



PHOTOGRAPHS BY KURT HERTZOG

What you need to know about sanding

In the first of a new series, **Kurt Hertzog** tells you all you need to know about sanding

Woodworkers often spend time in equal thirds on a project. Planning and building, prepping for finish and applying the finish. Projects can range from taking days to possibly months to finish. Woodturners often start and finish in just one session. Some have longer projects but most woodturners fall in the 'immediate gratification' crowd; mount it, turn it, sand it, finish it and then show it. Usually, sanding is done as quickly as possible and is very much disliked.

Depending on your turning skills, sanding may help you with your shapes and contours, but the most important reason for sanding is to create the best surface possible to receive the finish. Whether friction

finish, oil or multi-coat lacquer, the final appearance can never be any better than the surface beneath it. Unless you are painting, the finish will accentuate any surface flaws beneath it. Sanding needs to fair-cut surfaces together and ready the turning to finish. Proper sanding blends everything together and creates progressively finer scratch patterns until they are invisible to the eye. Understanding the basics of sanding and sandpaper can help you select, buy and use it wisely. Sanding may never be your favourite pastime or it may end up consuming one third of your total time, but it is extremely important in contributing to the end result. Let's explore some of the things you should know about sandpaper and sanding.

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TECHNICAL How to do that

SAFETY FIRST

Sanding any material such as wood, metal, plastic, etc. will create airborne particles that can be hazardous to your health. Regardless of the material, debris that is inhaled can cause both short-term

and long-term problems. Dust extraction at the point of generation helps minimise the amount of debris that would become airborne. Even with extraction at the source it is wise to use personal protective equipment to guard

yourself from the inevitable airborne particles. Overhead or shop-wide dust extraction is helpful but it removes the dust after it has been dispersed into the air and you have been breathing it. Always use proper dust protection.



Dust extraction at the point of creation reduces the amount of sanding debris that is cast into the air. Personal protective equipment such as a dust mask is still recommended



Depending on your needs you can use a powered filter helmet, permanent dust mask or a disposable mask

ABRASIVE SELECTION BASICS

Abrasive is simply a backing material with cutting agents bonded to it. Long since gone, flint and garnet used to be an abrasive cutting medium. Today, aluminium oxide and silicon carbide are the most commonly used by woodturners with emery, aluminium-zirconia, chromium oxide, ceramic aluminium oxide and diamond being others selected for special needs. This can include use for metals, high temperature, high pressure or high hardness level applications. Unless you have special needs, select aluminium oxide for your woodworking sanding needs. Silicon carbide is a second choice because of its shorter usable life in wood.

Materials and their most common applications

Aluminium oxide – wood, metal, paint, fibreglass and plastic
Silicon carbide – metal, paint, fibreglass and plastic
Ceramics – wood – hardest, most costly other than diamond, coarse only, usually on belts for aggressive sanding and shaping
Diamond – most common on stone and hard inlay

Abrasive terms you will often hear are 'steared' and open or closed coat. Stearated indicates that the sandpaper was produced with a dry lubricant embedded. Stearates, or soaps, help to prevent clogging of the sandpaper and can stretch the useful life. It has no detrimental effect to the material being sanded or the ability to take finish. Open and closed coat refer to the density of the cutting material

over the surface. Open coat abrasive is usually selected for woodworking as the less dense or open spaces help prevent clogging. Closed coat abrasive is a better selection for sanding metals or wood finishes where clogging is less of a problem. Don't overlook your industrial supplier and automotive refinishing suppliers as sources for your abrasives in addition to your woodturning supply houses. They can offer backing and abrasive particle selections that your woodturning supplier doesn't carry as well as grits in the very fine ranges.

The backing materials commonly used for sandpaper are paper, a variety of cloths, fibre, rubber and various plastic films. These assorted backings are available for different hand and power sanding applications as well as material being sanded and types of lubrications that might be used. Your selection of backing will be important if you venture from wood to metals, plastics, cast materials, and other sandable materials. The backings most commonly used for hand sanding by woodturners are paper and cloth. Paper is acceptable for most materials in a dry environment with cloth most used when wet lubricants are used in the sanding process. Paper will stand up to a dry or wax lubricant where cloth is more functional when water, oils, solvents and other liquids are used as sanding lubricants. Cloth is a more durable backing and is often selected for non-wood sanding applications. One of the most important considerations when selecting sandpaper is the backing weight rating. Paper runs from the lightest or 'A' to the heaviest at 'F' in sequence. Cloth runs from J, X, Y, T to M, from lightest to heaviest. The flexible



Think of sandpaper as a cutting tool, much like your lathe tools. Each particle of abrasive works the same as your tools



There is a wealth of information printed on the back of the sandpaper including measuring system, grit, backing type, backing weight, manufacturer, abrasive, lubrication and more

ABRASIVE SELECTION BASICS (CONT.)

sandpaper can easily follow irregular curves in your work while the more rigid is applicable to round or flat surfaces not needed flexibility or curving capability. Common backings for power sanding, depending on the mounting and service use, can be the paper, cloth, fibre or mesh.

