Sharpening Stellite 6K

Posted by WayneReimer - 19 Nov 2012 13:09

Hi everyone,

I've been absent for a while without good reason other than too many things on the go, including a good deal of knife buying, selling and trading. Much of that culminated with the acquisition of a Tom Mayo medium TNT with a Stellite 6K blade.

For those of you that haven't had the privilege of handling one of Tom's knives...do it if you ever have the chance. Over the years, I have had the chance to handle and use many, many hand made knives. I have never, ever encountered a hand made knife as precise or as beautifully finished as a Mayo. They fetch premium dollars, and I think they're worth every penny.

One thing that Tom is well known for is his use of Stellite 6K for many of his blades. I think it could be argued that he's used more of it for blades in the last 15 years or so than any other knife maker.

Stellite is an interesting alloy. It contains no steel, and is not magnetic. It's made primarily of cobalt and chromium with small percentages of other elements. On a Rockwell scale, it's soft, in the low to mid 40s. It's not terribly sensitive to different heat treat methods, and it's wear resistance is very high regardless of temperature.

I've wanted this knife for years. It's beautiful to look at, it's very functional art, and the stories of the longevity of an edge on 6K are almost legend. I wanted to own one, carry one, and see if everything I'd heard about this alloy were true.

When I received this knife, it had never been sharpened despite it having been through several owners and had been carried. It was still sharp, however it was more a working edge than anything.

I carried the knife for a while before deciding to sharpen it. There's something intimidating about tackling an exotic alloy on a knife that you've invested a lot of money in. There's very little available in the way of info on sharpening it, and contacting Tom Mayo didn't improve that a lot. He sharpens by eye on the grinder, and other than saying the burr could be "troublesome", couldn't add a lot of knowledge to the process for me.

When I mounted the knife, it was sharpened to 24 degrees front and almost 23 degrees on the back. I decided that I would re-profile it to 22 degrees front and back, and set to it with the 100 grit stones.

It's a strange material to work with. initially, there was none of the normal feel or sound of the stones actually doing anything. It took several strokes before the stone started cutting into the edge, and it developed a burr very quickly after that. It was at that point things got "interesting"

Once the burr was formed and the scratches were even along the edge, I switched sides, and the burr rolled to the other side very easily. I ran through 100 strokes and then began to sharpen both sides to eliminate the burr.

Not happening. After 100 strokes of sharpening, I had a really nicely formed, 44 degree inclusive edge, with a nicely formed, very even burr, running full length along the edge. I could not get that thing to break away, regardless of what I tried! Eventually, I just decided to progress through the stones a bit further and see what happened.

I proceeded up through the grits. after one full cycle up to 1000 grit, the burr was shrunken, but still present almost the entire length. I dropped back down to 200 grit and repeated the progression again...same basic result...at 1000 grit the burr had shrunken again, but was still present.

At the end of the afternoon, I have a VERY sharp Mayo TNT 6K. It took three complete progressions through the stones to 1000 grit to eliminate the burr, along with a good deal of "tinkering" at various times and points along the edge to get things balanced and keep them that way. Once sharp, I went on with strops and diamond paste down to 1 micron spray.

A few observations; I am ASTONISHED at how tenacious the burr on this edge was! If that is any indication of how well the edge lasts and wears, I will be VERY happy.

Stellite strops to a beautiful finish. I went for a fairly high shine since this is not a blade that's going to be used for hacking at cable ties or sawing trough boxes. I have knives much better suited than this is.

Overall, it is a frustrating material to sharpen. The end results are great; the relative softness of the cobalt/chromium allows the scratches in the edge to polish out very nicely. I'm hoping I don't have to do the whole thing too often though.

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Re: Sharpening Stellite 6K
Posted by cbwx34 - 19 Nov 2012 15:46

Interesting... I don't think I've heard of it. Got any pics? I'd like to see how the edge came out.

Thanks for the writeup... I'll have to read some on it.

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Re: Sharpening Stellite 6K
Posted by mark76 - 19 Nov 2012 16:53

Hey Wayne,

Interesting read! And interesting stuff, this Stellite 6K. I'd never heard of it and thought it might be the latest hot steel (alternative), so I did some research (ahum, I googled it). But apparently this stuff is already decades old.

As to your question regarding burr removal. Once you had obtained a burr, are you sure you hit the edge of the edge with your opposite 100 grit stone? My first guess was that you were very close to the edge of the edge, but not quite (particularly because you eventually managed to remove the burr). You can see whether you hit the edge of the edge with the Sharpie trick.

There are steels that are notoriously difficult to deburr, like VG-10, but then these steel don't get a burr easily either. They are simply more difficult to sharpen. That said, I'm no materials scientist.

Please let us know how you fare with your Stellite knife!

