THE ASP BUFFING AND POLISHING FAQ

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1. BUFFING AND POLISHING

   1.1. This FAQ discusses the tools and methods for polishing and restoring briar pipes and their stems: vulcanite or acrylic. The same methods are used for removing small scratches from the briar bowl as well as restoring the shiny black surface to stems suffering from varying degrees of oxidation (which produces a dull surface, tinged with brown or green as the oxidation deepens).

   1.2. I've written this FAQ for those who have little or no experience in machine buffing and/or using micro-abrasives, and the techniques presented are aimed at this audience. Further the information provided in this FAQ is based upon my personal experience as well as from what I have learned from working both in the jewelry industry and as a luthier. This FAQ is not intended to be the definitive work on the subject, but rather a helpful guide for pipe smokers who want to learn how to buff and polish their pipes.

   1.3. By way of background, I first used a buffer/polisher over 40 years ago, having been trained as a jewelry fabricator and watchmaker, then as a luthier (guitar-maker); and although I do not work in either field today, both have been serious hobbies/side-businesses. You can see photographs of an acoustic guitar that I have built on my ASP bio on this site.

2. FOR THE BEGINNER

   2.1. I'd like to make a few points at the outset, and separate them from the rest of the text so that they are neither lost nor overlooked. These points address the most common mistakes that I see beginners make.

      2.1.1. WHAT BUFFER? Without mincing words, I recommend the Foredom BL-1; it will be a tool that you can use for life; it is small and compact; it has infinitely variable speed; and it is well made. You can slow it down for your first work sessions, and gradually speed it up as you become more comfortable with the tool and the process. It is the buffer of choice for the jewelry industry – hundreds of thousands of them are in use today polishing rings, earrings, pendants and the like in thousands of jewelry factories around the world.

      2.1.2. WORK SAFELY. No loose clothing, no ties. Roll up your sleeves. Remove jewelry and watches. Wear a heavy apron that covers your chest to protect

you from work that may be flung from your hands and shot into your chest at high speed. Wear safety glasses. And get a good respirator; one made of soft rubber that completely encloses your nose and mouth and uses "filter cartridges". You do NOT want to inhale minute pieces of cotton, abrasive, vulcanite and the like; those paper nose-cones held on with a rubber band are next to useless. If you can afford it, get a ventilated hood for your buffer; if you can't afford one, study the photos of them on various web-sites, then at a Home Depot or Lowes find pre-made sheet-metal parts in their HVAC section that look like a hood, and cobble one together with a short length of pipe to mate to your shop vacuum. You now have a poor man's ventilated hood. Ready made or home made, line it with ½ inch foam: it will absorb the shock of the work that will inevitably be snatched from your hands by the spinning wheel. Move all other tools, pipes and other loose objects off of the bench top. Remember the speed of the wheel: anything it catches will be hurled at YOU at that speed. Be wary, work safely!

2.1.3. BUFF SLOWLY. One of the most common errors of the beginner is "accidentally" removing too much of the material being polished: edges and contours are flattened, stamped or engraved lettering is removed and the like. Use a small wheel (four inch diameter), and read – then re-read - the section on how to calculate the designated speed for these operations: Surface Feet Per Minute. The ideal speed for a beginner is 750 to 1000 SFPM: you will not easily remove edges and contours or remove stock at this slow speed; yes, it will take you a while to buff a pipe with a slow-turning motor, but a nice crisp edge or a button can be flattened in a split-second at higher speeds, so why not take your time?

2.1.4. LET THE WHEEL DO THE WORK. Or more realistically, the outer 3/16 or so of the wheel (the "loose" threads on the surface) is what is doing the work. ***Don't push or - worse yet - lean into the wheel***: you only need to press the workpiece to the depth of the loose threads, never any deeper. It is these threads that "catch" the polishing compound, and which are "brushed" over the surface of the work that does the polishing. You should ***never*** be slowing the motor down with pressure; You should ***never*** be distorting the wheel with pressure.

2.1.5. KEEP THE WORKPIECE MOVING. Never stop while it is in contact with the wheel. Shall I say it again? If you do not, you will end up with a wavy surface or ruts.

2.1.6. BUY HIGH-QUALITY COMPOUNDS. You use so little, buy the best, either from jewelry or machine-shop suppliers or the like. Avoid the stuff you can get in home-supply mega-stores or hardware stores; they are

generally made for less-demanding applications (such as chrome-plating industrial fixtures) and rarely produce as good of a finish as those made for the jewelry, optical or show-car industries.

