The edge of the edge... What is really going on?

Posted by razoredgeknives - 25 Jun 2012 23:00

So there is a thought out there among those of us who love the science behind the edge of a blade that says that the more refined you make an edge the thinner it becomes (i. E. If you were to use a metallograph and take a microscopic picture of the edge looking directly down on it). I don't have the article here, but this has been done on a commercial razor and it measures around 4um if my memory serves me correctly. But I know that several people can attest to the fact that they can get hair whittling edges at relatively low grit.... So what are your thoughts on this? Does the edge get thinner the more you refine it? Does that make it weaker for edc use?

I'll try to find that article and post it soon... It's an interesting read

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Re: The edge of the edge... What is really going on?

Posted by BassLakeDan - 26 Jun 2012 21:49

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razoredgeknives wrote:

.. if anyone can offer any experience or data to show that the edge of the edge does indeed get thinner with higher levels of polish or grit. And if so, will this degrade the edge quicker due to it being weaker?

..

well OK, it is perfectly OK to bring me back on track to thread discussions.
Now that we have this new topic area I feel a license to "drift off" a bit, but of course, that is not always appropriate.

So to address your specifics above I would venture to say that

1.) polish of the side of the edge positively may or may not make the apex become finer! It depends if the polish is applied in a particular way that continues to narrow the systems apex. It would seems that it is possible to just polish, abrade and polish, *only* the sides and never touch the apex. Then I would say you get no harm / no foul to edge longevity. In that case you potentially lessen frictional coeffiecients with the material being cut but there may be a trade off there as "stiction" is a real factor in material science. That effect when discussing knives I call the "cheese paradox".. it is the reason that a dull single wire cuts cheese better than a finely polished and very sharp razor blade.

2.) the degradation during use (slice cutting) of ever finer apex is really in the realm of, and up to, the

steel in question. Can it handle it? some do some don't. That is why (see my previous post with the image link) that applications of things like Boron Nitride are very effective on keen edges on lesser steels. Of course super fine edges are subject (in the real world) to "rolling" and other deformations, so geometry also becomes an important factor. It is an interplay of factors, there are no easy "one size fits all" answers.

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Re: The edge of the edge... What is really going on?

Posted by BassLakeDan - 26 Jun 2012 21:52

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wickededge wrote:

.. (Embedded link won't work so you'll have to copy and paste.)

yeah, what's going on with that.. I cannot get the 'tool-bar' thing to work anymore ???

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Re: The edge of the edge... What is really going on?

Posted by wickededge - 27 Jun 2012 09:50

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The web guy got back to me and it appears to be fixed. I have no clue what happened to spontaneously change it. Haven't got an answer about if the site got moved but it does seem a little quicker.

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Re: The edge of the edge... What is really going on?

Posted by razoredgeknives - 28 Jun 2012 21:03

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wickededge wrote:

I'm hoping to be able to add in to this conversation later this week once my 2000x scope comes in. I've got a bunch of sample blades I'm preparing today and hope to be able to photograph them edge on and from the side. I'm very curious about the interplay of grit and angle as it relates to the question of edge thinning as well as durability.

is it in yet?! I keep checking... lol. Really looking forward to the experimentation you will do!

on a side note, I tried some 3m alum ox laping film mounted on some aluminum blanks this week... worked great! I honed my straight razor edge from 10k chosera>1um lapping film>.3um lapping

film>finished on .125 CBN. It was the closest shave I have ever had w/ a straight! BBS... unfortunately i still had some weepers, and i put a half inch cut near my ear on accident (first time that's happened, lol). I gotta shave w/ this thing again to test it... I think I need to refine the angle which which I'm using it and the pressure and that hopefully will get rid of the weepers. Loving my WEPS!

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Re: The edge of the edge... What is really going on?

Posted by razoredgeknives - 28 Jun 2012 21:14

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BassLakeDan wrote:

razoredgeknives wrote:

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I'll try to find that article and post it soon... It's an interesting read

Ah Ha, the Professors papers resurfaces again ! Very Good ! I have quoted many times in other thread topics his classic definition of "sharpness"..

The problem is that "sharpness" is a very very hard word to get your mind and hands around. Definition of "apex sharpness" get confused in these discussions with "cutting ability" which are two different things.

As long as the edge is "straight" (whatever that means) and is vanishingly small, you have "sharpness:.

