

Reel Maintenance: Spin Grinding - "The Rest of the Story"

By Thomas R. Harrison

Over the years golf course superintendents have come across many innovations to make their work easier. The very nature of our work dictates some innovative talents or desires to improve the quality of our courses and to lessen the cost of maintaining them. For every operation on our course there are 10 sales people at our door with their rendition of how to make the job easier and save us money. At least 7 out of 10 of these people are selling poorly designed and poorly conceived products. I can think of dozens of these marginally designed pieces of equipment that I have seen over the years. Every company, whether they are in turf or not, has its good and its bad equipment to offer. A superintendent needs to use good judgement and common sense when evaluating new equipment and the preventive maintenance practices he will employ to make this equipment last.

Sometimes idea people, innovators as they indeed are, will try in vain to solve a problem with the sincerest of efforts. But the solution probably will not be there easily. Try as they may to make a difficult, time consuming job easier, the fact too often will be that the task will not be solved completely and easily at a reasonable cost. The subject that I am leading up to is the care and maintenance of fine cutting mower reels and, ultimately, do we spin or relief grind. How do we properly take care of high speed, low height of cut, high maintenance reels?

Since the advent of light weight fairway mowers, people have not done an adequate job of caring for the cutting heads. For too many years people tried running high frequency reels without the proper amount of preventive maintenance. When manufacturers delivered their first light weight mowers nobody bothered to explain to the purchaser the extra measures needed, on a daily basis, to keep the equipment running trouble free. When those first light weights did not keep their set as long as the old pull gangs did, people

started to blame the manufacturers. Rightly so the manufacturers and distributors were blamed, as they should have found in their field testing that these new light weight mowers need lots of extra care and that it is imperative that the purchasers were fully aware of this. The mowers need setting daily, and the cutting edge has to be kept at its optimum all year. The forgiveness factor, that is, "how rounded can the cutting edge of this reel and bedknife get before I have problems", is a lot less with the new light weights than the old gang mowers. The light weights require that the mowers be set daily with paper and that the leading edge of both reel and bedknife be kept reasonably sharp. Pinching the grass off with the old pull gangs at $\frac{3}{4}$ " was tolerable in August in years past but nowadays the light weights won't make it through on a marginal cutting edge. Pinched leaf blades with a higher frequency of cut, light weight mowing reel are a minor disaster.

Some superintendents have slowly come to realize that these mowers need more attention. They see that their mechanics need to be given more training and time to care for this equipment. As we are slowly coming around to accepting this added time requirement for preventive maintenance, we again are searching for ways to make it easier to maintain these new cutting edges.

Spin grinding, or truing up a reel by using the centerline of the reel shaft as the pivot point to set the grinding stone to create a perfect circle and thenceforth a true cylinder, is not a new concept. I remember Pete Miller teaching me 21 years ago how to set a reel on its reel shafts into an old Simplex grinder to true up a reel and remove any possibility of the reel having a conical shape. The present flurry of interest involving spin grinding and the push to purchase these expensive spin grinders is a tremendous tribute to free enterprise and the value of sales and marketing hype. Spin grinding is

a good way to remove the cone shape from a reel if the reel is conical. Other than that it is not a good practice to follow if it is the only care for a reel. In over 20 years of teaching people how to grind with the old Simplex grinders I have never had a man grind a reel off center to the point of the reel becoming conical. We check for a cone shape on every reel that goes into the grinder, but we have never had to compensate by spin grinding a reel on its center shafts.

Modern day light weight fairway mowers, and green and tee type mowers, all require the same type of consistent daily setting and adjustment. If the adjustment is done too tightly or too infrequently you will have problems. People tend to adjust these mowers too infrequently thus causing the reel to cut poorly and end up with a rounded leading edge on the reel blade and the bedknife blade. To compensate for this they then set the reel tighter to "make it cut". Or people will over-tighten the reel to bedknife adjustment in the first place because they do not know any better, eventually causing the bedknife to rifle. Finally, after starting down this path of poor mower care, the reel needs sharpening. Now this strikes terror into a lot of superintendents. Why sharpen a reel during the growing season? "Not if I can help it," some say. So we drag out the lapping machine to try to remove .020 inch of rounded, hardened steel. The results are poor at best. That much steel can be lapped off in 8 to 12 hours, maybe. Lapping was never meant to remove steel, but rather to hone the reel and bedknife together. If a rounded edge is lapped down too many times, the result is no relief between the reel and bedknife. A relief angle, or area of clearance behind the leading edge of the reel and bedknife blade, is critical to proper mower operation. That relief area is important for the quick removal of cut grass away from the low clearance contact point of the reel and bedknife. A spun ground system allows a maximum contact width between the reel and bedknife. When a blade of grass is cut by the leading edge of the reel and bedknife it then must pass backward through the reel and bedknife before exiting out onto the ground. If the tolerances between the reel and bedknife are 2% or less, or if the reel is set too tight, then the already cut grass blades are pinched between the reel and bedknife. Even though the

grass blade is cut by the leading edge it must physically fit between the reel blade and bedknife. With little or no clearance the grass blade gets pinched on its way out and causes binding. This pinching and binding very quickly take the reel out of set; that is, it widens the gap between the reel and bedknife to the point of poor cut. This widened gap consequently causes leaf blades to lay over the leading edge of the bedknife and reel causing these edges to become rounded. Now we're back to "a poor cut, let's set it tighter, we can't sharpen it now, let's lap it in" type of problem solving.