2.1.7. Practice on a junker pipe if this is your first time using a power buffer. You'd be surprised at how easy it is to create a wavy surface or remove edges, contours and buttons!

3. OVERVIEW

3.1. The polishing process requires that the surface be repeatedly abraded with finer and finer grits of abrasives until the subsequent scratches are so fine that they appear non-existent. This is the crux of this FAQ, and I will repeat it many times in many ways – *it's that important*!

3.1.1. Removing scratches with an abrasive compound on a wheel (on a buffer) is called "cut" or "polish", while removing smaller scratches with a wheel (generally, 2.5 micron abrasives and smaller) is called "color" or "buff", and is the step to get a smooth, bright, high luster final finish. (It is called "color" since the color of the compound will affect the finished color of fine metals such as hi-carat gold or platinum). Obviously, there will be some overlap of compounds and processes, and it is up to the operator to choose where to start, how large of a step to take between compounds, and when to stop: e.g. there is no need polish a pipe stem using the micro-abrasives used to polish an eyeglass lens.

3.2. ABRASIVES

3.2.1. Abrasives can be found in many forms, shapes and hardnesses but the two forms we will discuss are either glued (to a paper or Mylar film backing) or mixed with a sterate (wax), then packed in a bar or tube as a soft solid. The latter are generally referred to as "compounds" and are applied to a spinning cotton buffing wheel. Some abrasives - particularly those found in nature as minerals - possess a quality referred to as "friability", which means that they continue to break apart, constantly exposing fresh cutting surfaces that are smaller and smaller, somewhat accomplishing cut and color in one operation. Some of the most common abrasives are the natural ones such as: emery, Tripoli, diamond or rouge; and the man-made, such as: silicon oxide, aluminum oxide and silicone carbide. All of these abrasives have advantages and disadvantages, and the most important difference is the particle size. In natural abrasives (such as Tripoli and Rouge), particle size can vary considerably in a given batch; consequently, it is most important that the particles be "sieved" and separated into batches of a uniform particle size before they are glued to a

backing or compressed into a bar; how carefully and uniformly this is done impacts the cost of a given compound. Always buy the best is my advice.

3.2.2. Synthetic particles tend to have a more uniform hardness and shape which allows them to be sized more accurately than natural abrasives. It is important to note that sieve sizes between different measuring standards vary. Consequently, an abrasive with a 400 FEPA sieve, may not be the same as a 400 ASTM sieve size. In addition, other abrasives, (film or compound) are sold by sizes expressed in "microns". One micron is a metric unit of length equal to one millionth of a meter and is approximately equivalent to a 14,000 sieve size. A one-micron finish will produce a very nice finish luster. One of the better products on the market for buffing stems is the white compound sold under the proprietary name of FABULUSTER; it is very uniform in particle size - in addition, it is a friable compound.

3.3. PAPER AND MYLAR SHEETS

3.3.1. Abrasive papers or films can be purchased in grits from 1000 to .3 micron (+/- 20,000), but for our purposes we will use sheets from 600 to 8000, although it is good to have up to 12,000 on hand. For finer polishing, we will use the polisher/buffer, and anything rougher is outside of the scope of this article and in the realm of woodworking. For ease of use, these micro-abrasive sheets are best used by gluing them to a stiff foam block with contact cement. Many hi-tech auto-body shops sell these abrasive papers and films, as do machine shop suppliers, and hobby shops sell the MICRO-MESH brand, which I recommend. Micro-Mesh sells the "Craft Kit" which is comprised of two-inch square foam pads as well as one-inch by six-inch foam paddles (both are 1/4 inch thick) to which their abrasive films have been pre-glued. Micro-Mesh also sells loose sheets, and various sizes of foam blocks. I have found that the closed-cell foam insulation strips (about one inch square and three feet long) which are sold for insulating around window air conditioners make excellent sanding blocks. Simply cut off a 3 or 4 inch piece, and use contact cement to glue the sandpaper/film to one surface of the “block”. Beauty supply shops sell similar products in the nail section. The problem is that the grit size is rarely marked, and often incorrectly marked. However, once the reader is familiar with the "feel" of the Micro-Mesh products, it is easy to sort thru these "nail buffers" so as to find ones suitable for pipe polishing.

