Gingery Shaper Surface Tests, version 4

By R. G. Sparber

Conclusion

Most of the ripple was caused by the shaper's vertical jack screw being tight. This caused the horizontal ways to not sit squarely. The force of cutting moved the table which is supported by the horizontal ways to pivot and cause both a front to back slope in the cut surface plus excessive ripple as shown in most of the pictures below.

At least for now, I have "pealed this onion" enough. The remaining ripple might be due to the small play in the ram ways but if I tighten them anymore, they will bind up.

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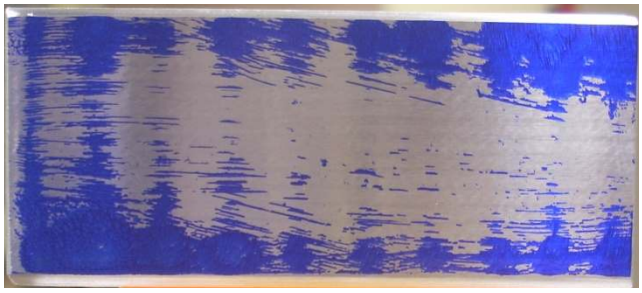
Final Samples

This sample was cut with the vertical jack screw loose, minimum table feed, and minimum speed of ram. The cutter is a sheer set at 45°. My DTI across this surface shows less than a 0.0001" ripple. The Hi-Spot shows that the surface has evenly distributed peaks.

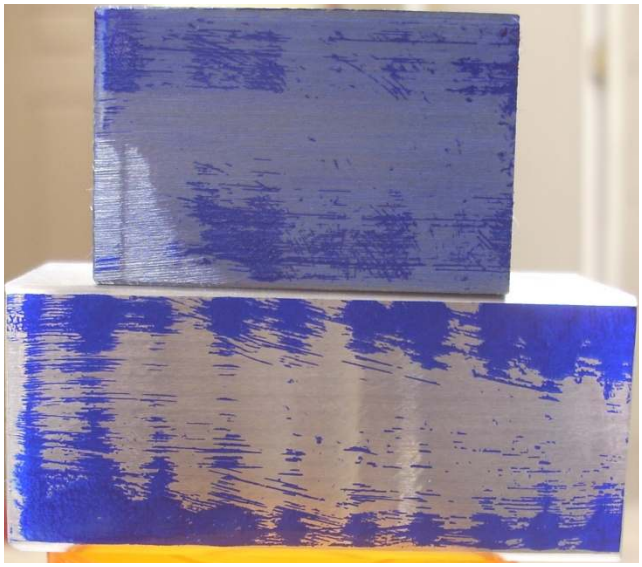
"Rexarino" suggested placing a parallel down on the cut surface to look for ripple. I did not see any regular vertical motion but even a slight pressure on the front or back end of the ram causes a change in the DTI's needle of around 0.001".



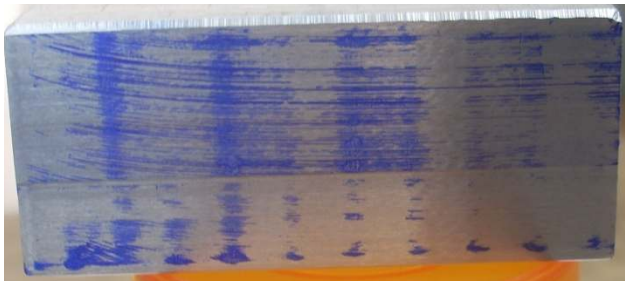
This sample is 1" wide. The shaper is set to minimum speed and minimum cross feed. The cutter is a sheer set at 45°.

I again used Hi-Spot to make the ripple easier to see. The blue around the edges tells us that it is higher than in the middle. The short lines of blue in columns indicate the peaks of the ripples. The height change here is less than 0.0002". The left end of this sample was closest to the shaper's column during machining.

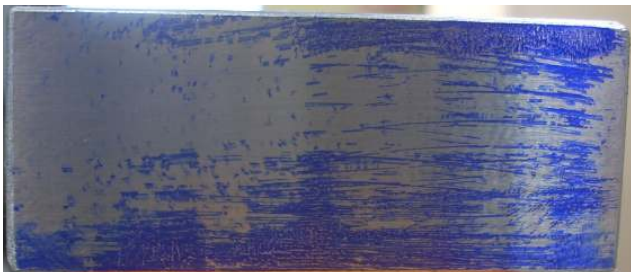
The ripple has a period of approximately 0.23" although some variation is evident.



