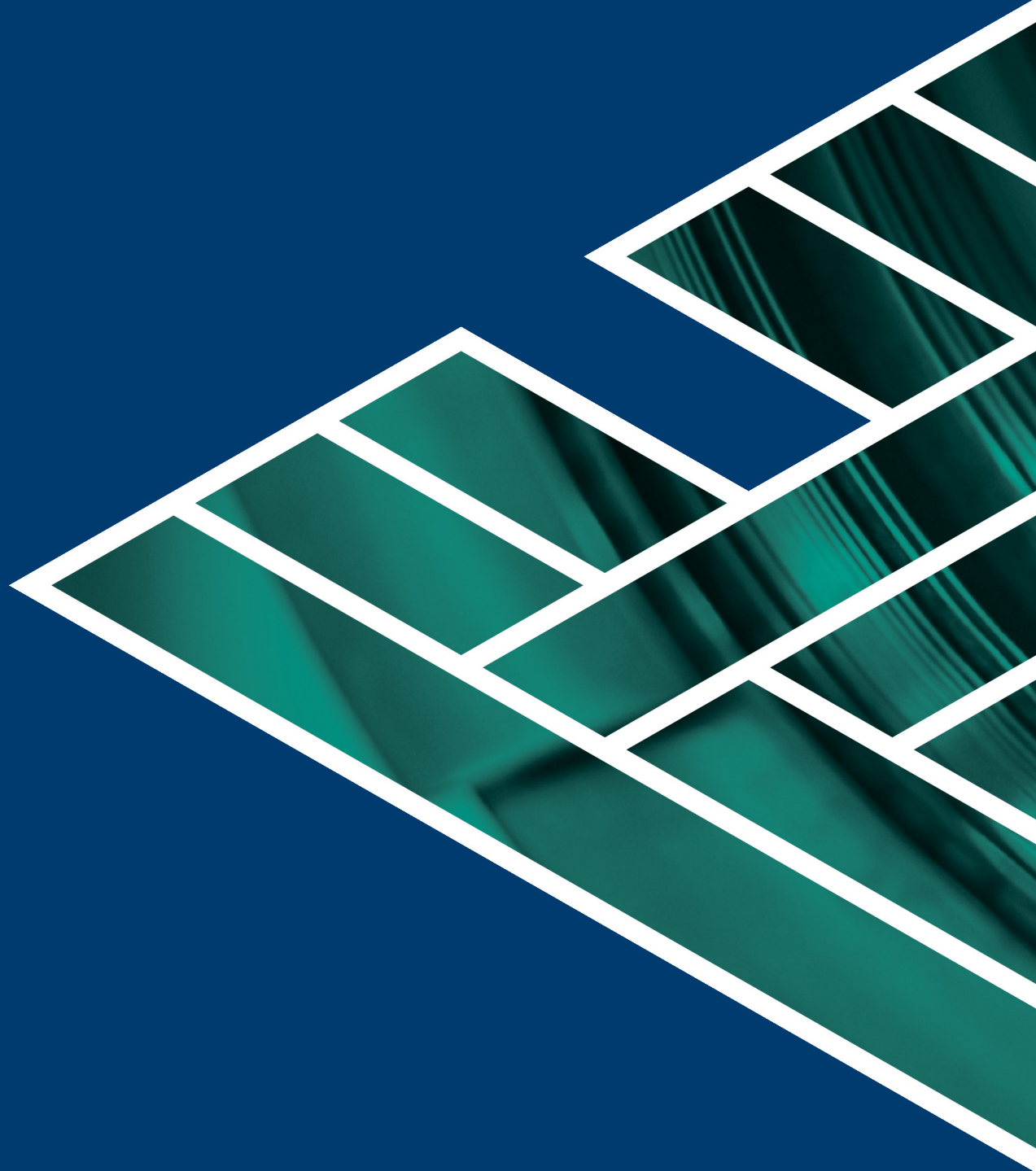




**HARDY**

MADE IN LIVERPOOL



**HARDY UK LIMITED**  
MACHINE GRINDING  
AND GRINDING WHEELS

TECHNICAL GUIDE



# HARDY UK LIMITED

## MACHINE GRINDING AND GRINDING WHEELS

Selecting the correct grinding in-feed speed and carriage traverse speed are both critical to the shaving operation. Hardy blades are manufactured to exacting standards with consistent properties throughout the 'useful height' of the blade and will produce the highest quality shaving with the maximum yield when the correct grinding speeds are set.

