-grind loose material that can, in fact, be more abrasive than the surface of the workpiece itself.

The cooler grinding zone results in less heat build-up and less surface burn. The result is significantly better surface finish, better product appearance and greater output from each wheel. Because each wheel lasts longer, it grinds more surface feet and there is less down time for wheel changes.

Transferring AVOS Technology to a Bonded Abrasive

The first AVOS products, introduced by Norton in 1997, were a line of coated abrasive discs. They featured the now-familiar triangular silhouette and holes cut into the grinding face. This design was made possible by the basic structure of coated abrasives, in which an abrasive mineral is applied to a flexible backing using an adhesive bond. Once a large roll of this basic material is made, it can be cut into virtually any shape desired.

Applying the AVOS concept to bonded abrasives presented a new challenge. A grinding wheel has abrasive grains distributed uniformly throughout the wheel. Thousands of these hard, tough abrasive grains move against the workpiece and cut away tiny chips of material. While this makes for a long-lasting cutting tool, it is essentially impossible to transfer the original AVOS design, with its "cut-out" shape, to bonded abrasives.

Norton engineers, intent on creating a bonded abrasives version of AVOS, tested a number of designs and prototypes before selecting the most effective – the three-notch design seen in the new series of wheels. Unlike the coated abrasives version, in which the holes and profile are cut after the basic shape is manufactured, Type 29 AVOS wheels are molded and manufactured to their final "notched" shape.

Design Adds Productivity to Popular Wheel Type

The first product type in the AVOS family of bonded abrasives is the depressed center wheel (also commonly known as a raised hub wheel). In this wheel shape, or "type," the area near the arbor hole is offset to accommodate the mounting nut and flange.

Depressed center wheels are highly versatile tools used for light to medium portable grinding jobs. They can be found in welding shops, pipe shops, fabrication shops, shipyards, pipeline construction, foundries, and railroad "maintenance of way" operations.

The new line of AVOS wheels features durable, tough aluminum oxide abrasive. They will be available initially in two types: 36 and 60 grit sizes for grinding ferrous materials, and a 46 grit product for use with aluminum and other non-ferrous materials. The wheels feature a resin bond reinforced with fiberglass for added strength.

AVOS depressed center wheels are available in two sizes: 4-1/2 x 1/8 x 7/8 in. and 5 x 1/8 x 7/8 in.

Guidelines for Best Performance

- The AVOS depressed center wheel series is a versatile and hard-working tool for a range of portable grinding applications. A few operator guidelines and "tech tips" will help the user extend the benefits of the AVOS design to its maximum:
- ALWAYS use the AVOS depressed center wheels on right-angle grinders
- Bring the grinder to full RPM before contacting the workpiece
- Grind at a flat angle – 5° to 15° is optimal
- Maintain full RPM until the grinder is off the work piece
- Do not over-tighten the wheel
- Do not start the equipment with any object protruding through the slots in the wheel
- Take caution when grinding near an edge, corner or projection that can snag the edge of the wheel.