Josh, I know you are a member of the team that is working with me on the sharp-tester-jig. I am soon going to send out a condensation of many emails from that group, where these definitions are discussed in some detail: Here is an example quote that might be of interest:

As to the geometry of the bevel effecting how sharp the edge is,.. In theory, any angle from 1 degree to 179 degree could be made to be very sharp if the that point is vanishingly fine and straight. Of course, as a practical reality the real limits of angle are much less. (this is) point sharpness.., (this is not) "cutting ability" which is a whole 'nother world. If we were using the jig to test any form of "cutting ability" then we have to do something very different than thin tape that is pressed, without lateral movement, across the blade edge. ..... The mind exercise to visualize (testing sharpness or to answer the question 'how sharps is it?') .. can be stated as this: If the blade edge was infinitely sharp and the (material to be cut) was infinitely thin we would have a metric result of 100 on the scale,

Anything that makes the blade edge less than that, or anything that makes the tape less than that lowers the number. The two factors interact. What we want to test and quantify is the deterioration of the blade as it goes less than infinitly sharp, we could do that if we had the right infinitely thin test tape, but we don't.

So, Josh, before you start discussing grit in relation to sharpness, you best get a firm definition of sharpness that you can center the discussion around. Most people do not understand, but 'whittling hair' is not a test of sharpness, it is a test the cutting ability of a blade to whittle hair. This is a subtle but very important distinction.

Dan, you really should start a thread on your "sharpness" tester... that way you could condense it all into one thread and get suggestions and let everyone in on it =) just a thought! Great work BTW! I am very excited that you got Cliff Stamp on board... between you and him my head swims

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Re: The edge of the edge... What is really going on?

Posted by jendeindustries - 01 Jul 2012 12:11

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razoredgeknives wrote:

So there is a thought out there among those of us who love the science behind the edge of a blade that says that the more refined you make an edge the thinner it becomes (i. E. If you were to use a metallograph and take a microscopic picture of the edge looking directly down on it). I don't have the article here, but this has been done on a commercial razor and it measures around 4um if my memory serves me correctly. But I know that several people can attest to the fact that they can get hair whittling edges at relatively low grit.... So what are your thoughts on this? Does the edge get thinner the more you refine it? Does that make it weaker for edc use?

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I'm a little late in joining here, so I'll jump back to the beginning

Here's my take:

Commercial razor blades, they get away with being less refined because they are very thin - around 0.3~0.5mm thick, which allows them to slice better. The usually have a more obtuse edge angle than you'd think - something around 23-25 degrees per side.

When using diamond plates (WEPS or otherwise) the diamonds literally score through the edge of the edge, actually leaving what can be considered a "negative" of sharp - the scored scratches are acting like scalloped serrations, while leaving a thinned down, but still relatively thick edge of the edge width rather than the edge of the edge being thin enough to sever cleanly. This is what I call a "false positive", and why you can shave arm hairs off of a coarse diamond plate such as the DMT 325.

Once you switch to the ceramics, Choseras or Shaptons, the depth of the scratches begins to bring down "the rest" of the higher points - IOW, it begins to thin out the thickness left by the diamonds, which is whey there is a perceived loss of sharpness and the edge no longer necessarily cuts hairs. You will also initially see more micro chipping as you work out the deepest scratches.

Only when you cancel out the scratches from the previous grit (or bottom them out) do you begin to thin the width between the two planes of the bevel. Once you achieve a thin enough wide at the edge of the edge, you can sever or "pop" hairs with ease instead of sawing through them. Whittling implies a greater width of the cutting edge, either from lack of refinement and/or more obtuse geometry.

If you jump to the diamond pastes and other compounds, as we've seen in the past, they tend to "polish the grooves" more, leaving a very well defined, yet still rather serrated and thick profile. This leaves a more toothy edge that has its serrations thinned out, making it more aggressive, but with less finesse than a more consistently formed edge.

So the long answer is, if you sharpen like I do - to remove the previous scratches, the edge becomes thinner at each grit and therefore more fragile. You can reinforce that thinness with increased geometry, such as adding a microbevel. But if you sharpen to polish the grooves, then your edge doesn't necessarily thin out as much, but you will lose that refinement quickly because it is really just a smaller scratch within a larger scratch, and that larger scratch is the "real" scratch, or tooth, if you will.

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Re: The edge of the edge... What is really going on?

Posted by razoredgeknives - 03 Jul 2012 02:31

Tom,

Glad to see you back finally! I know several of you guys were out since the blade show....

Thanks for your valuable input... I would like to see some microscopic evidence for this "thinning edge as the grits get finer and finer." I do recall having seen the images (in the knife shaving video you did) comparing the diamond finished edge vs. the waterstone finished edge.... it did appear as you were saying, that the diamonds actually scored through the edge of the edge creating deeper scratches that needed to be gotten out later.

But does this really thin the edge of the edge out? Or are we just simply reducing the deep grooves or "micro serrations" as we go to finer grits? Or both? This is why I am so curious about clay's new microscope

So, theoretically, there should be a *perfect* combination of a toothy, rough edge when finished on a strop w/ a certain grit size because in effect you would be polishing the peaks and valleys of the edge of the edge thereby creating a toothy yet thin edge... correct? I would love to find this sweet spot

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