There are many variables to consider when setting the grinding speed/feed rate and this is often a process of trial and judgment but it is worth experimenting to discover the optimum points as this will often produce the highest quality of shave and the most economical return on the blade.

There are many variables within the shaving operation. Abnormal grinding wheel speed, wet or dry leather, abnormal cylinder speed, abnormal leather feed-speed etc. Therefore, below are some useful details to indicate the effect of varying factors to determine the optimum grinding regime under variable conditions.

it is important to note that not all blades are the same. Alternative blades to Hardy are often manufactured to a 'cost target' and will not contain the same material properties or consistency. In some cases they are manufactured using inferior raw materials and processes. When the additional costs of re-blading, low quality shaving and significantly reduced yields are factored for the alternatives, Hardy customers find our blades to be the most cost effective solution, time after time. That's why some of the world's biggest groups and leading brands standardise their processes on Hardy blades.

The methods of setting the grinding speeds will vary from machine to machine. Older machines will be completely manual whilst newer machines may be PLC controlled or a combination of the two. At all times, the machine manufacturer's recommendations will take precedence over this 'generalised' guide.

Grind settings will have a profound effect on the quality of the shave and the yield achieved. The Hardy blade has been designed

specifically for the leather industry and it has the optimum balance of hardness and robustness for the application. Hide or skin; each blade is precision manufactured to exacting standards and quality control procedures. The Hardy blade will require significantly less grinding than inferior blades. Achieving optimum results for specific tanneries and individual machines will require a process of limited trial and judgment but this effort will be rewarded with the highest quality of shave and the maximum yield, which will significantly reduce costs.

**IMPORTANT** - At all times, personal protective equipment should be worn and the machine manufacturer's guides should be followed. If in any doubt, please contact Hardy UK or the local Hardy agent, who will provide further support.

### **MACHINE INITIAL GRINDING-IN**

After the re-blading and initial grinding-in of a cylinder has been completed during re-blading, it is critical that the new blades are also ground-in on the shaving machine to ensure the edge of the total blades outside

circumference is completely parallel to the centre line of the specific machine. This will ensure the blades are uniform and will produce a consistent leather thickness after shaving and improve the overall quality and yield.

**IMPORTANT** - The blades could be very sharp so it is necessary to wear appropriate personal protection equipment (PPE) at all times.

#### MACHINE SET UP

The grinding wheel and spindle assembly must be balanced to ensure there is 100% consistent contact between the blades and the grinding wheel. The carriage slide rail must be parallel to the centre line of the cylinder and there must be appropriate and correct lubrication. The rails should be periodically cleaned as shaved material can build up over time, which may absorb the lubricating oil.

Once the re-bladed cylinder is fully installed back onto the machine, the cylinder blades must be ground-in until such a time that the cutting edge has been fully sharpened across the full length.

**IMPORTANT** - It is normal for the cylinder centre line on the shaving machine to be slightly different from the centre line of the machine used for the initial grind-in process during re-blading.

The shaving blades are a precision component so the whole process of setting the grinding speed and in-feed speed needs to be carefully considered.

After completing the necessary checks, the machine can be started and, once up to full speed, the grinding wheel can be carefully advanced to lightly touch the cylinder blades.

**IMPORTANT** - Do not attempt to rush this procedure as serious and irreparable damage could be caused to the blades.

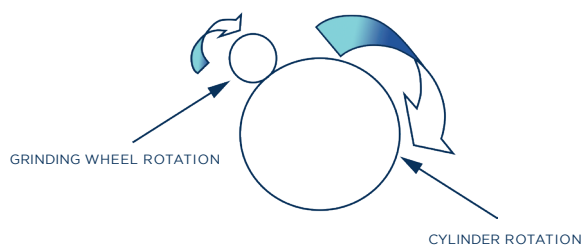
The carriage will be set to traverse automatically and continue to advance the grinding wheel in minimum increments until the cylinder blade circumference is absolutely parallel to the centre line of the machine and feed roller. Observe the grinding from the rear of the machine and ensure that all blades are being ground. The machine grinding-in phase is complete when the grind spark is consistent across the full surface of the cylinder blades. This operation can take anywhere between 30 minutes and 3 hours depending upon the accuracy of the initial grinding-in procedure during re-blading.

If the cylinder has not been initially ground-in during the re-blading operation, the machine initial grinding-in may take a considerable length of time. Again, it is inadvisable to try to accelerate this process as irreparable damage could be done to the blades.