You'll encounter two common grading systems used for abrasives. The CAMI – grit number alone – and the ISO/FEPA – grit number prefaced by P – only match up in two spots in the middle of the scales and diverge going higher and lower. You'll make things less error-prone to buy and use one or the other and not mix systems. A good selection from

the coarsest you'll need to the finest needed in the same system is wise. While the common 120, 220, 320, 400 grits are widely available, don't overlook the intermediate grits such as 150, 180, 240, 280, 360, etc. The common rule of thumb is to never make more than a 50% increase in grit number when sanding. For example, from 150 to 220 or 220 to 320 is a 50% increase. That said, there are many materials, very dense woods and plastics for example, that benefit by using the intermediate grits in the sanding process. You can usually buy up to 2,000 in the wet/dry silicon carbide sheets and these are available in the automotive refinishing retailers.

Common woodturner hand sanding selection

Aluminium oxide
 Open coat
 Paper backing – A or B
 Stearated or not
 80, 100, 120, 150, 180, 220, 240, 280, 320 and 400 – all in CAMI or FEPA
 Heavier duty, such as mixed materials or a lot of wet sanding;
 Silicon carbide
 Cloth backing J with all the rest of the parameters the same as mentioned

COSTS OF ABRASIVES

Abrasive is not a wise place to scrimp. You can overpay when buying small quantities, fancy packaging or at high markup merchants. Aside from these, you usually get what you pay for. Three important characteristics of concern are: uniformity of grit size, quality backing material and good

particle bonding to backing. Inexpensive or poorly manufactured abrasive may have grit particles that range widely from the indicated size. As you move through the grits to progressively make smaller and smaller scratch patterns, big variations in grit sizes or overlaps into different grit sizes will cause

problems. There will always be some variation in grit size but the smaller that variation, the better. Poor particle bonding to the backing material is also indicative of cheap abrasive. There will be some shedding of cutting particles when sanding but far less when using a better quality abrasive.

SANDING IN A NUTSHELL

Abrasives used in the process of sanding can accomplish two simple tasks. Properly done, the turning cuts that haven't been completely blended will be after the sanding process and the scratches introduced to effect that will be removed from sight. At completion, the surfaces and curves are faired together and the turning is assisted to the proper level, depending on the

finish that will be applied to the piece you are working on. Whether sanding by hand or power sanding, you must be sure to select a grit that is coarse enough to remove the 'high spots' as needed to blend cuts together. Depending on the design, material and your turning skills, if you need 80 grit, then so be it. There is no shame in starting where you need to. Your friends may brag about starting

at 220 but that is not really important here. That may or may not be accurate but properly done to completion, nobody will ever know what grit you started with. Remember to start with a grit that is coarse enough to remove the damages to the turning from the turning process and then work through the grits to effectively 'erase' the scratches that were put in by sanding.

WET SANDING

Wet sanding can be more appropriately called lubricated sanding. It is the addition of anything to the sanding process that will cool things and keep the dust down. The typical items used for wet sanding can range from plain water to waxes, oils and even finishes. I often use wax to help lubricate my sanding with the coarser grits – both hand and power. The soft rub on paste wax seems to assist the process by letting the cutting occur

with less heat, less dust and less aggressiveness. Depending on your mentor, they may suggest you use it everywhere, only in the coarse grits, only in the fine grits, or never at all. There are only two cautions that I would make. Mind the power cabling, boxes and switches. Fluids, especially water, can not only cause damage but present a very dangerous situation to you. You also need to be aware of any interaction your lubricating agent will have on your ultimate

finish. My use of wax at the coarser grits has never impacted any finish I choose to use. It is long gone physically prior to the arrival at the final grit. Be aware that any penetration of your lube into the material may cause problems later on. Of course, paper backing isn't as durable with lubes as cloth backing but, depending on your lube and your service needs, you may need to move to a different backing material on your abrasive, or change it more often.

