

GUIDANCE

TORO.

Aftercut appearance, Part One: The science behind the art...

As most of you can attest, the one thing you can always count on changing is the environment — and turf conditions along with it. At some point in every turf manager's career, they will encounter turf and/or soil variations that alter the aftercut appearance of their reel mowers.

After reviewing some of the latest TurfNet Forum discussions regarding aftercut appearance (ACA) on fairways, we at Toro felt it appropriate to shed some light on how the reel interacts with the turf and how changes in turf conditions can alter that interaction, as well as share a few adjustment tips to compensate for changing conditions.

Rather than provide a step-by-step diagnosis tool, we want to help you better understand how variations across the season affect ACA, and in turn help you better achieve the ACA you desire. Our recommendations result from thousands of hours of field testing and years of research and development that culminated with our Reelmaster 5010 series.

Every golf course (and even individual fairways) has its own unique conditions that often require special attention. These variations can include differences in turf and soil composition, cultivars, seasonal growing periods, geographic location, water, fertilizer, and even individual micro-environments within a single fairway.

As a manufacturer, we design reel mowers to perform optimally across a broad range of mowing conditions. We also provide a series of targeted adjustments to compensate for turf variability when conditions fall outside the range of 'normal'.

Toro machines are shipped with factory settings intended for the best performance under the widest range of conditions. They may, however, need to be adjusted seasonally as dictated by changes in specific turf conditions.

The following guidance is intended to highlight ACA issues which can surface during seasonal/environmental changes, and provide directional adjustments to compensate for them.

Changes in turf "spring rate" causing bobbing...

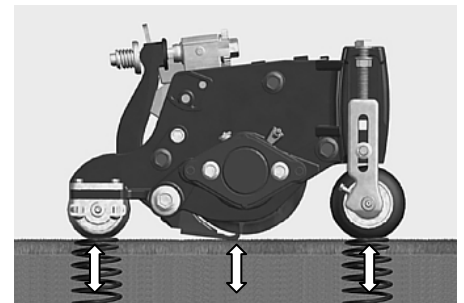
Varying levels of turf unevenness cause fairway cutting units to hop vertically as they traverse the contours in the fairway. Firm turf and heavier cutting unit weight help stabilize the reels to minimize bobbing and the resulting uneven cut.

There is, however, a window in early spring when the turf comes out of dormancy, the soil is very soft, and the "spring rate" of the turf approaches the level needed to create bobbing of the cutting unit. *Spring rate* determines the distance the turf deflects under the weight of the cutting unit. The softer a turf is — the lower the spring rate — the longer it takes for the cutting unit to restabilize and stop bouncing.

This turf condition is not isolated to the beginning of the growth season — but that is when it most often appears.

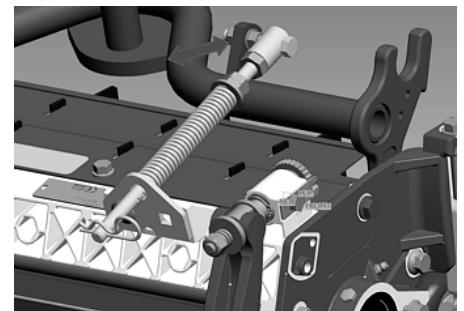
To understand this further, think of a typical spring suspension on a car as it rides over a bump. If the suspension is stiff like a sports car (a high spring rate), the tire (or in our case, the roller) will traverse through the bump and quickly stabilize back to following the contours of the road.

On the other end of the spectrum, if the suspension is softer (lower spring rate) like a Cadillac, the tire will traverse through the bump, absorb some of the energy, and continue to bob or sway vertically long after the initial impact. This is how the cutting unit can become "excited" to the point where bobbing occurs and continues across a fairway.



Soft turf with a low spring rate does not restabilize cutting units as quickly as firm turf does, so bobbing is more likely.

