

PREMIUM ABRASIVES ARE A CUT ABOVE

BY MARK F. PALMA

If your vocabulary includes terms like sandpaper, garnet paper, or crocus cloth, it might be time to take a fresh look at abrasives as a woodturning tool. Driven by the needs of the cabinet and furniture industries, abrasive manufacturing technology has evolved dramatically. Products for our home workshops are superior to those of a few decades ago.

Abrasive encompasses a range of products capable of removing material. The fundamental concept is simple enough—a manufactured or processed particle attached to a backing via an adhesive. Advances in technology have produced tougher particles of a more uniform size, stronger adhesives, and durable backings often tailored to specific tasks. Good quality abrasives are a cutting tool that can level bumps, address torn grain, and leave a burnished, smooth surface. These steps create the critical foundation for a quality finish.

Layers make abrasives work

Abrasives are comprised of four layers: backing material, abrasive particles, adhesive coating, and a top coating. The four-layer concept seems so simple that it's easy to overlook the engineering that goes into their construction.

Traditionally, abrasives used either paper or cloth as a backing, and they remain the most prevalent backings today. Both can offer excellent wear and are affordable. Other materials such as latex, mesh, foam, and various proprietary materials are more recent additions to backing. Cloth is sometimes subject to additional processes to make the backing softer with increased flexibility. A backing that feels soft, bends back on itself without cracking, and is hard to tear will offer

an advantage on any round work, and particularly on small details such as beads and detailed transitions.

The abrasive particles themselves comprise what may be the least understood layer. Quality abrasives use uniformly sized particles to create an even scratch pattern. The particles are both sharp and brittle. They are designed to fracture in use to create new cutting edges, sacrificing themselves to remain sharp as they wear away. Manufacturers often leave open areas on abrasive sheets (usually indicated by the term “open coat”) to create areas for dust to accumulate so that sanding generates less heat.

The adhesive coating is designed to hold the abrasives to the backing. Quality coatings are soft enough to allow the backing to flex, but a good adhesive will retain the abrasive particles even as the backing flexes. Some may be moisture proof to allow lubricated sanding with water or more often in the case for wood, oil. Bend the abrasive sheet back and sharply crease it—a quality adhesive will prevent abrasive particles from breaking free and you shouldn't hear any cracking.

The hidden layer is the top coating that is often added to premium abrasives. These coatings usually contain stearates that act as a lubricant to cause dust to fall away and not clog the abrasives.

The six sins of sanding

The origin of most of our sanding problems arise from the following six issues: inferior abrasives, purchasing the wrong abrasive for the job, using abrasives beyond their lifespan, starting with the wrong grit, generating excessive heat while sanding, and trying to do all the sanding under the power of a spinning lathe.



Abrasive choices

Abrasive quality varies, usually in relation to the expense of the product. High quality abrasive products have a uniform particle size, longer lasting and effective cutting abrasives, adhesives capable of holding the abrasive particles onto the backing, and a variety of backing choices to suit different tasks to bring added performance to the product. If you can interpret the back of the packaging, you should be able to learn all you need to know to make an informed decision. Look for information about open vs. closed coat, the type of abrasive material, and the type and weight of the backing material.

For most woodturning tasks, aluminum oxide offers a good compromise between performance and cost. An open coat abrasive is important at the lathe to minimize the heat of friction. Choice of backing is often a personal preference, but flexible cloth backing will conform to curves better than paper, while paper-backed abrasives can be creased in a tight fold to easily address details like beads. Gold backing (available from several manufacturers), abrasive mesh, commercial grade foam backed abrasives, and modified cloth backings are all good choices for woodturning applications. Avoid stiff cloth backed abrasives (C weight), and stiff and easily torn paper backing.

