Wet or Dry?

Robbie Farrance investigates the effect of wet and dry sharpening methods on turning tools, and reveals some interesting findings

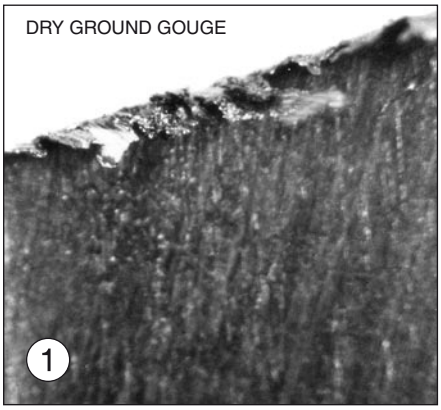


Photo 1. Shows a gouge ground with a **dry-grinder**. Note the way in which the burr is folded backwards. The view is into the flute of the gouge.

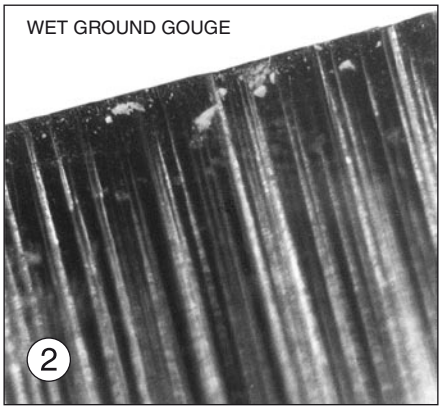
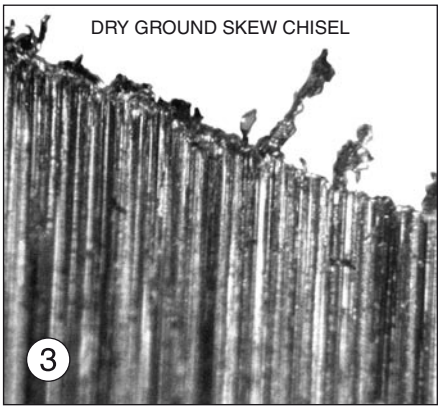


Photo 2. A gouge ground using the **wet-grinding** method, with the direction of rotation away from the tool edge. The view is into the flute of the gouge.



Photos 3 & 4. Show an attempt at burr removal on a skew chisel. In photo 3 the burr has been produced by the **dry-grinding** method straight from the wheel.

Dry grinding

One of the first microscopic observations, usually also clear to the naked eye, is the formation of a grinding burr. In the case of a high speed steel tool this is very pronounced if using a dry grinder, rotating towards the work piece, whereby a compacted and hardened burr is thrown up.

Water cooled sharpening

The alternative method of tool grinding used in these trials was by the means of a slow running, water-cooled grinder and the sharpening was undertaken with the stone running away from the cutting edge.

The leather honing wheel supplied with this equipment was also used, in conjunction with a honing paste. The resultant edge appeared from microscopic examination, to be burr free.

Is a burr beneficial?

Certain schools of thought suggest that with some turning tools this burr is beneficial, but this is not the case.

Woodworking edge tools, such as gouges, chisels, planes, etc. work by a wedge cutting action. A keen edge has the ability to penetrate between the layers of wood fibres and anything that interferes with this action is deemed to be detrimental.

So a hard burr, thrown over the leading edge of the tool will seriously impair its cutting efficiency. The conclusion has been drawn that this burr is hardened. With gouges in particular, it was found that this burr is extremely difficult to eradicate. Prior to turning with the tool, a slipstone was used to try and remove the burr for a timed period of one minute. This prolonged finishing did not remove the burr and often left its root firmly folded over the cutting edge.

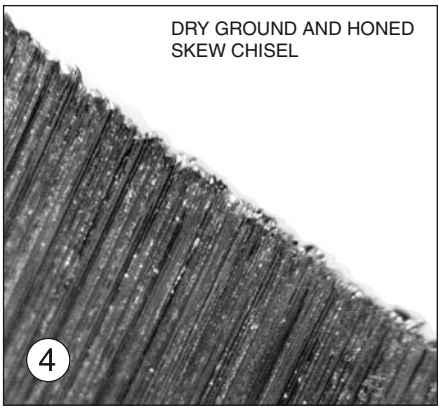


Photo 4 is after honing. Note the duller look of the honed surface and the root of the burr firmly in place.

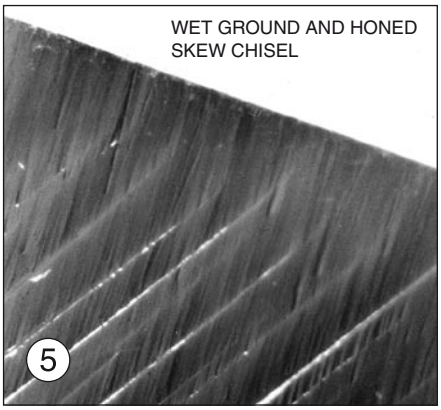
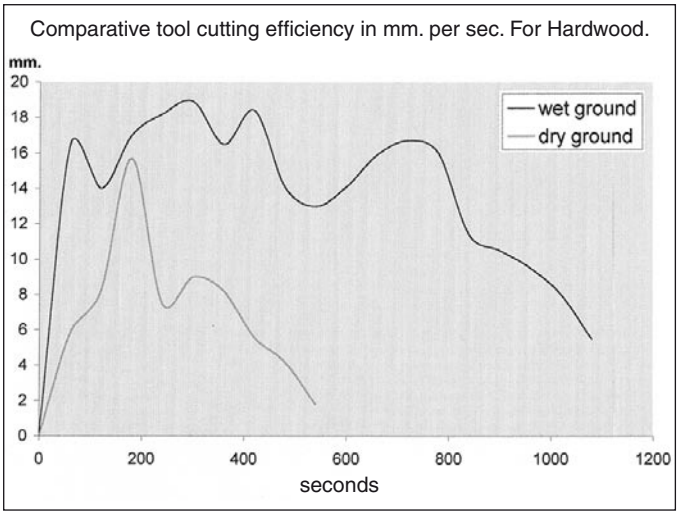


