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Results of Some Hardness Testing on a Hammered Scythe Edge

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1.0 INTRODUCTION

This short report is concerned with measuring the hardness close to the cutting edge of a scythe blade that has been sharpened by controlled hammering of the steel close to the blade edge. This hammering thins the steel locally close to that working edge, thus making, or helping to make, a cutting edge. At the same time it is quite clear that the steel will be cold worked in this region and this would be expected to result in some local work hardening. The extent of this work hardening was not known and the work described here was performed as a first step in determining the extent, if any, of any hardness increase resulting from hammer sharpening.

2.0 SCYTHES AND TEST PROCEDURE

The blades for testing were provided by Mr. Peter Vido and are shown in Figure 1 below.

Figure 1. The blades are numbered 1 to 5 from top to bottom in this photograph. The uppermost one is of contemporary Slovenian production. Blade #2 is a pre-war Austrian blade and #3 is also Austrian but of 1950's vintage. The all dark blade, #4, is Turkish and perhaps 30 or 40 years old while blade #5 is of current Chinese production.

Two methods were tried for determining the hardness close to the blades cutting edge. One method was to measure the hardness directly by making Vickers diamond pyramid hardness impressions close to and remote from the cutting edge. The other was to cut sections from the blade edge and then to prepare these sections and use a microhardness testing machine to measure the hardnesses. Of these two methods only the second one produced reliable results and only the results from this testing method will be presented here. A disadvantage of using this procedure is that pieces have to be cut out of the blade, causing damage to the blade. This damage can be relatively

minor or can make the blade unusable. Only one blade was tested this way in this instance. Three sections were cut out of the #1 blade. As it says in the caption to Figure 1 this blade was a current Slovenian blade. It had been factory hammered three times with additional hand hammering over about three inches (about 7 or 8 cm) close to the heel. The positions at which sections were taken from the blade are shown in Figure 2.

Figure 2. The three notches in the blade were made by cutting small samples out of the blade for hardness testing. Each sample was set in plastic to show the cross section of the cutting edge and was then polished, finishing with 1 µm diamond paste. The hardness impressions were then made on these prepared sections. The sections were numbered 1, 2 and 3 going away from the heel of the blade that is, right to the left in the photograph.

The average hardness in the "core" of the blade, at all three section positions, was about 430 Vickers diamond pyramid number (VHN). This corresponds to a hardness of about 44 Rockwell C. (A 10 kg load was first used for this core hardness testing.) The core hardness was also measured using a microhardness testing machine. The result from this testing was about 460 VHN, corresponding to about 46 Rockwell C, in reasonable agreement with the Vickers macrohardness results. Microhardness tests were then made closer to the cutting edge. These tests showed that the hardness increased only very slightly in the sections taken from the positions which had simply been factory hammered but there was a modest hardness increase, to about 560 VHN

(53 Rockwell C), in the region that had been hand hammered. (The hardness close to the cutting edge was only measured by a microhardness method.)

These results are shown graphically below in Figures 3 and 4 and the hardness positions are shown in a separate sketch.