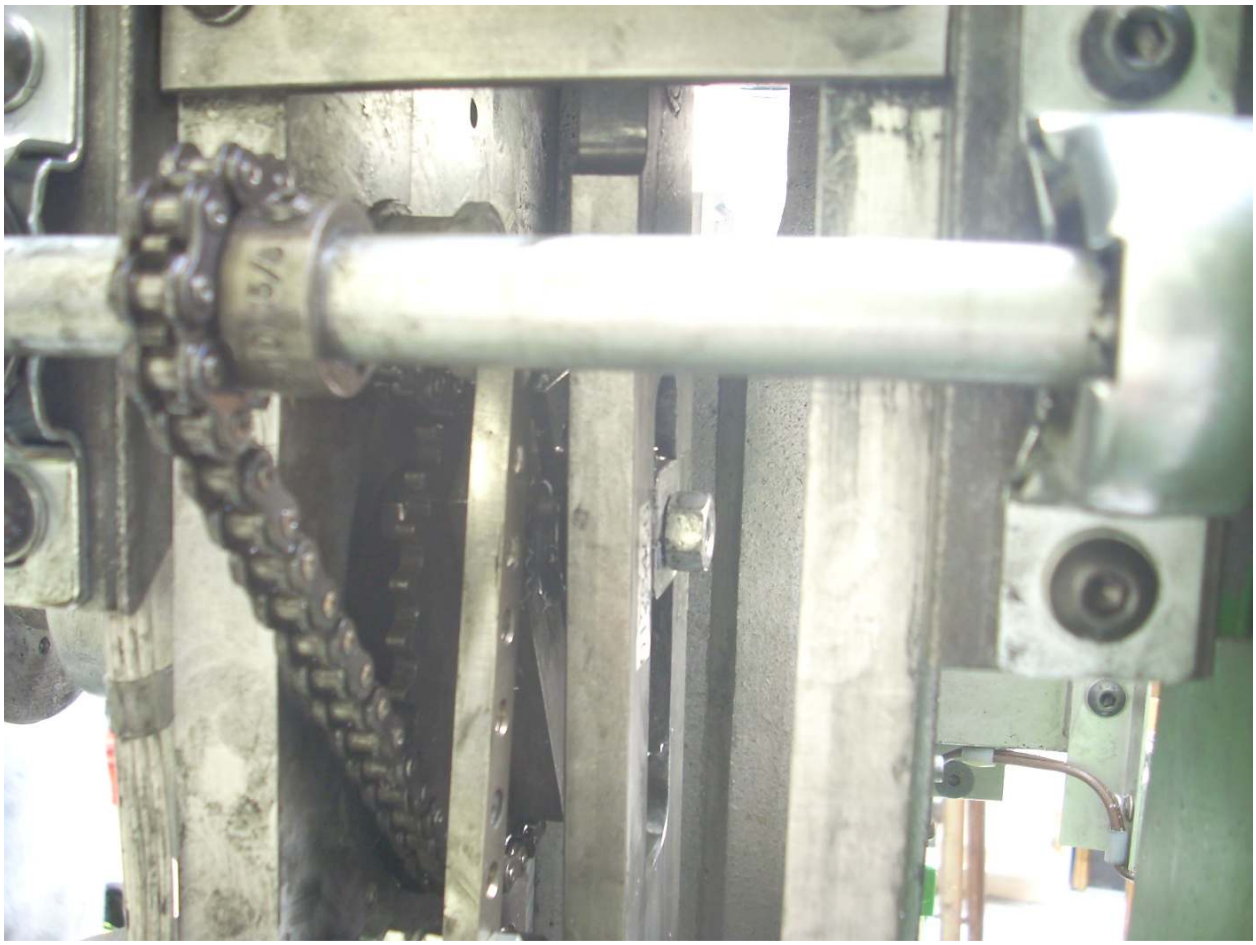
All of the previous tests were done with 6061 aluminum. The top sample here is CRS. It is sitting on the previous sample for comparison. The ripple is still evident but the period is longer on the steel than on the aluminum. This implies to me that I am looking at a resonance condition.