3.4. SOLID AND SEMI-SOLID COMPOUNDS

3.4.1. There are many different polishing and buffing compounds. Often manufacturers - or worse yet, distributors - separate them into additional

categories with 3 or 4 different levels of polishing and buffing. The nomenclature becomes more complicated because the compounds are used for different reasons by different industries depending upon the desired outcome and the surface itself - not to mention the time one wishes to invest in a project. For example, the optical and custom/show car industries will use the same types of abrasives in different packaging, yet the resulting finishes are often remarkably alike.

3.4.2. One of the difficulties in using and understanding abrasive compounds is that each manufacturer uses their own formulation in manufacturing a line of polishing abrasives. For example, there are two types of aluminum oxide used as a polish, sometimes called "A" and "B", and the size of the particle of each designation is quite different: Aluminum oxide "A" is 0.3 micron in size and Aluminum oxide "B" is an extremely small micron size of 0.05. To put this into perspective, 50,000 sieve is +/- .5 micron. A micron is a metric unit of length equal to one millionth of a meter.

3.4.3. Another difficulty is how carefully each manufacturer screens the abrasive that makes up a compound. Some manufacturers will sell a bar or tube of compound that is comprised of (for example) *only* 3 micron abrasives, while another manufacturer may have a *"range"* of particles from 2 to 5 microns in their compound, with the "average" being 3 microns. This is a very important distinction, because you will obtain a much finer finish with the former. Let the buyer beware.

3.4.4. When purchasing a bar of abrasive compound, the color alone will not reveal the concentration of abrasive compound used or the size of the particle used in manufacturing the compound. The ranges of abrasives used by one manufacturer in their green oxide compounds used is from 5% to 90%, a significant difference; and of course, the resulting finish from each bar will be significantly different. And too, there is no accepted color code to abrasives; it is simply a myth that one color is used prior to or after another color, so let me repeat: *there is no system of color-coding for abrasives!* I have seen "black rouge" for sale that is not rouge at all but emery, and would remove rust from steel! These variables can vary greatly from manufacturer to manufacturer. I would suggest finding and staying with one supplier when selecting your abrasives.

3.4.4.1. Unfortunately this can cause unpredictable results, and make the purchase of compounds difficult. Buying at tool shows, hardware stores, flea markets and the like is risky, IMO: I have seen bars of red compound that are 800 to 1000 grit and sold as jewelers rouge, stating that it is "suitable for use on precious metals". That product would damage high-carat gold or fine plastic in a fraction of a second.

3.4.5. To add to the confusion, different suppliers describe buffing and polishing compounds differently and many different brands are identical for all intents and purposes. Not all red compounds are jeweler's rouge, as many believe. Jeweler's rouge is made with ferric oxide, which gives it the red color. The word "rouge", is French for "red", and even though it is then semantically incorrect to call green or white polishing compound rouge, some do it anyway. As a final note, also remember that a bar of green compound is more than likely chrome oxide, and not rouge!

3.4.6. Practically speaking, I can tell you that the Tripoli that I use is the equivalent of +/- 7000 sieve and the rouge that I use is slightly finer than 1 micron (keep in mind that they are both friable, and break down to smaller and smaller particles as one buffs). Both, however are sold in unmarked wrappings, and your finding the same ones that I buy is highly unlikely. Before we get too caught up in sizing abrasives, please remember that it is extremely difficult to sieve particles finer than 12,000, and that methods other than a sieve are used to sort micro-abrasives. Further, the smaller the particle, the more difficult it becomes to assign a micron size to a corresponding sieve size and vice-versa; there are no true equivalents between micron and particle sizes, just “educated guesses”; consequently, when I speak of an equivalence between a sieved particle and a particle measured in microns, it is just that: an educated guess.

3.4.7. TIP: HOW TO JUDGE ABRASIVE SIZE. Now that you are aware of the fact that a given bar of compound marked “Tripoli” may be comprised of abrasive particles finer than another manufacturer’s bar of “Rouge”, you will want to be able to judge the relative size of the abrasives in any given compound for yourself. Let me give you a tip. You will need a one-inch by two-inch piece of sterling silver, 10 or 12 gauge; you can buy it at any lapidary or jewelry supply shop. On a large piece of plate glass (a glass table works well) lay a sheet of suitable abrasive: if you want to test rouge, use a sheet of 3M Imperial 1-micron lapping film (+/- 14,000) or Micro-Mesh 12,000. Using a continuous supply of water, lap the silver back and forth over the abrasive sheet until you have a flat, even surface. You now have a test piece with a know surface finish. Using a high quality masking tape, mask off ½ of the piece of silver, pressing down with your fingernail so that you have a tight, straight edge. Charge a ***clean, new*** wheel with the abrasive you are testing, and polish the exposed surface of the silver. Now remove the abrasive from the silver with soap and hot water, peel off the masking tape, and using a 25X loupe or magnifier, examine the silver closely in a strong light. You will immediately be able to tell if the compound on the wheel is finer or coarser than the previously prepared surface. By a process of elimination, you will be able to number all of your

compounds, and if you stay with one manufacturer, you will never have to repeat this experiment! (We use glass as a flat surface, inasmuch as it is the flattest surface available except for specially ground stone “flats” made by Starrett; sterling – though expensive – is soft enough to lap and polish quickly, and that piece should last for years).

