



IS RELIEF GRINDING ESSENTIAL TO ACHIEVING THE PERFECT CUT?

By Charmian Robinson

How do you ensure that you maintain your mowing equipment in a way that ensures the best possible performance?

First you have to understand what it is your aiming to accomplish and what you are looking to prevent. The aim of every Professional Greenkeeper is to achieve a clean quality cut and in doing so prevent the grass becoming diseased. How this is achieved is a constant source of debate, but can at least be rationalised by looking at current common practise and recommendations from the leading manufacturers of professional mowing equipment.

The recommended specification for all of the major manufacturers and a number of the smaller companies includes the stipulation that cylinders (reels) and bottom blades (bedknives) are relief ground. And there are very good reasons for this as explained by Ivan Miller, Division Service Manager, of John Deere Limited.

The cylinder back relief angle on John Deere equipment is ground to remove the cross section of the blade leaving approximately 1 mm (.040"). This angle is set at 20 degrees although the industry ranges from 20-45 degrees.

"John Deere recommends relief grinding the cylinders for the following reasons," explains Ivan.

1. Relief grinding removes metal from the trailing edge of the blade forming an angle (relief angle) to reduce the contact area of the cutting edges. This reduces blade contact area resulting in less friction.
2. Ensures longer wear life.
3. Less time is required to back lap.

4. Reduces squeezing and tearing of the grass as the unit gets dull by use.

5. Provides an area for backlapping compound to be trapped to more effectively back lap cylinders.

6. Because of the relief grind it is possible, with backlapping, to true a cylinder (make it round) if a blade is .001" to .002" too high.

7. Requires less horsepower to drive the cylinder."

John Deere recommends backlapping after spin grinding to remove burrs and rough edges left from the spin grinding procedure. John Deere machines also have "on board backlapping".

"This allows the technician to regularly back lap the cutting units to 'maintain' the cutting edges. But to maintain cylinders with backlapping the blade must have relief. Backlapping does NOT replace grinding and should never be used to sharpen extremely dull or out of shape cylinders," said Ivan.

"Another advantage of applying relief to the blades is a direct saving on fuel and repair costs. These will go up when cylinders get dull or when there is no relief grind because it does take more engine horsepower to spin the cylinders and that power will wear out components sooner. With Relief ground blades less horsepower is required to drive the cylinder."

Mike Stephenson, from the Turf Division of Lely UK Ltd, also has strong arguments for their Toro professional mowers having relief ground blades, although they advocate different angles on the bottom blades in keeping with their policy of light contact rather than non-contact mowing.

"Our reasons for relief grinding are well documented," said Mike.

"We have found very strong evidence to support our belief that relief grinding is responsible for:

A reduction in wear - due to less metal to metal contact

A reduction in power requirement - due to less metal to metal contact and pinch of the cut turf between the cutting edges

Improvement in the quality of cut - due to a better, cleaner cutting action

A better after cut appearance - due to improved quality of cut

Increased recovery rate of turf - due to clean cut of the grass leaf

Reduced back lapping time - due to less contact

Improved land area resulting from backlapping - smaller contact area to lap

Permits light contact adjustment - better adjustment of contact area

Improved machine life - reduced stress on the component parts

The reason we encourage different angles on the bed knives is because the bed knife (bottom blade) front face angle aids the presentation of the leaf for cutting and changes (depending on application), according to the distance the front face is behind the cylinder centre.

Bed knife Top face angle keeps the land area to a minimum reducing power and assisting cutting edge maintenance."

Although many Head Greenkeepers now accept the value of relief grinding as the desired method for achieving the ultimate in quality of



cut and acknowledge the benefits outlined by the mower manufacturers, he also has other elements to consider such as the time taken to relief grind his units.

The perceived amount of time needed to prepare and apply a relief angle when viewed in isolation can be a deterrent to many Head Greenkeepers looking to allocate their maintenance engineers work schedule to maximise efficiency.

Ian Robson, Managing Director of Hunter Grinders Ltd, examines the variables that effect the time required to sharpen a unit and explains how relief grinding not only gives you all the elements to achieve quality of cut, but also saves time in the workshop.

Calculating the time required to keep a cutting unit sharp

A simple basic formula has been devised to allow you to calculate this for yourself, which is described as Value A + Value B + Value C = Total Time to sharpen each unit

Value A

- Time required removing the cutting unit from the mower and preparing it for grinding.

Value B

- Time required mounting the cutting unit in the grinder, sharpening it and removing it from the grinder.

Value C

- Time required reassembling, setting up and refitting the cutting unit to the mower.

When you add up the variables and compare spin grinding to relief grinding, spin grinding a unit takes less time to set up and complete. So it could be argued that there are small time advantages to be gained from spin grinding only!

However, there is another extremely important Value to be added to the equation which is invariably over-looked and yet has a dramatic effect on the calculation; It is the fact that a spin and relief ground unit will stay sharp at least three times longer than a spin ground only unit and indeed some operators claim their units will stay sharp

five or six times longer when the unit has a full relief grind only. On average a spin & relief ground unit will stay sharp for approximately 12 weeks compared to a spin ground unit which will only stay sharp for approximately four weeks.

If we revisit our earlier equation we can now add the missing value which radically alters the time scale required to sharpen the units. During a typical growing season a spin ground unit will need to be sharpened on average at least six times whereas the spin and relief ground units need only be sharpened twice. Incorporating this value as the number of times the unit is sharpened per season gives the following results:

Spin Grind only all season: If for example the Total time per unit is 50mins x 6 grinds = 300mins

Spin & Relief Grind all season: If for example the Total time per unit is 60mins x 2 grinds = 120mins

Now the true picture as to how much time is required to keep your cutting units sharp is beginning to emerge.

And of course the time frame has to be multiplied by the number of cutting units you might have!

On the basis that an average working day is eight hrs, if you owned 24 cutting units and chose to spin and relief you would only spend six working days (48hrs) sharpening your units compared to 15 working days (120hrs) if you chose to spin grind only. A saving of nine days!

And of-course the figures increase proportionally for any club owning more than 24 units.

Further benefits of relief and spin grinding

There are occasions when a cutting unit has been damaged from contact with debris for example, or heavily coned, when it would take considerably less time to grind if it was first relief ground and then spun ground! This is because you can remove far more metal when relief grinding using coolant than you can dry spin grinding. This has a direct bearing on how heavy a cut you can take. Relief grinding without the benefit of coolant creates a build up of heat which will cause the metal to lose its hardness making it

impossible to retain a sharp edge. Also when you relief grind there is not the impacting effect on the grinding wheel which you experience when spin grinding which again reflects on how heavy a cut you can take.

Setting Up Your Units

On the recommendation of some manufacturers such as John Deere and Jacobson, units should be set up to have no contact between the cylinder and the bed knife. Other manufacturers including Toro suggest that set up should ideally in their opinion, have very light contact between the cylinder and bed knife. Unfortunately if you only spin grind this very light contact is almost impossible to achieve. This is because the cutting land is the full width of the blade, unlike the small land which is achieved when you relief grind. This has a very undesirable effect on the bed knife because contact generates heat which in turn produces even greater contact. In other words the bed knife loses its sharpness far quicker and therefore needs to be ground more often and replaced far more frequently.

Mike Stephenson sums up by saying, "It is vital when servicing to keep the machine operating as the manufacturer intended. Therefore important consideration should be given not only to the method of grinding but also to using genuine original manufacturers parts so that the equipment is kept to the original manufacturer's specification.

And finally on whether relief grinding is really a necessary option," said Mike.

"We certainly wouldn't put an extra expensive process in the manufacturing if it wasn't a fundamental requirement."

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