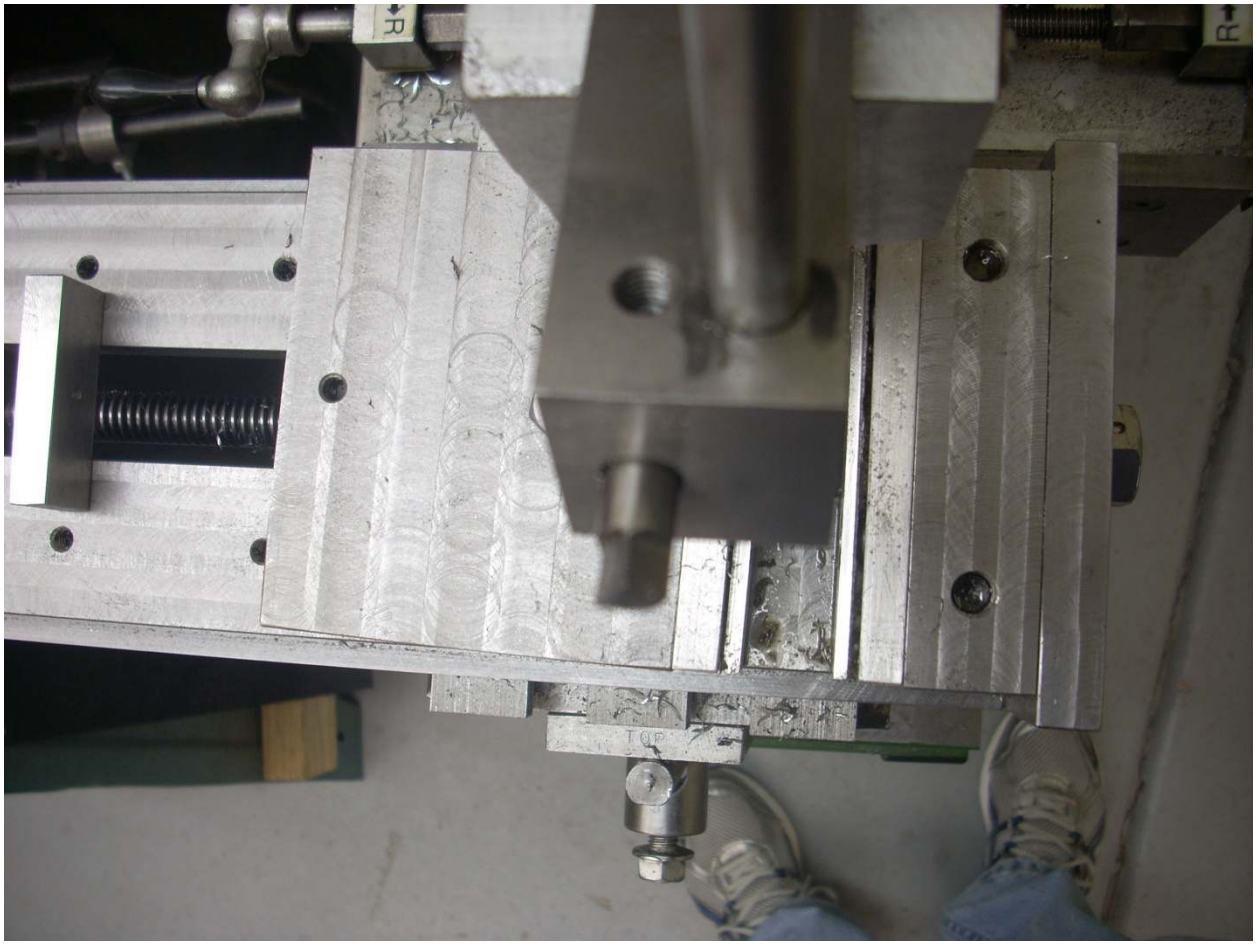
In this sample of aluminum, the block was moved closer to the column. The wider strip on top was cut normally. The narrower strip on the bottom was cut with a heavy weight resting on the head. It cut deeper but what I find more interesting is that the ripples are in the same place. That may be telling us that it is not a resonance condition. It might be telling us it is in the ram ways. The curved lines seen on the top strip match the ripples formed by my finger applying the Hi-Spot to the surface plate with my finger inside a plastic glove. When you are looking at 0.0001" ripples, it doesn't take much height to show through.