3.5. Some recommendations. Let me give you two source of quality supplies such as wheels and compounds, who sells jewelry tools and supplies commercially: http://www.foredom.com. I have no affiliation with either except as a customer, but I can assure you that they sell high quality supplies to the jewelry and gunsmithing industries. Foredom’s rouge, #40041 is one of the best sold, and their Tripoli is quite good also. Their wheels are excellent. For the stems, I suggest FABULUSTER, though WHITE DIAMOND (two grades are available) and ZAM are similar. I prefer FABULUSTER, and in a pinch it can be used for fine metals and other hard materials. Another source of supplies is: http://www.kingsleynorth.com/jewelers.html and they sell both VIGOR and GROBET polishing compounds, (two excellent ones) and all of the other supplies mentioned here.

3.5.1. For those who wish to go the extra mile, many micro-abrasives are available to the show-car industry as well as the optical industry. The abrasives used on plastic eye-glass lenses are as fine as .03 micron – try that on your tamper or fountain pen! I have asked my optometrist to buy .03 micron compound from his lab for me, and he has; you can do the same. It is supplied as a slurry, and I have found a foam sponge to be the best medium for its application. The shine is spectacular!

4. WHEELS AND MOTORS

4.1. Buffing wheels come in a variety of styles and sizes. With the standard polishing motor, the smallest buff possible should be used to obtain the optimum working speed. Choices should be confined to the stitched buffs, either treated or non-treated. The unstitched buffs generally lack the stiffness to generate sufficient friction at the interface to allow the surface to flow and fill in the micro-scratches necessary to yield a high luster. A separate category of buffing wheels are hard felt "bobs". These are used to maintain a perfectly flat surface, or perfectly sharp edge or contour, since they do not "give" as the workpiece is applied to its surface. In addition, complex or inside curves can be easily polished by shaping the hard felt wheel to the exact shape or contour of the inner curve. Be advised, however, that one can ONLY use hard felt bobs with a "polishing lathe" as described below, never on a home-made buffer or an Asian one; and the technique and control needed requires a LOT of skill and practice, so practice with a felt bob on old pipe stems! If you have no local supplier, Foredom and Kingsley North sell a complete line of polishing wheels.

4.2. A buffer/polisher can be made from a double spindled motor but at about this price point one might as well buy a proper polishing lathe manufactured for the dental, jewelry or optical industry. Such a buffer should ideally be of sealed construction and have a precision ground motor shaft, turning on self lubricating ball or needle bearings. They are called polishing "lathes" because they are made to extremely close tolerances, with a precision ground motor spindle, turning on needle or ball bearings, with microscopic run-out. What this means is that as the motor turns, the buffing wheel will (once trued) turn accurately and concentrically to the center of the spindle. Wavy surfaces and the loss of edges and contours on the workpiece are a result (if not of operator error or inexperience) of wobble and run-out from an inexpensive buffing set-up as described in the next paragraph - as the wheel wobbles - even if only by hundredths of an inch - it causes the ripples and waves, and makes it ***impossible*** to maintain a crisp edge. And all Asian buffers and home made equipment have a LOT of run-out! Again, let the buyer beware.

4.3. One can also purchase an inexpensive grinding unit made in Asia from companies such as Homier or Harbor Freight Salvage. Such grinders can usually be bought locally for between fifty and one-hundred dollars. One may also rig up various arrangements of pulleys and belts with a discarded washing machine motor or a similar motor. ***I really discourage the use of either.*** First, a grinder's motor is ***not*** the same as the motor made for a polisher/buffer in that a grinder is a high torque, and generally high rotation motor designed for removing large amounts of material quickly; neither is a washing-machine motor made for spinning a buff. The quick removal of stock is not the purpose of a buffer, and buffers generally have much less torque and a bit less horsepower. It is that unnecessary torque that will fling the pipe that much further (or break your finger) that much more quickly. Avoid them. In addition, the Asian units have a great deal of run-out because they are not precision-made, and turn on inexpensive bronze bushings in place of bearings. This introduces a great deal of off-center wobble, and can cause surface ripples in the finished work – so that one can not easily maintain a sharp edge or contour with a machine like these. As for the home-brewed machines, IMO, they are ***just plain dangerous*** in addition to being difficult to work with and have all of the faults of the cheap, Asian machines. Or let me put it this way: you wouldn't stick a soda-straw into a walnut shell to use for a pipe - would you? Then why maintain and restore fine pipes with a jury-rigged outfit?