The proponents of spin grinding say they can sharpen a reel faster than relief grinding. And they are right. They can sharpen a reel faster than any other method. But the problem is that if the reel was ground with some relief to begin with, thus eliminating binding and loosening the set, you would not have to be grinding at all. A properly ground reel with relief, set with 2 sheets of thin (newsprint) paper on a daily basis, will outlast a spun ground reel by a 2 to 1 margin before needing major work. Time savings in using the spin grinder are erased because you will have to do it almost twice as often.

Superintendents who are having troubles with their quality of cut lasting and consequently their reel stock becoming rounded are making several basic mistakes. First, new reels come from most equipment manufacturers spun ground. Not because it provides the best cut, but because it is economically the best way to get the reel cylindrical and usable. We make the assumption that a newly delivered mower is ready to cut. It will cut adequately, but only for about 6 to 8 weeks. Then we start over-tightening, lapping, and complaining to the distributor about the lousy cut. Or we tell the distributor we have a bad set of bedknives or reel stock. I have seen poorly hardened steel in bedknives and reels only twice in 21 years. Newly delivered mowers, with spun ground reels, need to be reground with a slight relief grind, before they are used. They must then be set properly before doing any mowing. This proper setting, with paper, is critical because we have all at one time or another, tightened a reel down too tight to make it cut. This destroys the temper and cutting ability of any reel. There should never be any contact between a reel and bedknife. The air gap between them should be the thickness of one sheet

of newsprint. If you put 2 dry pieces of paper through the reel, it should cut one cleanly, and leave the other sheet intact. If it cuts two sheets, you're too tight, but usable. If the one sheet is cut ragged then think about a light lapping. Optimum is for the reel to cleanly cut one sheet and leave the other.

Lapping a reel with slight relief is easy and quick because there is minimal contact between reel and bedknife. This minimum land area makes minor removal of uneven steel easy. An uneven cutting, spun ground reel will take longer to lap in because you are wiping 6 times the width of contact area. You will have to lap longer, tighten the reel tighter and use more lapping compound.

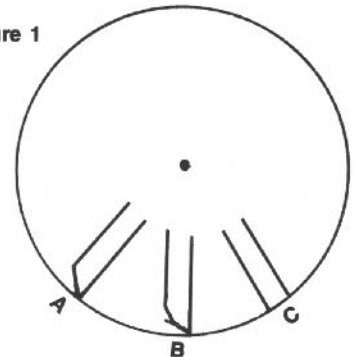
One of the other problems of using a spun ground system is reel life. Your reel life will be 40% less with a spun ground compared to a properly cared for and set relief ground reel. The reason is illustrated in Figures 2 through 5. Figure 2 shows a reel blade as it may enter the shop in late fall or any time when the leading edge has become too rounded. Figure 3 shows how the reel is ground during winter maintenance. The grinding stone must be set to duplicate the previous years relief angle but not take steel off to a point on the leading edge. Merely true up and add to the left over relief grind from the previous year. If you have no relief grind left from the previous year you are either setting your mowers too tight or not putting enough relief on to begin with. Figure 4 shows a lapped reel with a true, sharp leading edge and that the sharp edge was created by lapping off part of the old rounded leading edge. Figure 5 shows a spun ground reel entering the shop for winter. This spun reel will be spun ground until the rounded edge is removed to a sharp cutting point since it cannot be lapped. The difference is the removal of all the rounded edge in spin grinding while only removing part of the round in relief grinding. Relief grinding will, on the average, leave about .010 of an inch of steel extra on the bedknife each time grinding is necessary. This extra .010 of an inch each time you grind will significantly increase reel life. Multiply this times the extra number of times you will have to sharpen spun reels during the season and the savings could be considerable.

The computer printout by Express-Dual is an interesting piece of advertising. The printout, on face value if you quickly skip to the bottom line, is im-

pressive. But if you really sit down with pen in hand and think about actual operating conditions, their concepts do not hold water. The numbers will not add up. They cannot acknowledge pinched grass between reel and bedknife. They state longer reel and bedknife life, which is not true. They will not admit to more frequent sharpening, compared to the lapping of a relief ground reel. Their tremendous cost savings are based on the assumption that spin grinding will give the best long term results, which they will not. They are trying to sell a product which is great for production in a manufacturing plant to create a true cylindrical reel, but it does not provide the best, long life cutting reel. The rounded edges, pinched grass, wider blade contact areas and personal experience tell me spin grinding is not going to provide the best long term quality cut. If spin grinding was that good, none of us would be complaining about how poor factory sharpened spun ground reels are when the last week in June rolls around.

To those that are unhappy with relief grinding and the increased maintenance with small reels, don't blame the manufacturers, distributors, or the quality of the steel. The fact of the matter is that there are no easy short cuts in good reel care. Relief grinding for the time being is still the best, season-long solution to proper reel maintenance. Spin grinding, unfortunately, is not the answer. Your knowledge and commitment to doing the job right will give the best results throughout the season.

Figure 1



A - straight relief grind
B - relief grind with back grind
C - spin grind