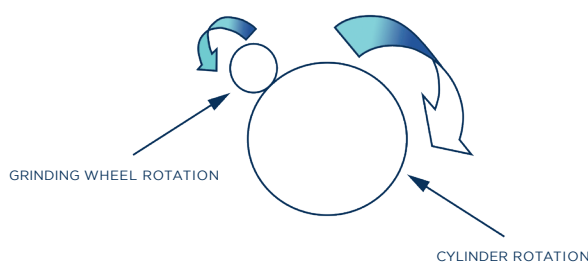
In some cases reverse grinding may be used whereby the grinding wheel will be set to rotate in the opposite direction than normal. This will speed up the process but it is critical that the in-feed speed is not set too high (see 'in-feed of the grinding wheel').

**IMPORTANT** - Once the cylinder is close to completion of the initial grinding-in, it is strongly recommended that the grinding wheel is reset to rotate in the normal direction and allowed to grind for some time to ensure that tip of the blades have a correctly defined final edge.

#### An example of reverse grinding:



#### Correct rotation of grinding wheel and cylinder for machine initial grinding-in is normally as follows:





## PRODUCTION GRINDING

The machine can now be set for production grinding. On modern machinery, the grinding in-feed and traverse speed, and in some cases even grinding wheel speed can be adjusted at the control panel. Older machines may have a combination of control panel and manual adjustment or could be fully manual. In most cases, there are usually 3 specific grinding options (see 'types of grinding').

The traverse speed (where adjustable) should be set at the minimum possible setting, the in-feed should initially be set at 1 notch and a single cam should be fitted. Use a test piece of material to shave to the desired thickness and visually check the quality of shave. If necessary, make in-feed adjustments by one increment at a time until the desired quality is reached. If the machine has a traverse speed adjustment, it is better to increase this before making ratchet adjustments as the grinding wheel effectively passes over the blade quicker and there will be less frictional heat generated.

The rate of yield is generally proportional to the rate of grinding and the slower the rate of grinding the higher the yield. However, the slowest rate of grinding may not produce the desired quality of shave, particularly if the hide is very wet/dry and/or the rate of removal is high (amongst many other variables). For this reason, a certain amount of experimentation is required although the optimum settings will be when the required quality and quantity of shave is produced using the minimum grinding settings.

If, during a batch, the shave quality is affected part way through, do not adjust the grind settings. It is likely that it will be something else within the upstream process or at the machine, and may only affect a small portion of that batch. If the quality continues to deteriorate, the full process must be checked before adjusting the grind settings as increasing the grinding rate may cause irreparable damage to the blades.

The Hardy blade is manufactured to provide a consistent hardness throughout the full life of the blade. It is normal to replace the blades when the height protruding from the cylinder is 5mm although this can vary from machine to machine.



**IMPORTANT** - If the machine is idle for a considerable length of time, redefine the blade edge by following the procedure above before production shaving commences.

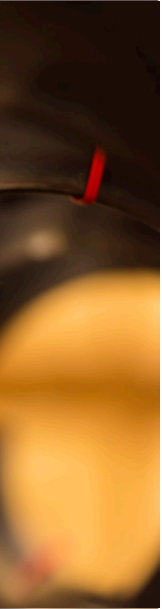
## CUTTING EDGE

The picture below has been taken from a used Hardy blade on a cylinder awaiting re-blading so is therefore at the end of its useful life. It clearly shows how the surface of the cutting edge should appear. Note the clear diagonal grinding marks and the condition of both edges. This blade has consistently produced a high quality shave and has been well maintained as there is no evidence of rust or aggressive chemical damage. Most of the small 'patches' visible on the cutting edge are minute particles of grinding abrasion as they have broken off from the grinding wheel and this is entirely normal. Some are in fact shave debris.

The picture has been magnified many times but the pattern of grinding should be visible.









## TYPES OF MACHINE GRINDING

### Continuous Grinding

This process continually grinds the blades and the grinding carriage is continually traversing back and forth. If this process is used, it is vital that the settings are adjusted in such a way that over-grinding is eliminated as this will reduce the yield and could cause irreparable damage to the blades.

There will be a device for adjusting the rate of grinding wheel in-feed (usually referred to as the ratchet) at the back of the machine, but this can vary from machine to machine. On modern machines the set up will be done via the computer or processor controls.

### Intermittent Shaving

Many modern machines are supplied with a facility to halt the grinding when the machine is shaving. Once the operator starts to shave, a device retracts the grinding wheel and the carriage is held in position. At this point, there is no grinding until the operator withdraws the leather from the shaver and releases the foot pedal, at which time, the grinding will continue from where it left off.

