USE OF CERAMIC SPOTTING MASTERS FOR SCRAPING

David R. Stussi
Gardner-Stussi Tool and Die

The fundamental techniques of scraping have been around for a long time. However, the specifics are often subject to variations due to circumstances, personal preferences, skill sets and tools at hand. The following paper is based on the techniques I have used over the years following a fortuitous tool substitution.

Standard cast iron masters with bluing and lead pigment are used through the roughing process and continue until the surface is within .0002 (.005mm) of the desired shape. At that time the master is inspected and corrected and the spotting process is used. The spotting process involves the rubbing of the master and the part but no bluing is used. The high spots are then visible as shining spots with the proper lighting.

Some years ago during the re-scraping of the v-ways of a Moore #5, the cast iron box square I used as a master was in need of correction. A ceramic straight edge was in process and had just been inspected. I decided to use the ceramic as a spotting master and the results were a marked improvement in all respects.

Due to the cutting action of the ceramic, the spotting marks showed much brighter than the results of the burnish action of a cast iron master. The metal removed transferred to the ceramic master after a short time. The removed metal loaded the master preventing the masters from cutting too aggressively. The geometry of the surface to be scraped was improved prior to a scraping cut being taken as a result of the cutting action of the ceramic master.

The ceramic straight edge was then inspected after several days of being used as a spotting master and had no significant wear. A standard cast iron master would have developed enough wear over this period to require some attention.

During the following years several ceramic masters have been acquired to be used in this spotting process and the following information details the results of scraping a Moore #3 table top.

Moore table 11 x 24 (280mm x 610mm) after rough scraping flat within .0003 (.008mm)
8in x 20in (200mm x 510mm) 99.5 Alumina ceramic master flat within .0001 (.0025mm)

The process used was to inspect the table, rub the ceramic master, inspect the table, and scrape (spot) the table and inspect. This process was repeated 4 times with a resulting table flatness of .00004 (.001mm). Each rub of the ceramic master improves the flatness generally about .00002 (.0005mm). Upon completion the ceramic master was inspected and no wear was detected. I have noted that any wear on the master shows as a localized improvement of the surface finish. To keep a uniform and effective cutting action the ceramic master has the surface finish roughed up with a small diamond charged hand lap to yield approximately a 20 to 32rms finish. It is important that this reconditioning be done 2 directions (or more) 90 degrees to each other to create 'peaks' rather than a 'ridge line' effect. During this process it is also possible to improve the flatness of the master through selective lapping.

The inspection was carried out with a .00001(.00025mm) mikrokator mounted to the spindle and a standard scraper block.
<table>
<thead>
<tr>
<th>1st) Machine Table (numbers in ( \mu ) of inch)</th>
<th>Table after ceramic master rub</th>
</tr>
</thead>
</table>
| \[
| 0 & 40 & 40 & -40 \\
| -40 & 20 & 20 & -40 \\
| -80 & -20 & -40 & -80 \\
| -120 & -40 & -60 & -120 \\
| \] | \[
| 0 & 40 & 40 & 0 \\
| -20 & 30 & 30 & -20 \\
| -40 & 0 & 10 & -40 \\
| -100 & -40 & -40 & -80 \\
| \] |
| 160 deviation | 140 deviation |

<table>
<thead>
<tr>
<th>2nd) Machine Table after spotting</th>
<th>Table after ceramic master rub</th>
</tr>
</thead>
</table>
| \[
| 0 & 40 & 40 & 20 \\
| -20 & 20 & 30 & -20 \\
| -40 & -20 & 0 & -20 \\
| -80 & -20 & -20 & -80 \\
| \] | \[
| 0 & 20 & 40 & 20 \\
| 0 & 30 & 20 & -10 \\
| -40 & -20 & 20 & 0 \\
| -60 & -20 & -20 & -60 \\
| \] |
| 120 deviation | 100 deviation |

<table>
<thead>
<tr>
<th>3rd) Machine table after spotting</th>
<th>Table after ceramic master rub</th>
</tr>
</thead>
</table>
| \[
| 0 & 30 & 40 & 20 \\
| -10 & 20 & 30 & 0 \\
| -10 & 10 & 20 & 0 \\
| -60 & -10 & -10 & -40 \\
| \] | \[
| 0 & 20 & 40 & 20 \\
| 0 & 20 & 20 & 0 \\
| -20 & 0 & 20 & 20 \\
| -30 & -10 & 0 & -30 \\
| \] |
| 80 deviation | 70 deviation |

<table>
<thead>
<tr>
<th>4th) Machine table after spotting</th>
<th>Table after ceramic master rub</th>
</tr>
</thead>
</table>
| \[
| 0 & 20 & 40 & 20 \\
| 0 & 20 & 20 & -10 \\
| -10 & 20 & 10 & -10 \\
| -40 & 0 & -10 & -40 \\
| \] | \[
| 0 & 20 & 30 & 20 \\
| 0 & 30 & 20 & 20 \\
| 0 & 0 & 20 & 20 \\
| -30 & -20 & -10 & -30 \\
| \] |
| 80 deviation | 60 deviation |

<table>
<thead>
<tr>
<th>5th) Machine table after final spotting</th>
<th></th>
</tr>
</thead>
</table>
| \[
| 0 & 20 & 20 & 10 \\
| 20 & 20 & 20 & 0 \\
| 10 & 20 & 20 & 20 \\
| -20 & 0 & 0 & -20 \\
| \] | |
| 40 deviation | |