Using old abrasives

Abrasives are a sacrificial tool; they are designed to wear and be thrown away. Applying a piece of abrasive to a 6" (15cm) bowl spinning at 300 rpm exposes the abrasive to the equivalent area of a 48" (122cm-) diameter table every two minutes. Turners should be throwing away abrasives faster than furniture makers, not hoarding piles of old abrasives. Many professional turners use abrasives so that each inch of the abrasive is only used for seconds, then they advance the sheet to a fresh inch, proceeding through the sheet as they sand. Watch the dust stream as it decreases in quantity, move to a new area on the abrasive sheet, and when you have used the whole piece, toss it and grab another. Do not use the backing as a gauge of abrasive life, as the backing should always outlive the abrasives. Old abrasives burnish wood, crush wood fibers, and create heat—not what you want to accomplish. In the grand scheme of things, the cost of abrasives is probably less than a dollar or two per piece, so why be cheap?

Wrong Starting Grit

The purpose of the first grit is to remove minor imperfections and efficiently create a uniform scratch pattern. Before you start sanding, examine the piece critically. Tearout or a bump that breaks a flowing curve

may be removable with abrasives, but these types of defects are best addressed with a sharp tool. The wood species will also influence initial grit selection. Some species are forgiving while others (for me, walnut) show every little scratch. With a less forgiving species, be cautious with coarse grits as they may leave scratches that seem impossible to remove with finer grits.

Using too coarse of an abrasive will create scratches you will need to remove; too fine and you will not be able to remove tool marks and you will generate heat that can damage the work. Sanding may require one or more pieces (or disks if power sanding) of the first grit to correct defects. Look carefully at the work. If the problems such as tearout or radial scratches are not corrected, drop back a grit and see if that fixes the issue.

Heat is bad

All wood contains trapped water within its cells, whether it is air or kiln dried. Sufficient heat of friction makes water boil and as it does it can crack the walls of the wood cells. This causes micro cracks that show up in finished work.

Sharp abrasives used at lower speeds cut wood without creating excessive heat. If you use sharp abrasives and slow speeds, you should be able to sand without feeling the work get warm. If you are power sanding, keep in mind the synergistic effect of the rotating wood and the spinning disk. Slow the lathe and disk speed even further when power sanding.

If you see the amount of generated dust declining, or if your hands start getting hot, exchange your abrasive sheet for a fresh one and consider slowing the lathe.

Power sanding

Sanding wood with a spinning disk powered by a drill or other device can be a great labor saver. However, your work will be better if you shut off the lathe periodically and look for problem areas that are not being addressed by power sanding. In my experience with sidegrain work, the disk tends to lift off the work as it goes over the hard endgrain. This leads to uneven sanding as the pad returns to the surface and approaches the facegrain. You may need to address this type of problem by hand sanding with the lathe off.

Power sanding on a spinning lathe can create radial scratches that will require judicious hand sanding between power sanding grits. With problematic species you may spend as much time hand sanding between grits as you do power sanding. One last tip—toss your used disks as they are used up quickly by power sanding.



Professional quality abrasives

Unlike consumer products that often present a compromise between cost and performance, professional products need to perform at their best (**Photo 1**). Professional quality abrasives should have uniform particles, high quality backings, and strong adhesives bonding the abrasive to the backing. They may also feature a backing that has been strengthened with an additional manufacturing step, and a stearate coating. In use these abrasives seem to cut longer before wearing out, have longer edge life, and have coatings that keep the dust from clogging the abrasives. They create a uniform scratch pattern and the flexible paper backing contours well to turned work. A personal favorite is 6" pressure sensitive adhesive backed gold disks. Folding them in half creates a half round, two-sided pad with two sharp corners, a sharp straight edge, and two large round areas that do not catch easily in spinning work.

Foam-backed abrasives

These work well for continuous curve objects but are challenged by small details and corners. They are comfortable in use and can be washed to clean out dust. Foam-backed products range from poor-to-professional quality. Avoid inexpensive products--they do not last. Commercial foam pads are a sanding system marrying a specific density foam to a high-quality abrasive (**Photo 2**). Quality foam-backed products have consistent density foam that does not tear or shred in use.

My personal favorites are the thin, high-density foam-backed pads. Thick foam pads seem to be too soft to allow any feel of how your sanding is conforming to the work. The thin high-density pads allow some flexibility while delivering feedback to your hand. Look for cabinet shop-grade pads. Cabinet shops use them to sand around door molding; turned work has similar features.