This system enables the operator to closely control the level and precision of the grinding, which greatly improves the life of the blade.

### Single Stroke and Automatic Stop

This type is commonly used for light shaving and/or dry leather or vegetable tanning but can be applicable to wet blue dependent upon the type of skin or leather being processed. It is also sometimes used as custom and practice in some tanneries. The carriage will traverse for a set period, usually once if the system has an automatic stop feature but it could be manually controlled at the discretion of the operator.

In the single stroke production technique, the carriage will traverse for one full cycle and then come to rest. The operator will then shave a predetermined number of hides or will monitor the shave quality before repeating the grinding process. If manually operated, the operator will determine how much grinding needs to be done to achieve the correct redefining of the blade cutting edge. The rate of hide or skin shaving should be closely monitored and recorded to determine the quantity of hide/skin shaving before re-grinding is necessary.

## GRINDING WHEELS

Grinding is an operation involving removal of worn particles of surface metal by 'scraping' with the hard particles of a wheel/stone called 'grit'. In the case of grinding or sharpening leather blades, the main objective is the removal of as little as possible from the surface material of the blade to 'redefine' the blade edge thereby resulting in optimal sharpness and maximum yield whilst maintaining shave quality.

The grinding wheel must be of the appropriate grade, approved by Hardy UK Limited. We will recommend and provide the optimum grade for use with Hardy blades.

### Aggressive or 'over grinding' the blade only shortens its working life

Heavy or aggressive grinding is unnecessary. A simple visual check can be undertaken by monitoring the length of the grinding spark from the back of the machine. The spark length should be no longer than about 2-4 inches and should be consistent across the full length of the cylinder. It is possible to also monitor the grinding by simply listening to the grinding noise. There should be a light and consistent sound, as the grinding wheel passes over the blades. If there are little or no sparks, no sharpening or edge 'redefining' occurs, resulting in a poor quality shave finish. Always use the correct grinding wheel grade and check that the wheel surface is not clogged or glazed.

**IMPORTANT** - With Hardy blades, the optimum grind occurs when the minimum amount of surface metal as possible is removed whilst maintaining shave quality. It is not economical to try to shave a large number of skins and then do rapid grinding with fast feed-speeds as this will not 'redefine' the blade edge and will generate significant heat at the blade tip resulting in the reduction of the blade hardness due to tempering of the blade, which can adversely affect quality and yield.

### Matching the Hardy Blade and Grinding Wheel/Stone

Through decades of experience, knowledge and successful use, Hardy blades produce the greatest yield and highest quality when used with Hardy approved grinding wheels.

### Cause and Effect

The larger the grit, the faster the surface metal removal resulting in a coarse blade edge. The larger grit size reduces the tendency of the wheel to clog (overheat). Conversely, smaller grit sizes tend to remove the surface metal slower resulting in a finer edge finish. But, the small grit size increases the tendency of the wheel to clog.





### **Effect of Grade**

If the grinding wheel is too hard, the particles of grit become blunt and do not break away easily and cannot be replenished by new grit particles. The wheel becomes polished or 'glazed'. An indication of this is given by the absence of any sparks on the grinding face of the wheel. The wheel is no longer cutting the edge of the blade, but is rubbing against it, producing heat, which may result in tempering (softening) the extremely hard edge of the Hardy blade. When the edge becomes tempered, it is possible to see indications of ribbing on the leather. Alternatively if the grinding wheel is too soft, the grit wears off rapidly and will result in a complete failure to 'redefine' the blade's edge. Shaving with blunt blades will produce a rugged finish on the leather and in all probabilities will also result in ribbing.