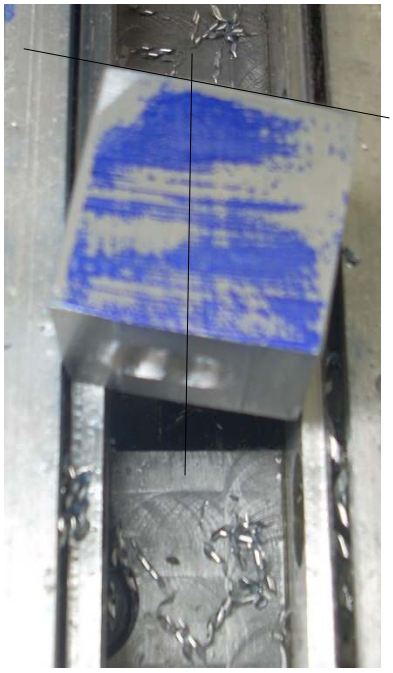
This sample was cut after I added a chain tensioner which will be discussed later. It is hard to see with the Hi-Spot, but when I catch the light just right on the clean surface, I still see the ripple. But now, I can't feel it. When I run my DTI across the surface, I see a maximum change of approximately the thickness of the DTI needle. So the tensioner really does help improve the surface finish.



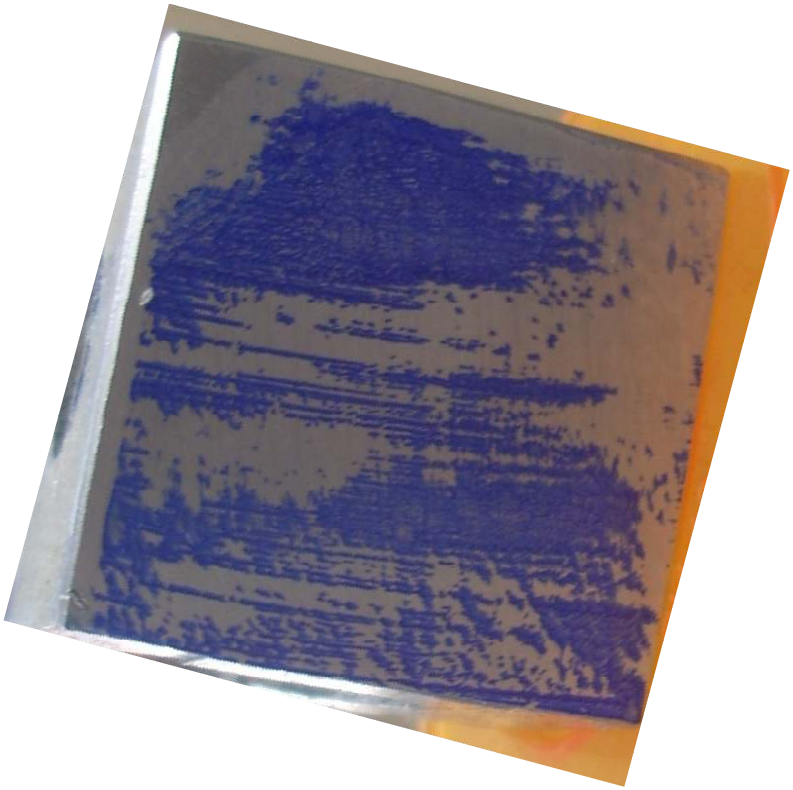
The tensioner wheel can barely be seen above the jack shaft. It is supported by the bar with the equally spaced holes in it. At the bottom of this bar is a bolt that connects to a spring. The spring is connected to the back, rear cross bolt. This arrangement was quick to try but may be replaced by a more ridged wheel support.