To offset this variation in turf, Toro engineered a turf compensation spring to optimize front-to-rear weight bias of the cutting unit. This adjustment gives you the ability to aggressively follow undulations of a fairway during normal mowing conditions, and if needed, shift more of the cutting unit weight to the rear roller to reduce any bobbing that may occur during the growing season.



Under soft conditions, the turf compensation springs may need to be adjusted to shift more c/u weight to the rear roller.

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Wet Conditions...

Wet or spongy conditions create many challenges for reel mowers. Cutting units are designed to achieve a specific mow height in relation to the bottom of the rollers. Notice that I did not simply say, "to achieve a specific height of cut." This is because the actual "effective" height of cut (HOC) is influenced by how far the rollers sink or engage into the turf canopy.

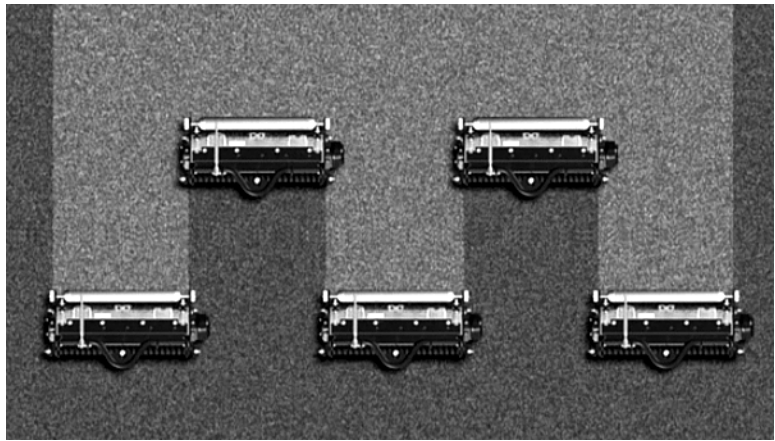
The amount of engagement is dependent on many factors, including cutting unit total weight on the turf, suspension system down-pressure, front-to-rear roller weight bias, roller type (smooth, grooved), canopy thickness, amount of clippings, and even the amount of grass/turf removed.

Under wet turf conditions, reel-to-reel setup consistency across the machine becomes more critical...

The effective vs bench-set HOC variation becomes more apparent when the turf is soft, as it will allow the cutting unit to sink or engage further into the canopy, resulting in a lower effective HOC when compared to the same fairway when it is dry or firm.

Under wet turf conditions, reel-to-reel setup consistency across the machine becomes more critical to ensure a uniform ACA. Issues that may occur if reels are not set up consistently include scalping, marking, step-cut and excess clippings, among many others. To compensate, most reel mowers have various roller options, adjustable counter balance springs, and most importantly HOC adjustment to allow you to achieve the same effective HOC in a variety of conditions.

When selecting a cutting unit configuration, one must understand that each cutting unit design or configuration will have a different effective HOC due to the differences in ground pressure at the roller, the cutting unit sus-



Wet or high-growth conditions may require special adjustment to ensure a uniform aftercut appearance across the full swath of the machine.

pension, the aggressiveness of cut, etc. This means that the same HOC for one type of reel mower will not necessarily give the same result on another.

To ensure your mower provides the desired ACA in wet conditions, it is most important to ensure all adjustments and attachments are set the same. If needed, it may help to switch to full rollers, add rear roller brushes, or increase the HOC setting.

