Maintaining Waterstones for use on the Wicked Edge

Posted by KenSchwartz - 05 Apr 2012 01:10

Well this may be a boring topic at first glance, but I assure you that for any serious sharpener it is one of the more valuable things to grasp thoroughly.

Diamond plates wear out. There's no getting around this. You can slow it down using plates wet to keep from abrading the substrate that holds the diamonds in place, but eventually they wear out. Sandpapers of all types wear out too. But they maintain their shape during this period. In part this is because they present essentially a single layer of abrasive and once it is gone, that's it. Diamond plates do wear VERY slowly, so it is certainly not a cause for panic or a reason not to use them. There are diamond 'stones' that have diamonds going through a depth of material but they aren't used by sharpeners for reasons beyond this topic.

Then there are sharpening stones. Some, like Arkansas stones wear slowly - but cut slowly too and are available over a relatively narrow range of grits, going as fine as the translucent stones with the surgical blacks next in fineness and other coarser ones available. They can be used with water (my preference), oil or plain. They are useful in some instances but primarily on knives of lower abrasion resistance - European kitchen knives, soft Buck knives, etc. There are also India stones etc but let's go on.

Next are both synthetic and natural Japanese waterstones a personal favorite of mine. These are available in a very wide range of grits from ~ 24 grit to 30,000 grit. Instead of a single layer of abrasive the whole thing has abrasive content so there is MUCH more abrasive present. Natural stones span an even wider range of grit sizes although not a lot more, primarily at the high end.

They do wear at various rates. In general softer stones and coarser grits wear fastest but this isn't a direct relationship. Thus several different waterstones, all 1000 grit will have different wear rates, different hardnesses, abrasive density, binding structures and so on. As you use these stones, you will find personal preferences for how you like them to wear and find that you will actually PREFER a faster wearing stone for some applications.

So stones wear. This is a fact of life that any even moderately serious sharpener must understand and work with.

Stones wear unevenly. Why? Because sharpeners (I include honers in this term) sharpen unevenly. For freehand sharpeners, this wear pattern is almost like a signature. For WE users, this is a property of the way the stone is used. For instance, the two far ends of the stone wear less because we don't run the edges to the very ends of the stone - nor should we as this risks damaging the edge we are working on. We don't press evenly throughout the length of the strokes of the paddles. You might press harder on

the left stone than the right or need to correct a bevel by grinding more on one side or the other or by twisting the stone, causing more wear on the right or left side of the stone. And on and on. I could spend a day with examples here.

So eventually we get our stones out of being 'square'. Typically they 'dish' or are thinner in the center and thinner to either side of center. In the extreme they start looking like a saddle. Similarly diamond plates will wear unevenly but just become less effective and aggressive rather than dish.

What to do? This is a key concept:

You MUST be able to keep the surfaces of a stone FLAT. This is as much a part of sharpening as anything else and a key to success. You will at times also need to readjust the stone to make the flat surface parallel to the back of the stone or plate. This is less critical, but still important.

Now before we delve into this topic, I need to address another very important topic of particular relevance to the Wicked Edge and other devices like the EdgePro - **stone thickness.** This is NOT a limitation of the Wicked Edge but rather a much more universal issue for ALL users of stones.

SO let's jump ahead and say that you are now a master flattener and truer of stones and that you now have in your possession a set of stones of IDENTICAL thickness - perfectly flat and true.

So you start out on a knife needing some serious work with a 'butter knife' dull edge and chips - the type your neighbor sends you. You start removing chips with a coarse stone and progress up once the knife is repaired up through a series of grits to say a 5000 grit edge. Or maybe you have a better knife and go all the way to 30000 grit.

Now lets say you do this to 10 knives. By now your stones have dished - not terribly but less than perfect (I promise to return to this more later).

You need to flatten the stones. Yes, you do. So you flatten and true them. Now you measure the stone thicknesses. Do you think that all these perfectly flat and square stones are the same thickness?

They will NOT be. WHY? Because they wear at different rates. This is a fact of life. In general, your finer - and most expensive - stones wear slowest. Thank God! You will completely wear out your coarser stones long before your fine ones. So stones like a 30k Shapton will probably never get replaced from

being worn out - and not used on 'lesser knives' or knives not requiring that level of finish. But especially if you do a lot of sharpening you will wear out your coarser grits first.

