THIN IS IN

New ultrathin cutting wheels produce quick, clean cuts and have durability typically not associated with thin wheels

by Susan Woods, managing editor

Compared to conventional .045 cutting wheels, ultrathin 1-mm wheels for use with right-angle grinders cut fast and leave a smooth, burr-free cut and a clean seam.

Ultrathin cutting wheels are primarily used in thinner materials. Just a few of the many applications include thin sheet metal such as ductwork, tubes, profiles (any type of stamped or punched part that is flat) and cross-section rods 1/2 in. or less. Applications also include welding repair operations, such as cutting out and replacing a damaged section of a part.

One example is in trailer and railcar manufacturing operations where the company makes one "standard" car or trailer and has to quickly modify or customize it for specific customer needs. This could include cutting out holes for additional electrical boxes, power outlets, conduit channels or lighting fixtures.

"In my experience, the biggest challenge at these facilities is making the repair or modification without doing additional damage to the part and creating additional work," says Rick Hopkins, senior product manager, Weiler Abrasives Group. "In these types of operations, you want to make as little impact as possible on the part so you don't have additional repaint or refinish operations. This often requires cutting clean holes in a previously finished part."

The best way to accomplish this is with 1-mm ultrathin cutting wheels that produce smooth and burr-free cuts, minimizing additional rework.

For welding applications, the ultrathin cutting wheels also are the better choice.

"When prepping for welding on thin materials, the smoother the cut, the cleaner the joint and, therefore, the less welding required," Hopkins says. "The wider the gap, the more weld

This technology increases the density of the wheels, resulting in longer life, reduced friction and superior stability allowing the operator to work safer.

rod, the most expensive consumable on the job, is needed to make that good, solid weld."

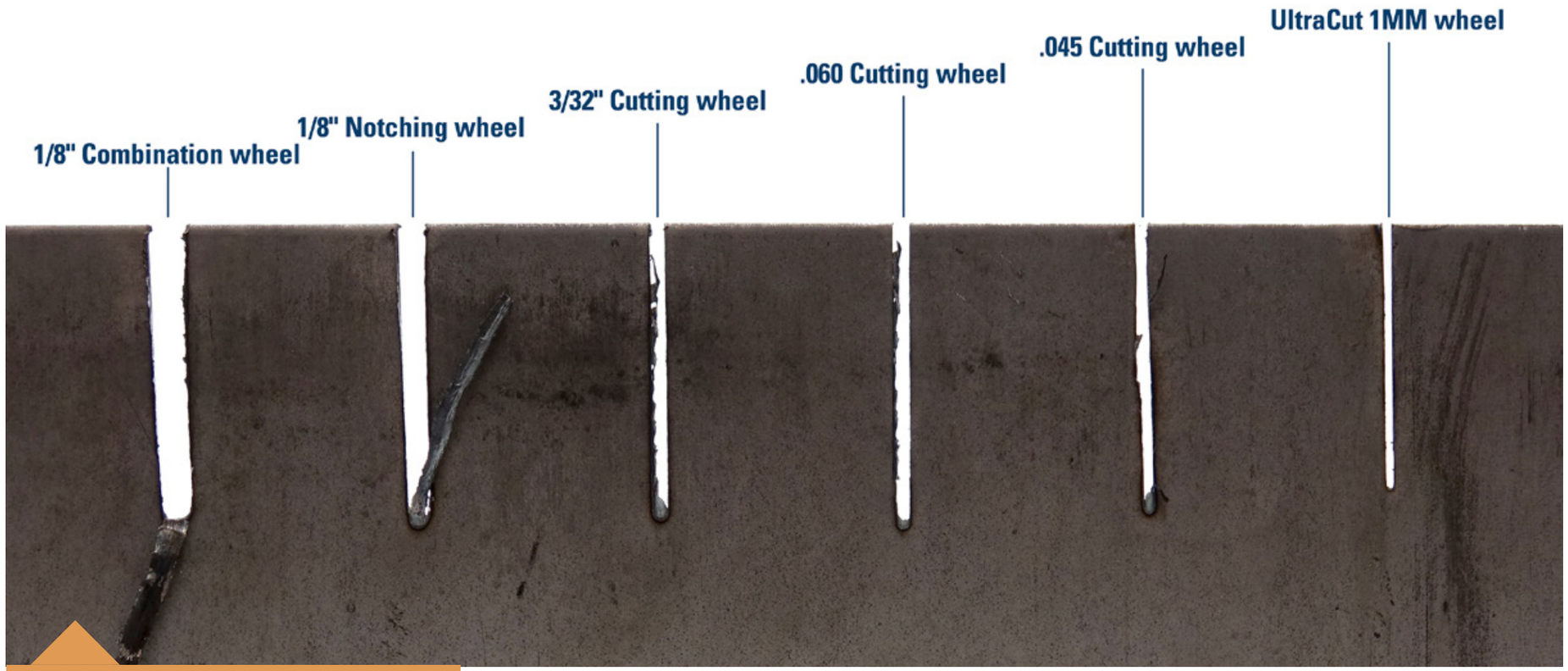
Also, the greater amount of weld rod used means more heat input into the material. It is ideal to have the thinnest joint possible with any kind of welding repair operation so the metal doesn't overheat and discolor the workpiece.

UNDER PRESSURE

Ultrathin cutting wheels are easy to control because the operator doesn't need to apply a great amount of pressure.

"Ultrathin wheels reduce surface friction, allowing the user to quickly and easily enter a cut, whether through a plunge or traditional face cut. With significantly less resistance, the operator is able to make a much faster, more precise cut," Hopkins says. "With thicker wheels, the wider face requires more effort to initiate the cut and and generates more heat and friction, requiring a higher level of operator skill to maintain a straight, smooth cut."