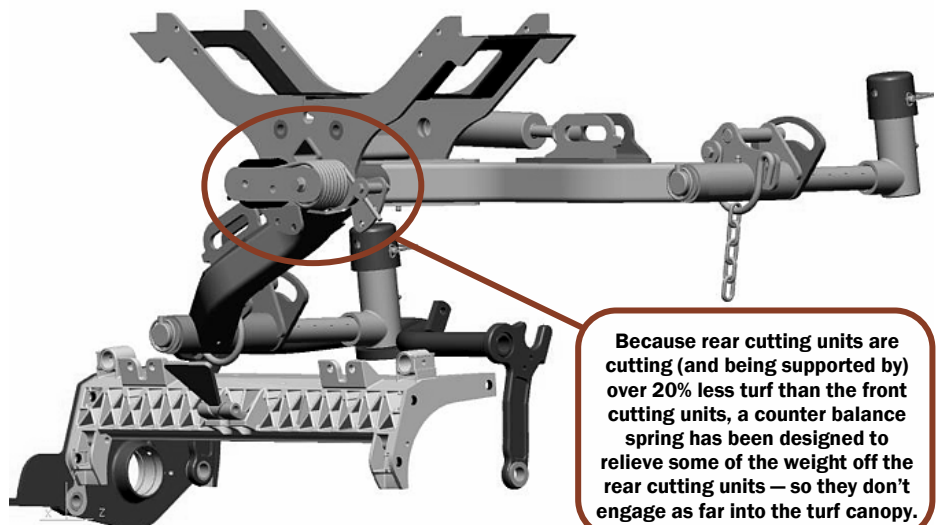
High growth conditions... (cutting unit overlap)

In times of high growth rates (like in the spring, after fertilizer applications, or even from extended periods between mowing), the thicker canopy and increased amount of leaf blade removal create a unique mowing surface which may alter ACA from reel to reel.

As the cutting unit rides over the turf, the canopy acts as a support, pushing up on the rollers and bedknife with varying force depending on the amount of turf or canopy thickness below it. This is also part of the reason why you observe a difference between bench set and effective HOC.

Now, let's address the fact that all cutting units have a certain amount of overlap between them to minimize uncut turf when turning or mowing on side hills. The Reelmaster 5010 series with 22" DPA cutting units, for instance, was designed with 2½" of overlap on each side of the cutting unit. This means the front three reels are exposed to a full 22" of thick, uncut turf canopy, while the rear two only see 17" of full turf canopy (and 5" of pre-cut turf). This is over 20% less full canopy pushing up on the rollers and bedknife, which in high growth

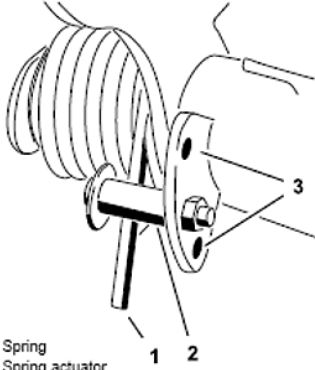
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Because rear cutting units are cutting (and being supported by) over 20% less turf than the front cutting units, a counter balance spring has been designed to relieve some of the weight off the rear cutting units — so they don't engage as far into the turf canopy.

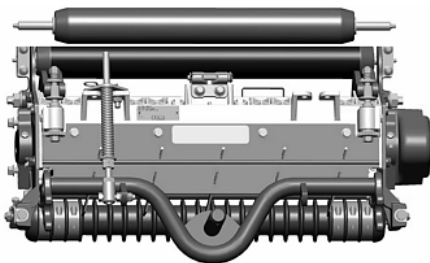
Aftercut appearance (Continued from page 13) or even soft wet conditions can result in a lower effective HOC on the rear units — which, in turn, can create a step-cut look across the mowing path.

To compensate for this, Toro has designed in a simple counter-balance spring that can be set to relieve some of the weight off the rear two cutting units, thus reducing the difference between front and rear cutting units for a more uniform HOC and resulting ACA.



Each of four settings on the counterbalance springs increases or decreases counter-balance on the cutting unit by 5 lb. The springs can be positioned on the back side of the spring actuator to remove all counter balance (4th position).

Other ACA variations which can result from cutting unit overlap include *double roll* marks and *double cut* marks. Each has its own unique visual appearance and typically shows up as small (2" or less) strip between each cutting unit. To compensate for these, Toro developed shorter rear rollers (standard on 5" dia. cutting units) to eliminate the double roller marks most often seen in cool season grasses.