Mesh-backed abrasives

Mesh-backed abrasives make intuitive sense in their ability to shed sawdust and allow cooler sanding temperatures (**Photo 3**). By releasing sawdust, their "self-cleaning" feature reduces heat build-up and keeps the abrasive clean and cutting. The backing has just enough grip to allow them to be easy to hold at the lathe. They are flexible and conform to small details. A little dish soap removes build-up and returns them to a nearly-new state. In my shop, they seem to be durable and are a favorite for spindle projects and pens. The material is available in small sheets and disks and works well with 2" (5cm) and 3" (8cm) hook-and-loop power sanding disks.

Be aware that the backing will outlast the abrasives. Watch the dust coming off the work and when it

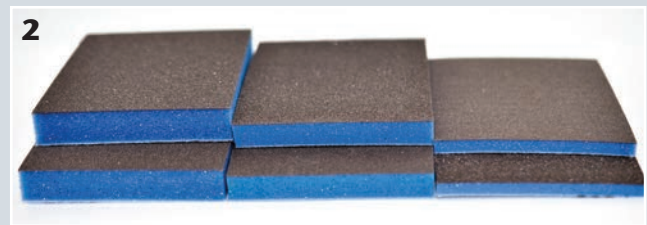
declines, replace the abrasive pad. Mesh-backed abrasives are more expensive than most other options, so I reserve them for situations where I will most benefit from their use. I wouldn't use mesh-backed abrasives for initial big bowl sanding but would turn to them for detail work. Mesh-backed abrasives are also excellent for sanding green timbers and oily tropical hardwoods.

Production abrasives by the roll



Whatever sanding tools they use, you can be sure a commercial woodshop goes through a lot of abrasives. Thus, production grade abrasives are often purchased in large quantities.

Foam accommodates contours



Foam-backed adhesives are well suited for many turning tasks as they excel at conforming to curved surfaces.

More air-than-there, but effective



Mesh-backed abrasives resist clogging, and when they do clog, they are easily cleaned with compressed air or with a brush.



Variable grit abrasives

These are a relatively new product available in disk form (**Photo 4**). Each foam-backed abrasive pad lists a grit range (e.g., 1,200-1,500). At lower rpms, the abrasive acts at the lower end of the range, while at higher speeds they act as a finer grit abrasive. The coarsest available grit is 700 and the finest is 3,500, so they are clearly designed for fine sanding applications. I have found they work well for pens, acrylics, and some exotic hardwoods.

Latex-backed disks and sheets

If you've done any sanding with powered discs, you know the edge gets more use than the interior and is prone to wear. Manufacturers have developed a latex-backed disk that offers better edge wear properties. The latex backing bonds the abrasives into a tough matrix that prevents the disk edge from tearing and keeps the abrasive particles in contact with the work.

Latex disks are available in 2" and 3" sizes, as well as in sheet form. They are between paper-backed and mesh-backed disks in expense and provide good disk life. They make sense for initial sanding of a bowl or vessel. The first grit takes on all the hard work of removing problem spots and is subject to the most wear.

Modified cloth-backed abrasives

Cloth backing is strong and durable, but consumer grade cloth abrasives tend to be stiff and unwieldy. In contrast, higher-end cloth-backed abrasives are supple (**Photo 5**). In fact, many are more pliable than comparable paper-backed versions. Manufacturers accomplish this with a careful selection of cloth weight and by rolling the abrasive sheets at an angle over a roller (one or more times) to relieve stress.

These products are tough, long lasting, and cut well. They conform to tight curves and hold up to tough applications. Unlike the consumer grade cloth-backed abrasives, these are a wonder.

Micro abrasives

Micro abrasives have been used for decades by high end model makers who want to replicate the finish of production vehicles on their model cars. They are also used in a variety of industrial applications to put a mirror finish on clear plastic lenses. The grit range usually starts at 1,000-1,500 and proceeds through 12,000-15,000. It is important to note that micro abrasives were designed as a system, with the user proceeding through all the grits in succession according to the manufacturer's instructions (**Photo 6**). They are meant to be used with a lubricant (water

or oil) and flushed repeatedly as they are used. They do not cut unless they are kept clean. Most can be washed and reused for years.