The solution to this is NOT, absolutely NOT, to grind down your 30k stone to the thickness of your coarsest stone. Your solution is to adjust for the difference. How? Use an angle cube to be precise. Got a softer knife and need less precision (but still FAR more than freehand sharpeners can produce)? Use a Sharpie permanent marker on the edge and using a light sweep of your next finest grit make a small lateral sweep over a small part of the edge and see where you are at. With a little practice you should get to within a few tenths of a degree in just a few swipes using the continuously variable adjustments - not the premarked notches. If you are off a couple tenths this next grit will fully compensate and give you a clean single bevel angle with just a few more strokes. Not perfect, but if you want perfect - measure.

The old adage 'measure twice, cut once' applies here very strongly. Perfection takes more time. With a device like the Wicked Edge, you approach perfection far more closely than freehand and you see things less than perfect more easily. Slop unnoticed by a freehand sharpener becomes obvious, much like seeing one item moved on a clean desk versus one item misplaced on a desk piled high with everything that hasn't been taken care of.

I'm going to stop here for now and continue this topic in subsequent posts on this thread for emphasis of this one point of stone maintenance - dealing with the variations in stone thickness as a stone is used when comparing coarse stone wear rates to finer stones.

Ken

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Maintaining Waterstones for use on the Wicked Edge

Posted by mark76 - 05 Apr 2012 02:07

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That is REALLY informative, Ken. Please do continue! I am very interested in the best way of flattening waterstones. I hear many different opinions: two stones of the same grit size against each other, use of diamond stones, special lapping plates...

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Maintaining Waterstones for use on the Wicked Edge

Posted by KenSchwartz - 05 Apr 2012 09:21

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"Now lets say you do this to 10 knives. By now your stones have dished - not terribly but

less than perfect (I promise to return to this more later)."

OK, I did promise. I'll explore several methods of stone flattening here and later talk about leveling your stones. I'll present this showing my biases and please take them as that. There's more than one way to accomplish things. I'll probably talk about texturizing stone surfaces later on too, a related topic, which then extends into slurry formation techniques and so on ...

Ever wonder why the pyramids had stones that fit so well together? Or the Mayans or other cultures? I see some 'experts' marvel at this ancient precision. But yet the answer is so simple - knowledge more in the hands of craftsman than academicians. If you rub two stones together they wear the high spots off and eventually they fit closer and closer together. Indeed when using water especially they can stick SO close together that they actually DO stick together. This is termed STICTION. Stiction can be your friend OR your enemy. Now for our ancient bricklayers, even with HUGH bricks, this is good enough. For some sharpeners this too is good enough. But is it really? Well, pardoning the risque analogy, but think of two lovers and not necessarily two thin ones (sorry). Their bodies melded together as one. The bulges of one are met by the depressions of the other into a close union. But are either of them flat? Not necessarily. Or more bluntly, NO. So it is with rubbing two stones together. It is an improvement but not true flatness. For greater flatness, you use three stones, rubbing them in pairs = A+B, B+C A+C averaging out the three surfaces to a pretty precise flat surface. This is how ancient Japanese leveled their stones - and at times some still do. Ideally you would want three identical stones, but often use a coarser stone for leveling. There can be issues of grit contamination here, but that's another topic. And these days the luxury of having three, let alone one expensive natural stone is not often practical. For a coarse natural stone to use for flattening, stones like an Ohmura or Hirashima are sometimes used, as the Ohmura can take sustained submersion.

We also have modern 'flattening stones' These are typically coarser stones of varying grit from as coarse as 24 grit to 120 and even 220 grit. Norton, Naniwa and more recently Nubatama have stones of appropriate coarseness that maintain their shape relatively well. They work well but eventually require flattening themselves. And here we are back to the above three stone technique. Personally I find these stones not too useful for Shaptons, because they just aren't effective for abrading the surface of these abrasion resistant stones. But for softer badly dished stones this is an alternative.

In some instances, you can sprinkle Silicon Carbide on the surfaces of these stones to make them cut better - available in various coarse grits. You can even use Silicon Carbide on a soft metal flat surface or platen'. You can also use glass as the flat surface. I personally find this technique messy but it can be useful for coarser stones.

Some use a sidewalk for badly dished stones, plus water or not. Personally I HATE this technique because of MASSIVE contamination issues and would never recommend it. Might just be that the sidewalks I've used might not be good sidewalks or that people don't care for masses of colored mud laying around - especially neighbors. Avoid this.