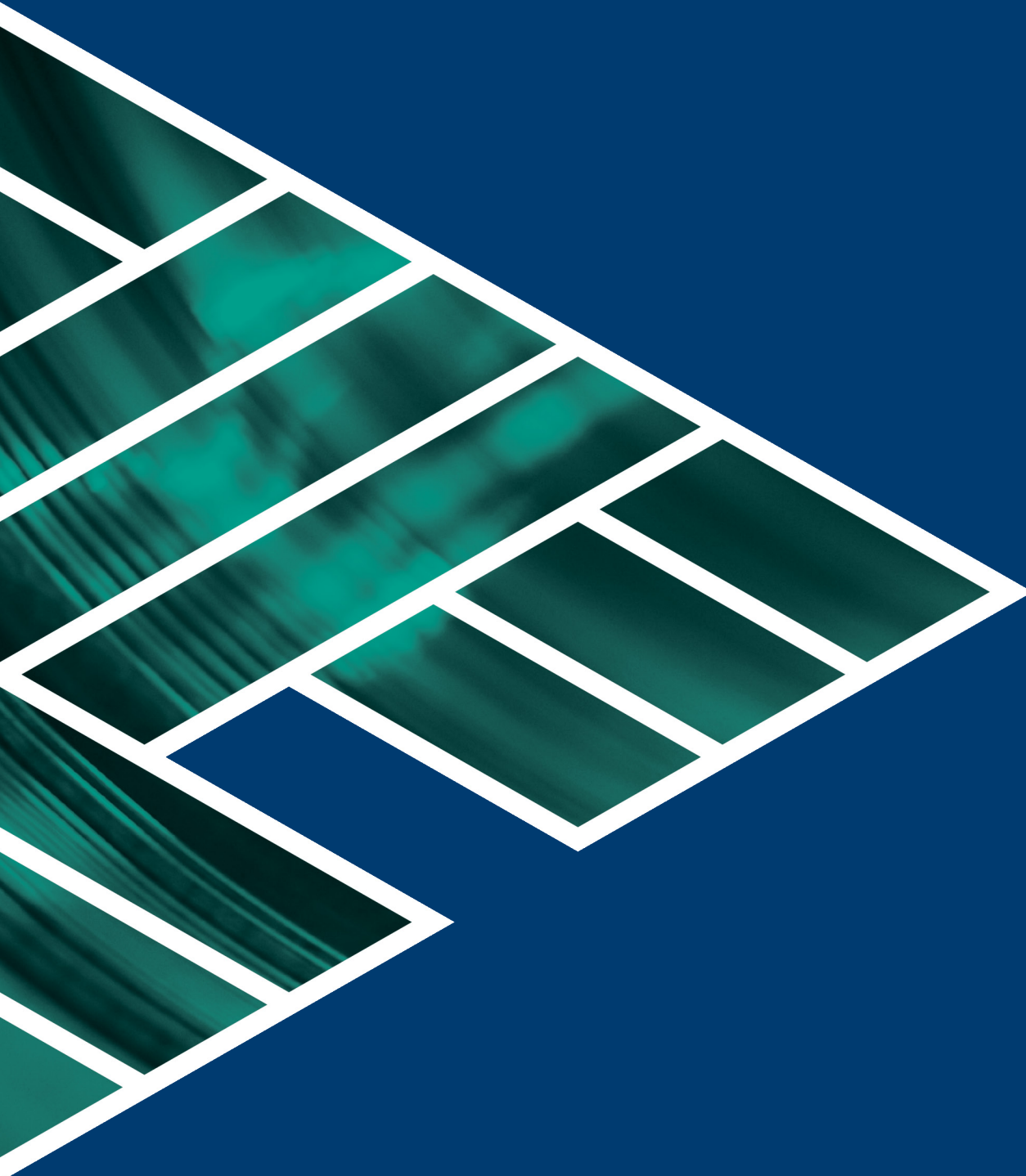
Another serious consequence of a soft grinding wheel, is that by the end of one traverse - movement from one end of the cylinder to the other - the diameter of the wheel reduces, resulting in a marginal change in the blade diameter of the cylinder itself. This again has a detrimental effect. Observing the spark stream will determine if the grinding wheel is too soft. If the length of the spark stream varies over the length of the cylinder then in all probability the grinding wheel is too soft.

### **In-feed of the Grinding Wheel**

This is another very important factor, affecting the performance and the life of the blades, especially when the feed mechanism is manually operated. If the feed is too great, the grinding wheel will of course, 'redefine' the blade's edge, but will unnecessarily grind away considerable portions of the usable blade. As Hardy blades are designed to produce optimum quality and yield through a combination of hardness and wear resistance, it is not necessary to set a fast feed-speed often associated with lower quality blades. Furthermore, a high feed-speed will cause damage to the blades. Conversely, if the feed is too slow, the blunted cutting edges are not fully 'redefined' to a sharpened state and the ribbing of leather may continue. In addition, the speed of the grinding wheel, the traverse feed and the cylinder speed all effect the performance of the blades. There will always be a balance to feed speed, grinding speed, product being shaved and operator preferences to achieve the optimum performance with Hardy blades.

**THE KEY TO OPTIMUM GRINDING IS OBSERVATION, TRIAL AND JUDGEMENT.**

CUTTING EDGE  
PRECISION BLADES  
**MADE IN LIVERPOOL**



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