4.4. The three most popular polishing lathes are (in descending order of power and size): Baldor, Red Wing and Foredom; the Baldor lists for about $325; the Red Wing about $289 and the Fordeom about $199. The internet prices are lower, but not by a lot inasmuch as these buffer/polishers are designed for industrial use and purchase. I own one of each, but will tell you that the Foredom BL-1

will be just perfect for home maintenance and restoration of smoking pipes - it can be had for about $175.00.

4.5. DREMEL. In a word: **NO!** Don't even ***think*** of using one on a pipe! They spin ***way, way*** too fast (15,000 RPM) and that little buff concentrates a lot of power on a very small surface. It has sharp edges and can run away from you and nick and gouge the workpiece before you can recover control. The Dremel was not made for buffing a pipe, and you can do a ***lot*** of damage with it in a very short time. They are very good tools and quite useful; I own two, but not for buffing and polishing!

4.6. Be certain that you purchase an appropriate tapered arbor (right or left hand) for the direction of rotation of the spindle for the buffer you use. If you get a tapered arbor from a machinists supply, be forewarned that it will run less accurately than a narrower jeweler's tapered arbor because it has a very wide taper and so can be used with lower priced buffs from the hardware store which have a large center hole. Jeweler's buffs are purchased from a jeweler supplier and are made with a smaller hole; they are more expensive, and require a smaller jeweler's tapered arbor. They are also more accurately cut, and give a finer finish. Foredom and Kingsley North sell jeweler's buffs: for Tripoli, I use a coarse-weave (60 tpi), four-inch diameter muslin buff with three rows of stitching (though some prefer the even stiffer yellow-treated buffs); for FABULUSTER and for carnauba wax, I use a fine-weave (80 tpi), four-inch diameter muslin buff with three rows of stitching. For the final buff (using no wax or compound on the wheel) a loose-stitched (usually 1 row) flannel or even a man-made chamois buff, turning at a low speed (under 1000 sfpm).

5. USING COMPOUNDS ON WHEELS

SPEED. You can improve the effectiveness of the polishing operation by operating in the optimum working speed range for the grit being used. This is measured in distance over time and is always expressed as SFPM, or "surface feet per minute". This is the speed that the outer surface of the wheel is turning at, and NOT the spindle speed – and this is an ***extremely*** important distinction! To obtain the SFPM, the formula is: spindle speed x diameter of buff x π/12 = SFPM. For an automated calculation of SFPM, go to: http://www.carbidedepot.com/formulas-turning.htm

5.1.1. For example, the optimum working speed for Tripoli is 1500 to 2000 SFPM, and a 4 inch wheel turning at 1725 RPM spindle speed will produce the optimal speed on the surface of the wheel. I use and recommend a four inch wheel; larger wheels simply produce an excessive surface speed that is dangerous to the operator and material, and one has less control with a larger wheel. Trust me when I tell you that 8-inch wheels can break fingers as well as propel a stem into your chest or a bystander at a high rate of

speed. I have seen photos of European pipe-makers using giant wheels on huge, slow-turning motors. I simply do not understand why, and attribute it to custom or unavailability of the buffers sold in the U.S. I have used such set-ups to buff guitars, and know that Gibson uses them on its production lines; but in my opinion, that are unsuitable for a small object such as a pipe, and it would be too easy for it to be snatched out of your hand and propelled into a wall, or worse yet, you! Stick with a 4 inch wheel!

5.1.2. I would suggest working at 750 to 1000 SFPM, and that would be with the dial at about 1/3 on a Foredom polishing lathe. Yes, it is slow, but at that speed bad things happen slowly, and you can sometimes recover from a mistake that you could not were the motor turning faster. In addition, you will be less likely to buff off too much stock, or stamped lettering at that speed. Once your confidence and skill level increase, you can speed up.