That's not to say, however, that ultrathin wheels don't require a certain level of operator skill to cut most efficiently.



This photo shows cuts made with a range of different size cutting wheels. Note the lack of burr formation and lack of heat discoloration with the UltraCut wheel. As the wheels, and their cut lines, become thicker, the size and orientation of the burrs increases as well as the heat through the cut, resulting in the "bluing" that can be seen down the sides of the cuts and at the end of the cut lines.

Weiler Abrasives Group's UltraCut wheels provide the benefits of the ultrathin profile but with the durability of a conventional cutting wheel.

Safety and cutting tips

These tips ensure the safest and most efficient use of bonded abrasive cutting wheels.

Before mounting any cutting wheel, check and ensure that the maximum safe rpm rating on the wheel is higher than the maximum rpm rating of the power tool being used. Use of a wheel with an rpm rating lower than the tool, improper mounting or misuse compromises operator safety as well as the safety of coworkers and can result in serious injury.

Proper personal protective equipment should be worn during operation of any power tool. This equipment includes eye, face and hearing protection; safety shoes; sleeves to protect the lower arm; gloves; and leather or fire-retardant jackets or aprons.

Finally, never operate a power tool without a guard that is properly rated for the size of the cutting wheel and mounted correctly per manufacturer instructions.

Before cutting any material or profile, ensure that the workpiece is properly mounted or clamped so that the cut line is as close to the mounting point or vise as possible while allowing for safe and adequate clearance of the tool, guard and hands. Before cutting, allow the wheel to spin freely for 60 seconds. This allows any potential defects in the wheel to be identified.

When cutting, think SPOT, which stands for speed, pressure, orientation and time.

• 1/8-in. bar stock: Never bump or impact the material to begin the cut as this can damage the cutting wheel, reduce cutting performance or lead to wheel failure. Using light pressure and a consistent motion through the cut provides the fastest cut rate and prolongs wheel life. Applying too much pressure through the cut causes increased friction and heat buildup. This can cause increased heat discoloration of the workpiece and reduced wheel life.

• 1/2-in. bar stock: When cutting thicker material, after allowing the tool to reach full free-running speed, approach the workpiece from the same angle, increase motion through the cut as appropriate for the thickness of the material.

• Round bar and round tube: Cutting round bar stock or tubing is easier because the countered surface provides the same contact surface regardless of angle. Applying light to moderate pressure and consistent movement provides the most efficient cut and minimizes heat buildup.

• Square tube: When cutting material with a larger surface area, beginning the cut from a corner reduces friction and minimizes kickback. After allowing the tool to reach full speed, engage the workpiece from the corner and work the cutting wheel through the material using consistent pressure. Use light to moderate pressure to work through the cut, being careful not to plunge the wheel too deeply into the workpiece. Depth of cut depends on wall thickness.

• Angle iron: When clamping angle iron on a table or bench, it is important to fix the workpiece with the corner perpendicular to the table. When clamping in a vise, approach from the corner and cut through the workpiece using the same pressure and motion throughout the cut.

• I-beam: When cutting I-beam and other irregular profiles, select a larger cutting wheel diameter to allow adequate clearance through the cut. Start the cut at an outside edge and use as little pressure as necessary to avoid binding and kickback. A consistent rocking motion through the cut ensures a fast and smooth cut.

• Sheet metal: Sheet metal is cut in the same way as any thin gauge material. However, because required cuts are generally longer, it's important not to dwell or plunge the cutting wheel too deeply into the cut. Rocking the wheel forward and in an upward motion helps keep the wheel from binding or plunging too deep.

Check out this video to see safety and cutting techniques.

"With any abrasive, pressure and heat are the enemy at all times," Hopkins says. "These types of cutting wheels, particularly ultrathin wheels, must be kept perpendicular to the workpiece. Keep consistent pressure using a gradual motion through the cut rather than just pushing straight through it. Allow the cutting wheel to do the work."

Ultrathin cutting wheels are more susceptible to twisting, turning and side loading, which can cause binding, premature wear and, potentially, wheel breakage. This is why proper use of the wheel during cutting is so important.

Another technique tip is to be aware of vibration, which is a detriment to any cutting operation, particularly with ultrathin wheels.

"Always make sure that the cut point is as close to the clamp or mounting point as possible while still allowing access to the workpiece," Hopkins says. "Cutting further away from the clamping point causes excessive vibration through the workpiece and that will adversely affect the life of any cutting wheel."

Regardless of wheel width, proper use of any cutting wheel begins with proper safety. See page 30 for proper safety and cutting techniques.

UltraCut cutting wheels are for many applications, including thin sheet metal.

DURABLE DISADVANTAGE

While the benefits of ultrathin cutting wheels are that they cut fast, are easy to control, and leave a smooth, burr-free cut, it comes at a price – durability.

"Ultrathin wheels typically cut quickly and smoothly, but the compromise is life," Hopkins says. "Any time you remove material from a product, you lose some durability. With most ultrathin cutting wheels, what you gain in speed and performance, you sacrifice in wheel life."

But that is where Weiler's UltraCut wheels come in. The wheels are made with solid core technology that provides all the benefits of the ultrathin profile without comprising durability (life). This technology increases the density of the wheels, resulting in longer life, reduced friction and superior stability allowing the operator to work safer.

UltraCut wheels are 100 percent zirconia alumina - a tough, self-sharpening grain that performs well on a range of materials. A contaminant-free Inox version is available for stainless steel applications.

Whatever the application, selecting the proper wheel requires some thought. Ultrathin cutting wheels cut fast and leave a smooth, burr-free cut and a clean seam. And now, wheels are available that are lasting longer, which is another factor in the decision on what wheel to use. ■

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