So we get to what I prefer for flattening stones - diamond plates. They ARE flat. How flat? This varies. Good high quality plates - Atoma and DMT are VERY flat in the range of within 0.001 inches over the surface of the plate. IMO this is more than adequate for the most discerning of tastes. You can get even flatter with the Shapton Diamond lapping plates, but I feel this is excessive. Tom might disagree.

Diamond lapping plates are available in various grits. I use plates as coarse as 60 grit but typically for Atoma plates you have 140, 400, 600 and 1200 grits. For DMT (and I prefer the diasharp series) grits are 120 (XXC) 220 (XC) 320(C) and fine and extra fine (1200) and XXF(8k) You also have diamond films as an option here from as coarse as 165 microns and 125 microns up to finer and finer grits that you can use for texturizing (another topic). While the DMT plates work quite nicely and are a continuous surface of diamonds in a nickel matrix, they do develop a great deal of stiction and the more expensive Atomas offer better performance. I've used DMT's for years and they are an excellent product but for stone flattening the Atomas are superb. I have not used the Wicked edge diamond plates for stone flattening yet, but because of size, they might be an alternative but something a bit larger might be better for stone flattening duty. I'd be interested to here other's experiences here.

So you have your diamond surface. What grit is ideal? Well coarser grits leave a rougher surface texture and get the work done quicker. But they leave deeper scratches and wear the stone faster sometimes unnecessarily so. So, for a badly dished stone, use a very coarse plate (eg, 140 Atoma). For coarser stones - also a coarse plate. A finer plate on a coarse stone wears the diamond plate faster. And a very coarse plate leaves a more aggressive coarse stone surface, which is desirable. For finer stones - 1k and above, I use a 400 Atoma, since this leaves a smoother surface or a DMT coarse, however the DMT coarse has very strong Stiction issues so you need to move fast and use lots of water. This also produces a minimum of wasted stone to create flatness.

Now flattening is something to be done OFTEN. How often? Depends on usage. But even done quite often your finer stones will last for years of use. It is better to flatten as a minor touchup often than to flatten a badly dished stone. This is analogous to keeping a knife sharp with little work or waiting until it gets very dull and doing a lot of work. It is counterintuitive, but you waste LESS stone flattening than working on a dished stone. AND you get far better results and waste less metal on your knives with a flat stone. I should probably expand on this point if someone asks.

It is a matter of technique to minimize stone wear by trying to use a stone evenly concentrating on the high spots when you can. This is an issue of technique that can be discussed later.

Next, having discussed flattening equipment, we will discuss flattening technique. Please ask questions as I write these mini lessons so that I get some feedback if this is addressing issues of interest or is/isn't hitting the mark or if I've explained something poorly.

Ken

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Maintaining Waterstones for use on the Wicked Edge
Posted by wickededge - 05 Apr 2012 10:40

Great post Ken, thank you! I'm moving it to a new category call Maintenance and making it a sticky.

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Re: Maintaining Waterstones for use on the Wicked Edge
Posted by KenSchwartz - 06 Apr 2012 11:58

Thank you Clay for putting this topic as a sticky!

Ken

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Re: Maintaining Waterstones for use on the Wicked Edge
Posted by BassLakeDan - 06 Apr 2012 13:25

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wickededge wrote:

Great post Ken, thank you! I'm moving it to a new category call Maintenance and making it a sticky.

At the risk of getting yelled at for cross=posting I am hereby going to be so bold as to copy one of Kens Excellent posts to this thread/. Some of Ken pearls of wisdom are so well stated that I would hope we can get an entire thread of them in one sticky place so that I, and perhaps others, can refer back to them from time to time. So here is one that I have read and re-read several times. It is just right on target!

Quote from Ken "... I thought I knew what sharp was, but I have proven myself wrong so many times that now I just look forward to reaching the next level."...

This is a difficult topic as no one has found a definition of sharpness that covers all cases and that satisfies all their needs for evaluation. In short, it is a tower of Babel.

Take the CATRA testing. It is essentially evaluating push cutting performance under strict guidelines. It is setup to detect the instant that a cut starts. Essentially a burst injury type of separation. It tells you very little of slice cutting performance. It also tells you little of how a blade's overall geometry contributes or inhibits the ability of a knife to pass through an object or objects of different density. So, for instance, if you cut a cucumber slowly it may not cleanly separate, but with a bit more speed the inertia will 'follow through' and you get better separation. This is different than a straight push cut vs a slight slicing motion when contacting the board. People have used string extended over a platform on a scale, and taring the platform's weight measured the point where the string is cut. This is fraught with string consistency issues, string tension issues, matching the string performance to the force range of the cut and variance along the edge, etc.