A cloth applied light paste wax makes a great lubricant for the coarser grits of sanding. Many use lubes throughout the grit sequence



When the disc gets clogged, a crepe belt sander cleaner will rejuvenate the sanding disc. Add wax, or your chosen lubricant, as needed when removed



TECHNICAL How to do that

KEEP IT LOW

Sanding is a cutting process. Each and every particle of silicon carbide, aluminium oxide or other grit material is a tiny cutter. It cuts into the wood with the relative motion between the sandpaper and the material and the pressure applied. High speed relative motion on coarse grits is

counterproductive. The faster the speed, the less the abrasive is engaged with the wood and therefore, the less effectively it cuts. It is not only less effective at cutting but it also increases heat generation. Heat is the enemy of wood in general. When you need to wear a glove so that you can bear the heat

generated during sanding, you are going far too fast. I suggest that you slow the speed right down to be able cut more effectively and minimise the heat created. Going slowly keeps your sandpaper in contact with the wood and following the contours instead of hopping over the surface.

HAND SANDING

Hand sanding can be as simple as folding a piece of abrasive into thirds and holding it to the work as the piece spins on the lathe; however, there are safety considerations to think of. In addition to the safe turning attire and practices you must always use, presenting the sandpaper so that the work is running away from your point of contact is a wise choice. Somewhere in the seven to eight o'clock position, referenced as facing the headstock, both on the inside or outside of a turning rotating CCW will allow the paper to be pulled away safely and keep your hands from being 'jammed' by the

turning. Always keep the sandpaper moving so that you don't create any flats. When needed, open the folded thirds paper to expose a fresh surface. There are many ways of holding sandpaper other than with your hands. Commercially offered or home-made fixtures can reach into difficult places and keep you from putting your hands at risk. Another great use for holding fixtures is to conform to a shape or contour. Rather than freehanding, find or make a mandrel to match the radius you are sanding so that you can effectively sand it without deformation.



The safe zone for hand-held abrasives with the lathe running normally is at the seven to eight o'clock position. The abrasive can be safely pulled away and the hands won't jam



Reaching into places where you put your fingers at risk can be done safely using other holders such as forceps or similar, but don't hold them with your fingers in the loop holes!!!



Home-made sanding sticks - padded or not - can be used to reach into open vessels where you can't normally get to safely. They are also helpful for sanding interrupted surfaces without having your fingers and hands at risk

POWER SANDING

Especially popular with bowl turners, power sanding adds another way to fair curves and prepare for finishing. Power drills or rotating sanders will work. Be especially careful when using corded power drills. Be certain that the cords are

free and clear of all potential catching and the corresponding danger it presents. Battery operated drills work nicely as well providing variable speed, reversing, maneuverability, and the absence of a cord to get tangled. The turning can be stationary and the sanding disc

rotating, or they can both be rotating. Either way, there is relative motion between the wood and the cutting edges of the abrasive so cutting can take place. Abrasives are available for power sanding in a variety of backing, grits, attachment methods and more. All of

For power sanding there is a wide range of sizes, shapes and hardnesses available as mandrels for abrasives. Hook and loop, PSA and speciality snap mounts are the most common



I find it quicker to change the entire mandrel than to change the abrasive pad. The pads last far longer and hand tightening secures the mandrel for use



There are savings to be had cutting your own pads and sanding discs. Whether scalloped or folded up edges, you can soften the sanding process and cornering



Stopping the lathe lets you attend to areas needing special attention and use the pad flat. This is combined with normal power sanding as needed

POWER SANDING (CONT.)

the standard abrasive selection criteria hold true here, with the addition of attachment method, diameter and special edge softening characteristics. The abrasive is usually attached to a sanding pad - with that pad mounted into a drill or similar device. These sanding pads are available in a wide array of diameters, shapes and durometer. The user can select the size that will fit the part to be sanded along with the correct contour and hardness or flexibility. Depending on the shape you wish to sand, the selection of the pad and abrasive is key to the success of the task.

The tendency is to use a small pad because it will fit into areas and be very maneuverable. This is the wrong approach for the most part. Pick the biggest pad that will fit so that your sanding doesn't introduce hills and valleys based on the sanding pad diameter. Go to a smaller pad as needed to get into areas but be aware that it can alter

your curves and shapes quickly and usually not for the better. There are soft edge pads and special cut abrasives for working on the insides of bowls and platters that will be gentle on inside lips and curves. You can find those or even make them as necessary.