As an aside, here is the cutter mounted in the clapper block. It was ground from ¼″ HSS. Yup, those are my feet…

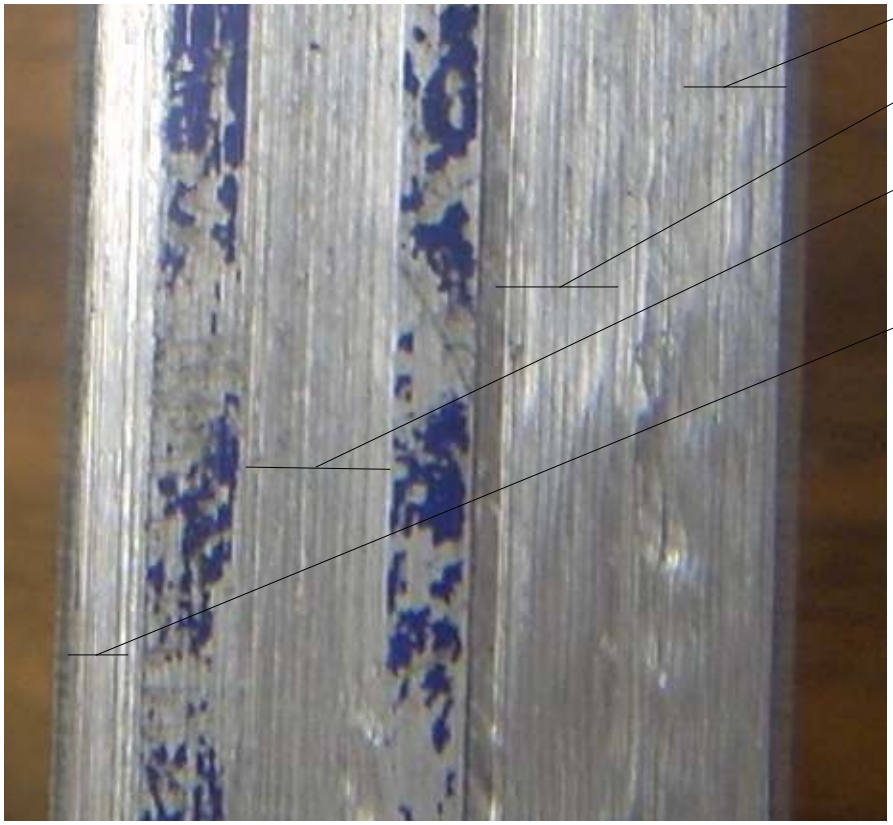


As per John Martin's suggestion, I turned the block so the initial contact of the cutter was not perpendicular to the motion of the ram. It seems that this reduced the ripple. It does appear to me that the ripple is still perpendicular to the ram's motion and not the edge of the block.



Background

There has been a lot of speculation as to why I get a slight ripple in my cut surface using a sheer style cutter. Here is some real data to discuss. In all cases the table advance was at maximum. The picture was taken through a magnifying glass and then I cropped a small part of the picture and expanded it on the PC. The material is 6061 aluminum. My depth of cut is around 0.004" and my advance is around 0.01"



lowest speed

highest speed

hand powered through hand wheel

hand powered by pushing and pulling ram and manually moving the table.

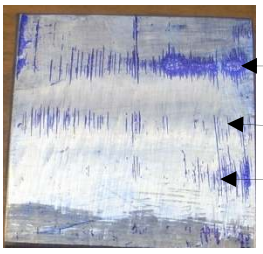
I won't bias your comments by adding my own. What do you see?

My next test involved cutting a cube of 6061 using WD40 as the cutting fluid and the machine set for max speed and min feed.

After cutting the surface and deburring the edges, I put a thin coat of Hi-Spot on my surface place and then pressed the cut surface down on it. You can see that the area where the cutter initially hits the block is higher than most of the rest of the surface. That alone is interesting since I always thought it looked like it was lower.

I used a scraper to remove these high spots. I'm not trying to scrape the surface true, just expose the area with ripple in hopes of the Hi-Spot making them easier to see. I've got a few new high spots to scrape off.

Now I'm starting to see bluing in the central part of the surface. Just a bit more scraping to do.



Now I'm seeing the central area. I believe I am seeing three rows of fine lines. Each row is the crest of a ripple. Yet riding on each ripple are these perpendicular ridges that must be formed by the cutter.

My final test was to run my DTI from one of those lines down into the valley between crests. I read a change of 0.0005".

Rick