5.2. One step that should never be overlooked in polishing is the necessity of cleaning the coarser compound from the piece prior to moving to a finer one. Cross-contamination is one of the biggest problems encountered during the polishing process. If the binder of an abrasive is allowed to overheat it can plasticize and smear over the piece. If this material is not removed prior to moving on to the next finer step, the heat and action produced by the subsequent operation can liberate the coarser abrasive and intermix it with the finer one. A quick wipe with a cotton pad ***lightly*** dampened with alcohol works well. And it goes without saying that you should use one wheel - and mark it - for each compound. Never, never use more than one compound on a given buffing wheel!

5.3. Though cross-contamination is less of a problem with the sheet or film abrasives, it is extremely problematic with the buffing abrasives. It is a good practice to label or color code your buffs to help reduce the likelihood of cross-contamination. Here the abrasive particle is generally so small that the size difference is not visually apparent. When the buff becomes clogged it can be cleaned with a dressing stone, a wheel rake or a piece of hacksaw blade (18 TPI) wrapped in friction tape to protect your fingers. Hold it against the bottom third of a SLOW spinning wheel and keep it as perpendicular to the wheel as possible. There are also commercially made buffing wheel rakes and abrasive stones sold for this purpose.

6. METHODS

6.1. There are two methods of using abrasives. For deeper scratches in the briar, and for tooth-marks and extreme oxidation on the stem, one will start with an abrasive film or paper with a 1000 grit size or finer and repeatedly abrade the

surface with finer and finer grits of abrasives until the subsequent scratches are so fine that they appear to be non-existent (making certain that the scratches left by the preceding abrasive have been completely removed!). Once a satisfactory surface has been obtained - or if the surface is already smooth - one will use a compound applied to a cloth wheel spun by a motor, and progress from coarser to finer abrasive compounds in small steps.

6.1.1. The most common mistake that I see, from both amateurs and those who should know better, is to ignore this principle: to repeatedly abrade the surface with finer and finer grits of abrasives, in small increments, (making certain that the scratches left by the preceding abrasive have been completely removed!) until the subsequent scratches are so fine that they appear to be non-existent. I have repeated this many times over because it is ***that*** important! In fact, one can usually improve almost any pipe costing under $100 by meticulously sanding it with 1000 to 8,000 paper, then buffing with Tripoli. Most pipes under $100 are sanded to 600 or so, then polished with Tripoli because the price point doesn't permit meticulous, step-by-step hand sanding with finer and finer grits!

6.1.2. I have seen bowls, stems, tampers, jewelry and other objects sanded with 600 grit paper and then taken to a Tripoli wheel then waxed without carefully and completely sanding or polishing the surface with each and every intermediate abrasive. While such a surface appears shiny (if you squint), it is not as reflective as it could be because of the intermediate scratches left behind and not removed. An analogous situation is on an automobile that someone has waxed without removing the "micro-scratches" that the automatic car-wash leaves: it looks fine from a distance, but viewed in direct sunlight, those pesky scratches become visible. The practice of sanding thoroughly with each abrasive one step at a time is such an important concept in obtaining an "optical quality finish" (i.e. one that reflects as much light as possible and appears to be liquid) that I can not emphasize it enough. Folks ask me how I get my stems or my car to have such a lively, reflective shine – what's my secret? I've just told it to you: the removal of scratches by meticulously using each and every intermediate abrasive!

6.2. Each grain of abrasive is in reality a sharp, small grain that acts as if it were a tiny plane, and scratches off a minute bit of surface material; obviously it leaves behind small "scratches" or grooves the size of each abrasive particle. By moving to the next screen-size and slowly and thoroughly sanding the surface, those scratches are replaced with smaller ones and so on until the scratches are so small that they appear as a highly reflective surface to the naked eye. At about 1 micron (approx. 14,000 screen) the surface becomes quite reflective,

but plastic eyeglass lenses are polished with .5 micron compounds and high quality optics with .03 micron!

7. PRACTICAL APPLICATION

7.1. The appearance of many pipes, tampers and even fountain pens range can be improved by a run-through with micro-abrasives because the makers rarely will spend much time on an inexpensive article, and some judicious hand polishing by the reader can produce a pleasing luster.