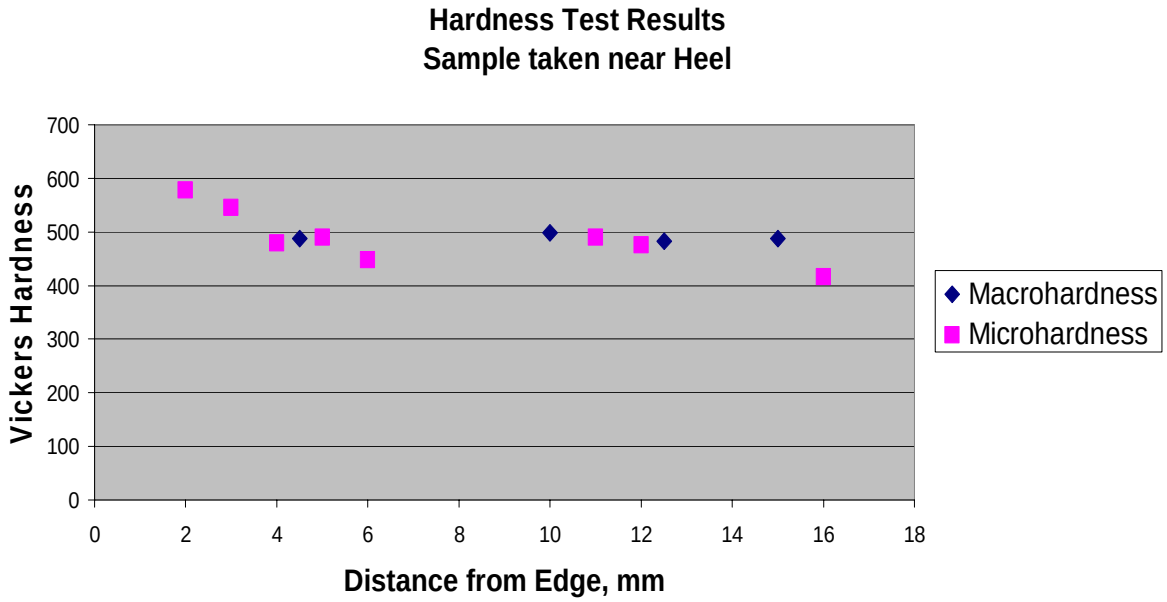
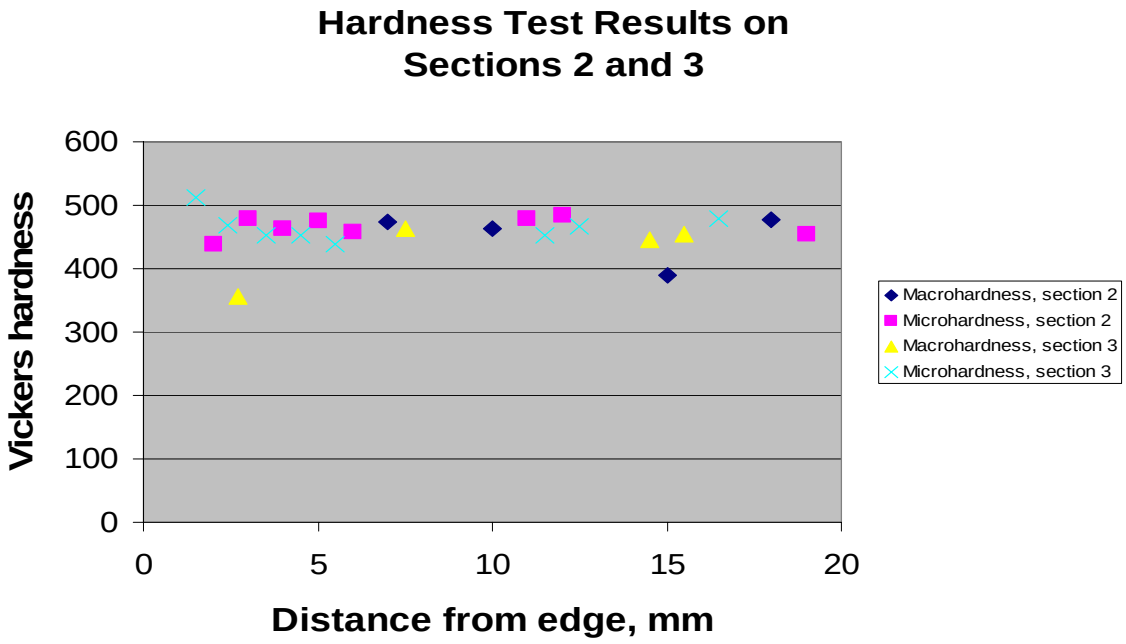


Figure 3. Test results from sample #1. The graph shows the results from near the heel of the scythe (section 1). In it, note the modest rise in hardness at positions within 3 mm of the blade edge. (The blade edge is the "0" position on the graph.)



Figures 4. Test results from sample #1. The graph gives the results from the two samples taken away from the heel. (See figure 2 for the position of these samples.) There is little change in hardness at these positions as the blade edge is approached.

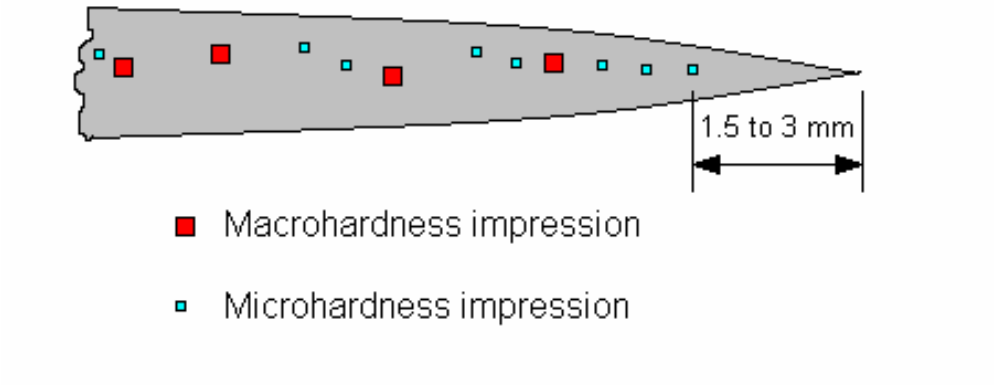


Figure 5. This sketch shows the typical positions at which hardness impressions were taken.

3.0 CONCLUSIONS

The hardness testing did not show a major degree of work hardening towards the hammered edge of the scythe blades. In the case of the two sections taken through factory hammered edges the degree of work hardening was little or none. In the case of the single section taken though a hand hammered edge there was an indication that the hardness had increased by about 10 to 20% close to the working edge of the blade.