The most popular use for micro abrasives for turners is in pen making, acrylic casting, and sanding a CA finish. As they were designed for all types of plastics,

Multiple grits in one pad?



Variable grit abrasives may look conventional, but note the grit range stamped on the back.

Modified cloth for durability and flexibility



Modified cloth-backed abrasives marry the flexibility of paper with the durability of cloth.

Micro-mesh for that glass-like polish



Micro-mesh abrasives come as a graded system, often color-coded (with an accompanying chart) to help distinguish between grits.



these abrasives can leave a finish that can be buffed to perfection. One manufacturer uses color coding to identify their grits, while others rely on you to mark the grit on each pad. Wash them frequently, dry and store them flat, and they will last for years.

Non-woven abrasive pads

Non-woven abrasive pads were designed for industrial applications to replace steel wool and to perform a variety of metal sanding tasks. They have become a staple of professional woodworkers and cabinet shops, and the technology also benefits woodturners. Steel wool can introduce oil to the wood surface, as well as fine strands of metal that may stain or rust, especially in combination with water-based finishes. Steel wool is also dangerous when applied to a spinning blank as it can tangle and pull the turner into the work. Woven abrasive pads perform like steel wool with none of those drawbacks.

Non-woven abrasives come as nominally 1/4" - (6mm-) thick pads cut to a variety of shapes (**Photo 7**). They are a mesh comprised of plastic fibers with abrasive particles embedded within the fibers (as opposed to being on top like other types of mesh abrasives). You can cut them to shape with scissors. Many manufacturers color code their pads to distinguish grits.

Non-woven abrasives do not clog easily and can be cleaned with soap and water. They are safer for lathe work as they tear if they catch on the work. They can be used to sand, apply wax, or to cut back the sheen on a finish. From cleaning rust from a lathe to burnishing work after sanding, their applications are limited only by your imagination.

The myriad abrasive products on the market can be bewildering to navigate. Generally, more expensive products use higher quality materials and more costly manufacturing processes. Cheap abrasives are unlikely to lead to a quality outcome. Do some research and choose a product to suit your task. One of the best ways to find abrasive products is to pay attention to what the cabinet manufacturers are using. They need a product that performs in a demanding environment. ■

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Resource guide

3M (www.3m.com) manufactures a broad line of abrasives, sold primarily through third parties. Check out Stikit PSA backed or Hookit Hook and Loop backed 5" (13cm) and 6" (15cm) disks, 3M Production Resinite Gold production paper in 8-1/2" x 11" (22cm x 28cm) sheets, and Scotch-Brite non-woven abrasive pads.

Uneeda (www.sandpaper.com) manufactures commercial grade abrasive products that can be purchased directly from their website, including EKASILK PLUS and EKADIAMOND foam-backed aluminum oxide sponges in various foam densities, from 5mm to 1/2" thick. Check out EKAFLEX modified cloth backed abrasives and UAOFG film backed abrasives.

Klingspor (www.woodworkingshop.com) offers a wide variety of products mentioned in this article, including Ultraflex foam backed sanding pads, KlingNet mesh-backed abrasives in disks and pads, Fusion Foam variable grit abrasives, latex backed abrasives in various configurations, and Klingspor Gold.

Mirka (www.mirka-online.com) makes several products mentioned in this article, including Abranet mesh-backed abrasives in sheets and disks, Abralon foam backed micro abrasives in disk form, and Mirlon non-woven abrasive pads in various grits.

Micro-surface (www.micro-surface.com) manufacturers Micro-Mesh and offers a selection guide on their website to guide you through their product line.

Like artificial steel wool



Non-woven abrasive pads replace steel wool, offering similar performance but avoiding the latter's drawbacks. They can also be used with oil to reduce friction.

ADDITIONAL RESOURCES

For an in-depth review of a selection of modern abrasives, check out Jonathan Katz-Moses' video at the link below.

tiny.cc/sandpapertest