7.1.1. Since this is not the PIPE RESTORATION FAQ, I will not delve into the minutiae of that process, but for these tips. Before starting, clean the airway of the pipe with a small bristle brush made for this purpose - dipped into a small dish of Everclear grain alcohol, running it through until the alcohol runs clear. Follow this with pipe cleaners dipped in alcohol. If it is an estate pipe, I soak the stem in a quaternary disinfectant overnight. Ream excess carbon/cake from the bowl. Wipe the rim of the pipe with a Q-Tip dipped in alcohol until the tar and carbon have been removed. Be judicious: too much alcohol or pressure will dissolve the stain! If you remove the stain, or want to re-stain a pipe, buy a powdered aniline stain. I dissolve mine in water, because I feel that the result is more transparent and lively than if it were dissolved in alcohol.

7.1.2. Small dings and dents can often - but not always - be removed with steam. The wood in a dent has been compressed, and steam will often swell the underlying wood, causing it to "fill" the dent. Either a steam iron (ONLY if it has a "burst of steam" feature) or a clothes steamer are suitable: simply aim the jet of steam directly onto the dent for about 15 seconds. After two or three burst of steam, the wood will either swell back to, or close to its original form - or not. I do not recommend mastic fills for pipes. Enough woodworking/restoration; let’s get back to the subject at hand!

7.2. Begin by using 1000 grit abrasive paper on a foam block. Take long, gentle strokes that conform to the shape of the bowl or stem. Alternate each stroke with a following stroke ninety degrees to the movement of the first stroke. Slowly and methodically stroke the work until the entire surface of the pipe and stem have been sanded, Pay attention to the edges of the button, and the rim, and never, never alter a contour. Examine your work under a 15x loupe; pay attention to the button and sharp contours to ascertain that you have not rounded any edges or changed any contours. The surface should have a uniform finish. Re-stroke any areas that do not.

7.2.1. Next, repeat this with successively finer grades of abrasive films until you reach 8,000. I can not stress the importance of taking small steps - it is this that gives the mirror finish. In fact the most common mistake I see is going from 600 or 1000 paper right to the buffer with Tripoli! Each grain of abrasive, whether on film, paper or a cloth wheel, and no matter what it is made of, is a sharp-edged particle, not unlike a chisel or plane blade. As a compound-laden buff turns, or a sheet of abrasive film is stroked each of those particles acts like a mini-gouge, taking the "edges" off of larger scratches while making them more shallow. The surface is to be repeatedly abraded with finer and finer grits of abrasives until the subsequent scratches are so fine that they appear non-existent. If you skip a step, you are merely rounding off the sharp edges of a larger scratch, thus reducing it's optical reflectance - but not improving the surface. (This, BTW, is what cheapie auto detailers do - called a "squint-job" in the business: it looks good if you squint!).

7.3. TO THE BUFFER. At this point, the workpiece is taken to the buffer, but if you are like me, you will sand up to 12,000 before going to the buffer, and then go to FABULUSTER; Tripoli is used only if the stem is green or brown from oxidation or if you stop at 6000 or less abrasive film/paper. Now, holding the stem, mentally divide it into halves. Remembering that Tripoli and FABULUSTER are friable (that is, the abrasives break down into finer and finer pieces) you will want to start on - and stay on - one half of the workpiece until you reach a final luster, then re-charge the wheel to do the second half. Put a coarse cotton wheel on an arbor, turn the speed on low; and with medium pressure, touch the bar of Tripoli (or FABULUSTER) to the spinning wheel for a second or two ***at the most***. It should visibly color the wheel, but not load up compound on the wheel; this is called “charging” the wheel.

7.3.1. Hold the workpiece firmly in BOTH hands, and ***gently*** touch it to the lower quarter of the wheel as it faces you, and immediately move it slowly and evenly from left to right, never stopping. Remember that it is the “loose-ends” of the wheel, that is to say, the last 1/8 to 3/16th of an inch of cloth that holds the compound, and that does the work. Consequently, there is no need to force the work into the wheel; The work should be pressed into the wheel for that 1/8 to 3/16, and no more; if you are visibly distorting the wheel, you are applying too much pressure; if you can hear the motor slow down, you are applying too much pressure. Let the spinning surface of the wheel, ***not the motor,*** do the work!

7.3.2. If excess compound is visibly transferred to the workpiece, you have used ***way*** too much compound; touch the spinning wheel lightly with your wheel rake to remove the excess. Keep the workpiece moving; do not stop while the work is against the wheel. Polish the first half until you have achieved

a luster that you are happy with. Using the same principles, finish buffing the pipe.

7.3.3. Next, wipe the remnants of the Tripoli from the work with alcohol on a cotton ball that has been slightly dampened – ***not wet, not soaked*** – in alcohol, and repeat the polishing process with FABULUSTER until you have a bright, mirror finish!