In a practical but imperfect sense, I use the ability of a knife to slice or push cut through copy paper as one index. For push cuts it is a direct downward motion perpendicular and from a point of touching the paper. I measure how far out from a pinch grip it will do this, eg push cutting 2 inches from a pinch grip. There are ways to cheat on this and edge thickness and angles change the values for equally sharpened edges. Ultimately the ideal test of sharpness is done by using the knife for it's intended task.

Not all knives are sharpened the same along their whole length, so ultimately you have to sample along the whole length. So for instance, a deba might have a less acute angle at it's heel than it's tip because the heel is used for chopping off fish heads and the tip and midsection for filleting the fish so the angle is varied along it's length in a continuously variable fashion. This CAN be done with a WE.

Sharpness is not the only goal involved in sharpening a knife. You trade for longevity of the edge, the task it will be used for and so forth. In some instances aesthetic considerations may even exceed sharpness requirements. This is a topic in itself, which can take into account both personal and cultural aesthetics. In some instances like shaving, comfort may be of equal importance to sharpness.

This doesn't even begin a discussion of defining sharpness.

Ken

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Re: Maintaining Waterstones for use on the Wicked Edge

Posted by mark76 - 06 Apr 2012 17:24

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This is a fascinating read, Ken! Really "everything you ever wanted to know about stones, but were afraid to ask". And more. If you're ever going to write a monograph, I'll be one of the first to read it.

A quick question: what is the difference between a diamond stone and a diamond lapping plate? Two different names for the same thing, or two different things? And my local dealer sells a Naniwa Nagura stone. It this an example of what you call a modern flattening stone?

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Re: Maintaining Waterstones for use on the Wicked Edge

Posted by KenSchwartz - 08 Apr 2012 02:25

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Dan and Mark, thank you for the kind words. Much appreciated.

So a diamond plate has a layer of diamonds typically embedded and partially exposed in a metal bond matrix, typically nickel, whereas a diamond 'stone' has diamonds dispersed inside the (typically harder) matrix to various depths or the entire 'stone'. You also can have resin bonds and hybrid bonds, but this goes off topic. These 'stones' are typically used in industrial processes and really not suited for hand sharpening operations. These are used for tasks like polishing the insides of engine cylinders and hydraulic pressure lines are used to exert pressures well beyond hand sharpening pressures. Typically if used for hand sharpening they will glaze over because the surface won't refresh adequately. These are also dimensionally precise 'stones' and not using as fine grits as we sometimes use for knife edge production. They are also rather expensive with stones barely the size of WE blanks costing hundreds of dollars.

Naguras is a large topic worth a separate discussion or several. The stones that accompany the Naniwa Chocera stones are often mistakenly referred to as nagura stones. They are not. They are simply waterstones. In this case 600 grit waterstones not too dissimilar in composition to say an 800 grit

King brand stone.. They should be referred to as cleaning stones, used to clean off metal swarf that gets caught in stones, typically from running a stone too dry. They are too small to flatten a stone adequately and can be used as a small 600 grit stone and certainly not as a true nagura stone. I rarely use these if at all. True nagura stones are a completely different topic. If a stone gets too much embedded metal swarf in it simply lapping it with a diamond plate both removes this embedded metal swarf at the same time it flattens the surface.

On to stone flattening technique in the next post. Hope this answers your question adequately.

Ken

mark76 wrote:

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Re: Maintaining Waterstones for use on the Wicked Edge

Posted by jendeindustries - 08 Apr 2012 07:36

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Excellent stuff, Ken!

Keep it coming!

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Re: Maintaining Waterstones for use on the Wicked Edge

Posted by mark76 - 14 Apr 2012 14:27

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Thanks again, Ken. I think I understand your explanation of the difference between stones and plates. The only thing I don't understand is that these stones are so expensive. The Wicked Edge diamond stones cost $65 for two paddles. That is not exactly cheap, but also not hundreds of dollars per stone. Or are the WE diamond stones technically diamond plates?

And to make a shortcut: is a course or medium WE diamond stone suitable for flattening a fine WE Chosera stone?

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