Like hand sanding, letting the abrasive cut is key. If you go too fast with the lathe rotation or the rpm of the drill powering the sanding disc, you'll build up heat and skate over the surface rather than cutting with the edges of the grit. There are many ways to refine your power sanding. The relationship of the rotational part speed in relation to the abrasive rotational speed also has an impact on the quality of the sanding process. The direction of rotation and speed of one or the other, or both, can have an impact. The opportunity to refine the shape and remove scratches with the combination of relative motions and directions is exhaustive. Coupled with the various abrasive grits, you have an enormous

opportunity to sand the turning to the desired end point. Power sanding abrasive discs are more expensive because of the pre-cutting and pad attachment methods. The attachment can be hook-and-loop, adhesive, special snap features or other. Because of their cost, I clean power sanding discs to maximise their life. More sturdily built, the sanding discs lend themselves to cleaning with the crepe belt sanding cleaner pads. You can hold the abrasive disc, spinning at low speed, to the crepe cleaning pad to clean the debris from the disc. This has the effect of extending its life considerably. There are special cuts of sandpapers for power sanding. Special-cut scalloped edging will be softer on the corners. Home-cut square papers can reach into undercuts nicely. Learn from your turning mates. At club meetings, look for work with flawless finishes, regardless of their turning type, and ask the maker for some of their tips and tricks for sanding and finishing.

SANDING ZONES

Holding abrasives to the work needs to be in an area where it can be effective and less prone to problems. With the lathe running counter-clockwise as usual for cutting, hand and power sanding can readily be done at the 7 or 8 o'clock position. This

position can be used on the inside of turnings as well. If you reverse the lathe as many do for sanding, be sure the grub screws on your chuck or faceplate are secured for safety. The sanding zone on the outside of the turning is now better suited for 10 to 11 o'clock and the

inside is 4 to 5 o'clock. With the lathe switched off, any area can be sanded with the headstock locked or with the turning being controlled by hand on the hand wheel. This allows for special attention to be paid to any problem areas you may have.



Power sanding position on the outside of a turning with the lathe running counter-clockwise or the normal turning rotation. Be careful with large pads and small shafts



A good sanding zone for sanding, powered or not, on the inside of a turning when the lathe is running counter-clockwise

TECHNICAL How to do that

SANDING ZONES (CONT.)



The sanding zone for the outside of a turning when the rotation is reversed and the turning is spinning clockwise



The sanding zone for the inside of a turning when the rotation is reversed and the turning is spinning clockwise

SPECIAL ITEMS

Abrasive sheet and cut discs can be bought from extremely coarse to extremely fine. Because of the high costs of cut discs with special features, many turners opt to make their own. Pad materials are available as are hook-and-loop sheet goods. The abrasive materials can be bought in long roll so individual pieces or discs can be cut and modified as desired with cost savings to be had by the maker. While not usually needed for wood, plastics and other materials can benefit from the very fine abrasives.

In addition to woodturning suppliers, you can turn to automotive refinishers and

plastics processors to take advantage of their speciality abrasives. There are whole families of speciality abrasives with special backings, padded and not, pre-made shapes and forms, lubricants, chemical abrasives, rouges and more. Abrasives and forms used in the cosmetics industry can solve special problems. While you can find "traditional" sandpaper products from below 30 and above 2,000 grit, there are other products specifically for high polish and gloss finishes. These are used on very dense woods, plastics and metals. Micro-Mesh products use a totally different different scale ranging from 1,500 to 12,000.

They equate to about 400 grit at their low end and are far off the FEPA and CAMI scales at the high end. The chemical polishes and super fine abrasives find favour with the pen turning community because of the frequent use of plastics and metals. Depending on your application, there is something already available to fill your need. Sometimes it is in a different industry, but it can be applied. Often it is already in your workshop. When it fits, I often use my random orbit sanders on turnings. Again, be careful of power cords or compressed air lines lest you put yourself in jeopardy.



Like buffing wheel compounds and jeweller's rouge, these plastic polishes carry a fine abrasive. Micro-Mesh abrasives can bring a mirror finish

Flapper wheels and plastics with embedded abrasives have a valuable place in your sanding toolbox

The abrasive manufacturers are continually creating new products to make sanding easier and more convenient

Abralon and Abranet from Mirka are products from the automotive painting arena that work great on wood and plastics



SPECIAL ITEMS (CONT.)