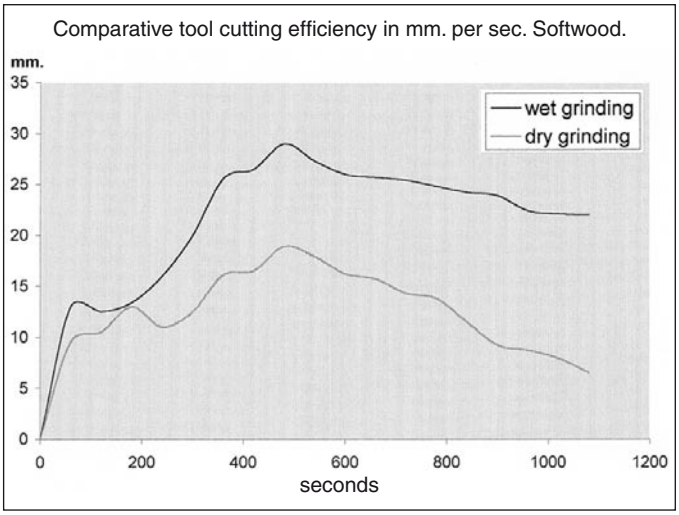
Photo 5. In this case the **wet grinding** method has been used in conjunction with the honing wheel. Note the clean polished edge.

WOODTURNING

Extract from an article in issue #70



This graph shows the collective results of both tool grinding methods for hardwood. The path lines on all the graphs are seen to undulate. This is because the data has been reproduced without any statistical manipulation. This graph, shows very clearly, the peak at which the burr was worn away from the dry-ground tool.



This graph shows the results of trials performed with softwood A standard, group one joinery quality pine was used, and selected to be reasonably knot free. Both tools can be seen to maintain their edge for a longer period, but the trend for the wet-ground tool to achieve higher results is maintained. Notice the point at which the dry-ground burr disappears. Also of note is the fact that both tools mirror some upward performance trends, caused by timber density, etc.

Method of investigation

In order to answer some specific questions as to how sharpening methods may affect the tools, a means of showing the resultant cutting efficiency had to be found. It was finally decided to show how much wood could be removed by a tool in a measured time, over a measured distance, giving a resultant depth or volume of wood removed.

The equipment used was a K.E.F. dry bench grinder mounted with an 80 grit white wheel and a Tormek 2004 SuperGrind system, in conjunction with their Universal Gouge Jig. Honing was by means of an Arkansas slip stone of medium grade for the dry grind and the manufacturer's leather honing wheel for the wet grind.

To perform the trials, the tools were prepared to the same degree of sharpness, so far as could be judged by edge 'feel' and from microscopic observation, before the start of each complete 'run'. This test was repeated with eight pieces of hardwood and eight pieces of softwood and the results are shown in the graphs.

Whilst these trials proceeded, it became clear that the wet ground tool was performing better than the dry ground, both in terms of durability of the cutting edge, and the finished surface of the wood.

Best results

The resultant data was assembled in the form of a graph... The wet-ground tool gave the best results on a consistent basis, and far outlasted the dry-ground tool in terms of durability.

An odd thing was that up to a point, i.e. three minutes into work time, the dry ground tool seemed to increase its cutting ability. Fall-off in performance was fairly marked after this point. The residual burr, which had proved so difficult to remove with a slip stone, had worn away in use. With this protecting guard gradually being eroded, the tool had in fact become sharper, until the burr had completely disappeared.

Conclusions

Using gouges and chisels, it would seem that a universally far better performance could be obtained by adopting a wet grinding method, in conjunction with honing. It's generally assumed that using a slow-running water-cooled system will be time consuming, but this turns out to be more supposition than fact.

The initial grinding of the tool to shape (profiling) can take longer but, once this is achieved, subsequent grinding is simple, quick, and more to the point can be repeated with a good degree of accuracy. Adopting the wet system does in fact result in a sharpened edge, in the accepted sense, not just a coarse-ground bevel.

- The wet-grinding method leaves a polished, burr free edge without any overheating of the tool. This polished surface creates less friction in use, thus aiding the durability of the cutting edge.

- Due to less frequent sharpening with wet grinding, the tool life is significantly prolonged, since less material is removed. The dry grinding method leaves a hard compacted burr, which is very difficult to remove.

- The evidence suggests that using a wet-grinding method gives a sharper edge and cleaner cuts with more than double the effective turning time between sharpening. From the graphic data, it can be seen that, even after 18 minutes of continuous turning in softwood, the wet-ground tool was still cutting more than three-and-a-half times faster than the dry-ground tool.

The author

Robbie Farrance has spent a lifetime working with wood and its associated subjects, and became a full time teacher of wood-trades some 12 years ago. He holds many qualifications including H.N.C. and is a National Assessor. Currently employed by the Royal National Institute for the Blind, it is for his work in pioneering methods of teaching blind and partially sighted students, that he has gained national and international recognition.
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