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Re: Sharpening Stellite 6K
Posted by WayneReimer - 19 Nov 2012 17:49

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hi there,

Stellite has been around for quite a few years, and is used in many applications where they need high wear resistance with low/no lubrication. It has only been used by "high end" knife makers

primarily due to cost; the raw material for an average 3 inch knife blade runs more than $100....6 or 8 times that of an average high quality blade steel.

Yes I was definitely hitting the edge...I'm an old fan of the sharpie trick. it's simply the nature of stellite; the edge will roll easily due to the cobalt content, and won't tear away due to the chromium and other elemental contents. the only way to eliminate is to abrade it away, and since it's highly abrasion resistant, that too takes some time.

Now that it's very sharp, I'm curious to see how long it will remain that way. There are several scientific papers available, comparing it's wear resistance to a variety of other materials; Talonite, which is also used for knife making, is also known as Stellite 6B...it's less than 50% as wear resistant.

Some others that come to mind;

440C - 6K is approx. 400% more wear resistant

VG-10 - 6K is 70% more resistant

AUS8 - 6K is 80-90% more resistant

know there are several others that were compared, I just can't remember them offhand. Of course, these are lab results, which have little meaning in real world use. I know a number of people with 6K blades, both Mayos and other manufacturers. The consensus seems to be that it is not a steel you'd use for prying or extreme hard use because it doesn't have the sort of Rockwell rating for that application. It's best as a slicing material...I keep wanting to type "Steel", which it isn't....there are several knife makers who specialize in kitchen and chef's knives that use stellite extensively because of it's wear resistance...

I normally carry two knives with me most of the time; lately it has often been a Strider SJ-75s for light duty, slicing things, and a fixed blade Strider SLCC Wharncliffe, or a Strider SA fixed blade for heavier things, prying,etc. I've swapped out the SJ-75s for the Mayo to see how the resilience of the blade material works out

I had a quick look at the edge through the USB microscope just before my wife dragged me out shopping...it looks WONDERFUL for only 1micron stropping. I'll snap a couple of photos later on and post them.

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Re: Sharpening Stellite 6K
Posted by WayneReimer - 19 Nov 2012 22:26

As promised, a shot of the edge of my Mayo TNT with the stellite 6K blade. Sharpened & stropped to 1 micron diamond spray

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Re: Sharpening Stellite 6K
Posted by mark76 - 20 Nov 2012 04:46

Nice!

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Re: Sharpening Stellite 6K
Posted by wickededge - 20 Nov 2012 16:13

Wayne,

This has been a fascinating post. Thank you!

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Re: Sharpening Stellite 6K
Posted by WayneReimer - 02 Feb 2013 13:13

I wanted to update this post with a synopsis of how the Stellite 6K has done in a daily carry situation.

I've had the knife in my pocket daily for approximately 2 months now, and after I got over my initial hesitation with using it (not wanting to put the first scratch on it), I've used it exactly the same way I would use any other daily carry knife...cutting a sandwich, peeling and apple, opening a box or a letter, scoring drywall, cutting tape, etc. etc.

From my initial sharpening two months ago, I have done nothing but strop it every 4-6 days with a one micron strop, followed by a few passes with bare kangaroo. I have been frankly astounded at the level of wear resistance this material has. One of my other EDC knives is 3V steel, the latest "super steel" in terms of wear resistance. The 6K maintains an edge on average 30% longer than the 3V. With 440C, VG10, etc. I'd grown very used to stropping these every day...once a week with the stellite is in reality a bit too much...it really doesn't need it that often.

This material will not handle prying. If you're using your EDC knife for any amount of that sort of thing, this is not the material for you. If you use this stuff stricly for cutting...food, paper, boxes, that sort of thing...it's pretty tough to beat, despite being an "old" material unlike the latest "super steels"

As a matter of interest, for those of you using an iphone, there is a new application available called "Knife Steel Chart" from ZviSoft LLC that is a searchable database of all known steels used in knifemaking. It allows you to search based on material name, the standard,maker, country of origin, or the technology used to produce it.

When you've found the steel your looking for, it gives you a chemical breakdown, it's characteristics, Rockwell rating, alias names, etc.

I've been using it for a couple of weeks, and find it invaluable. Well worth a look

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Re: Sharpening Stellite 6K
Posted by BobNash - 02 Feb 2013 13:25

Thanks for the update - great to know your experience.

someone just showed me that iphone app last weekend at the AZ knife collectors show, it is pretty cool

There is also an android version which you can find by searching the play store for the same name Wayne has in his post

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Re: Sharpening Stellite 6K
Posted by WayneReimer - 02 Feb 2013 13:51

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great to know the Android version is out! I knew they were working on it, but hadn't heard it was available yet

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