8. WAX – THE FINISH

8.1. A pipe finish is unlike any other wood finish extant. All other wood objects are sealed and protected with a finish that is a barrier which lays on top of the wood, and is then waxed; a slightly different finish is an "oil" finish which technically soaks into the wood, but actually has a thin layer which dries – or polymerizes – on top of the wood. Pipes are finished differently: carnauba wax is applied to bare wood, with no intervening finish; it is melted by the friction of the spinning buff, and transferred to the pipe where it hardens. Every article that you will read about waxes and polishes on woodworkers' sites deals with furniture and the like where the finish lies on top of the wood (and is then waxed); further, furniture is not subjected to the constant handling that a pipe is, nor the high heat that it is subjected to. Consequently the information on woodworkers' web-sites is – at best only partially applicable to pipes.

8.2. CARNAUBA WAX is a hard solid wax exuded from the Brazilian Carnauba Palm; it is sold in flakes, and melted into pucks. It can only be applied if it is softened. For furniture and automobile uses, solvents are added to it to soften it so that it can be applied. In fact the most expensive paste waxes are only +/- 35% carnauba, and often, other waxes – natural and synthetic – are added, as are other polymers, making them really unsuitable for pipes. Once softened with solvents, carnauba will never revert to its rock-hard natural state, and that is the reason that paste waxes are not suitable for a pipe finish. The only way to seal raw briar is to apply carnauba wax with a buffer.

8.2.1. Let's digress for a moment and talk about maintaining that shine between re-applying wax with the buffer. If you use a paste, liquid or spray wax or furniture polish – with or without carnauba – you are actually softening and removing the buffed-on carnauba with the solvents in the paste/liquid/spray; this is not a good thing! I suggest two approaches: the first is to use a soft, woven cotton cloth (such as a T-shirt) with nothing on it and buff with it; the second is a commercial product called BRIAR WIPE. If you do use Briar Wipe, it is important to follow the instructions carefully and allow the solvents in it (it is a mixture of solvents, silicone polishes and synthetic wax) to evaporate ***COMPLETELY*** from the cloth – this takes at least 24 hours. If you do not, the residual solvents will soften and remove

the carnauba that was buffed on. Once the solvents have evaporated, you are left with a mixture of silicone and synthetic wax on the cloth, and wiping the pipe and stem with the cloth transfers them to the waxed pipe, making it shiny and fingerprint resistant, while slowing oxidation on the vulcanite stem.

8.2.2. You will read many articles about synthetic waxes vs. silicones vs. carnauba wax both on automotive detailing and woodworkers' sites. While reading them, keep firmly in mind that a pipe does not have a hard finish like furniture or a car, and is (obviously) not used in the same manner: thus the material presented does not apply to pipes! I have been making/finishing guitars for over 40 years, and am an automobile aficionado who spends hours detailing my car with a Porter-Cable orbital buffer in a four-step process. I've read the debates, and I have no problem with using synthetic or silicone polishes (along with carnauba) on my cars or guitars or furniture or pipes – I've been doing it for years. My advice is that rather than take the advice of a self-appointed expert, read the debates (I think the show-car detailing sites have the most in-depth articles) and try each product for yourself and come to your own conclusion. Just remember: if you use a paste, liquid or spray wax on a pipe you are actually removing the buffed on carnauba, and exposing the bare wood; if using BRIAR WIPE, always let the cloth dry completely!

8.3. APPLYING THE WAX. Mount a clean fine-weave wheel on your buffer, spin it at about 900 to 1000 SFPM, and touch the "puck" of carnauba to it for a second or two to transfer wax to the wheel, and lightly touch the pipe to the wheel. Keep the pipe moving, keep the pressure light, and don't keep going over and over the same area: wax "on" is wax "off" by the next pass! Remember that you need only a THIN coat of wax; if you apply it too thickly, it will become sticky as you smoke the pipe.

8.4. Next, mount a flannel wheel on the buffer, spin it a bit slower, say 700 SFPM, and lightly buff the entire pipe until it gleams. There! You're finished!

9. IN CONCLUSION

9.1. I hope that this little paper has been of some help in demystifying the art of finish sanding, buffing and polishing to those who would like to master this craft. As you grow comfortable with the buffer, you can speed it up so as to work faster, but always remember: SAFETY FIRST! Don't take a chance – you eyes and fingers are valuable and not worth the five minutes you save by rushing a job!

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