Don't overlook your random orbital sander if your turning lends itself. The larger the pad surface, the faster it gets done with better flatness



In addition to the powered power sander, there are many sizes and versions of the non-powered, rotary sander using the turning rotation for power



The non-powered rotary sanding pad gets its power from the rotation of the part. After learning the knack for getting it running, you'll enjoy using it



The various stropping and rotary sanding brushes work nicely on carved and textured areas. They will sand without significant loss of detail or digging

GOOD SANDING PRACTICES

The good practices for sanding are pretty simple:

1. Use good lighting – inspection of surfaces with a bright light at a high angle of incidence will let you see things which are often missed
2. Start with the correct grit – don't try to make 320 do the job of 180 grit. Begin as coarse as you need and work through the grits
3. Keep the sandpaper moving while sanding – staying in one spot will create a flat spot or dig grooves. With the sandpaper continually moving you are always feathering your sanding area into the adjacent areas
4. Sand slowly and let the abrasive work for you – slower speeds let the grit cut and minimises excessive heat generation
5. Clean between grits – when you have finished with a particular grit, clean the

sanded area of dust and shed grit prior to moving onto the next grit

6. Step through the grits – avoid big jumps in grit size as large jumps are not very helpful in achieving a great finish. Remember the 50% change is the maximum recommendation. Smaller change is better
7. Don't change grits until it is time – with the coarsest grit removing tool marks and each successive grit removing the scratches from the previous, don't move until the only thing there is the scratches from the current grit. Until then, keep sanding
8. Throw away spent abrasive – clogged up 220 shouldn't be used as 320. It should be thrown away
9. Only go as far as needed – progress to the end point you need based on the material and the finish that you will apply. You can



There is never too much light when examining work that you are sanding. High-intensity lamps that can be positioned as needed are helpful



Examine the surfaces as you go with a high angle of incident light. If you missed any scratches then go back to the grit that you need to be able to correct the problem



Don't be afraid to stop the lathe and sand with the grain. Using the same grit will make a marked difference. Do this at each grit if necessary



With proper PPE, a quick wipe with mineral spirits will often show sanding flaws easily overlooked on the turning. Mineral spirits won't raise the grain



The coarsest grit of abrasive is used to remove the tool marks. Start where you need to with your abrasives. Starting too fine won't be effective



Once the tool marks are gone with the coarsest abrasive grit, each successive finer grit removes the scratches from the prior grit. Keep going until your level of scratch 'invisibility' is reached

GOOD SANDING PRACTICES (CONT.)

sand too far. Don't sand to 1,000 when you only needed to sand to 320 or 400

10. Sand with the grain – sanding on a lathe usually means sanding across the grain, which is not ideal. That said, there is nothing that stops the woodturner from sanding with the grain. Turn the power off and sand by hand with the grain. The lathe makes a good workholding fixture. Even after the work is dismantled, you can

sand with various grits by hand and work in the direction most conducive to the best looking finish

11. Use lubricants as needed – waxes, oils, water and some other chemicals are great for sanding. Use them with care of the electrics and the finish to ultimately be used

12. Use proper protective equipment – a dust mask is in order regardless of other

air and dust handling. Don't find out later that you've been abusing your body. Always use the appropriate PPE, especially during sanding tasks

13. Reverse the lathe properly – many turners reverse the lathe direction with each grit whether hand sanding or power sanding. Remember good sanding areas based on direction and the security of the grub screws.

CONCLUSION

You may never fall in love with sanding, but I'd suggest you learn to tolerate it. Without a quality sanding job, your work will never be as good as it could be. Good practice includes sanding slowly and starting with the appropriate grit. Work through the grits and move on only when you have successfully removed the scratches from the previous grit. Skipping grits or not completing any one of them properly will show under your final finish. There is no fix for this other than sanding through the finish, going back to the problem grit, doing it correctly and then continuing. Explore the available sanding sponges, steel wools, fibre sticks, flap sanders, manicure items and a myriad of other items that can perform sanding functions. Don't lose sight of the fact that buffing and

polishing is sanding on a very fine scale. Try to remember the finer and finer scratches until optically imperceptible. While you may never spend 30% of your time sanding, I can

assure you that hurrying through the sanding process is a disservice to your end result. Invest the time needed to get to the end point your turning deserves.. ●



Proper sanding can only enhance a project. It is far too late to find a sanding flaw after the additional value is added or finish is on