A top view of the Toro 5" DPA fairway cutting unit showing the full width rear roller (installed) with the now-standard shorter rear roller behind it.

Double roll or double cut marks?

TIP!

Run two passes side by side in the same direction, one pass with the reels on and the other with the reels off. If the strips go away on the pass where the reels were not spinning, then it is a *double cut* mark. If the strip is the same between the two, it is generally a *double roll* mark.

A second technique is to examine individual strips from both sides of the mowing pass (behind and in-front). If the color appears lighter from both directions, it generally indicates a double cut mark. Roller options like front shoulder rollers or a decreased bedknife attitude should be considered. If the color shifts from light to dark when viewed in different directions, it generally indicates a double roller mark and roller options should be considered with different end designs (example: shorter rear rollers).

An optional front shoulder roller is designed to reduce double cut marks (most often seen in warm season grass) by increasing the rolling action of the cutting unit in the overlap areas.

High growth conditions (clipping dispersion)...

Excessive clippings during high growth conditions can have a significant affect on ACA due to their ability to alter the way sunlight reflects off the canopy and affect the HOC between reels..

When clippings are thrown forward, they thicken the canopy and reduce the ability of the to engage into the turf, thereby altering the effective HOC. This issue is magnified by the helix design of the reels because the front reels tend to throw additional clippings into the path of the rear cutting units — causing them to rise up, resulting in a higher effective HOC and creating an *opposite* step cut appearance.

Toro has designed a clipping deflection system to compensate for this condition, but you may also need to consider the rear throw configuration to improve mowing capacity and reduce clumping in high growth conditions. Rear roller brushes have shown dramatic improvements in clipping dispersion and ensure a smooth, level roller, which ultimately increases consistency from reel to reel.

High thatch conditions...

Thatch buildup is another turf condition that affects the interaction of the reel with the canopy and the resulting ACA of the turf. Because thatch creates a

spongy surface and a denser canopy, the cutting unit may exhibit similar tendencies to wet or high growth conditions.

The most critical issue created by thatch buildup is related to how the denser canopy reduces the amount of sunlight and nutrients exposed to the base of the canopy. This ultimately reduces the amount and depth of green leaf tissue on the leaf blades, which magnifies any inconsistencies between cutting units, especially from an effective HOC standpoint.

In high thatch conditions, the green-to-white color gradient from tip to crown is smaller than normal...

To understand this further, we need to take into account the fact that the leaf blade has a color gradient from tip to crown, green to white/tan respectively. Because of this, aftercut appearance and mowing uniformity is highly dependent on uniformity in effective HOC. This is especially in high thatch conditions where the color gradient is smaller than normal, or when taking off more than 1/3 of the leaf blade.

To compensate for this potential turf condition, Toro has engineered an integrated blade and brush style groomer. This optional attachment combines the cutting action of a blade

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Aftercut appearance (*Continued from pg 14*) with the lifting action of a brush to reduce thatch, encourage lateral growth, and reduce grain, resulting in a firmer, healthier fairway, and a cleaner cut.

Other maintenance options effective in reducing thatch and grain include verti-cutting, mowing in alternating directions, aeration, topdressing, etc. But like all changes in turf maintenance practices, removing thatch or grain will involve patience due to the retraining process of the turf.

Hot or dry conditions...

When turf enters into the peak season for heat and dryness, it is fairly common for the leaf blade to dry out or retain less moisture resulting in a less lush canopy. This reduction in canopy moisture has a direct impact on the cutting

unit as the moisture in the clippings acts as a lubricant for the reel as it makes contact with the bedknife.

When this moisture in the leaf blade is reduced, cutting units have a tendency to experience increased heat and friction across the reel and bedknife surface. It is a good rule of thumb to run not as tight of contact between the reel and bedknife during these seasonal conditions. Similarly, during high turf stress conditions, it is generally a good rule of thumb to back off on the HOC to relieve stress on the turf.

In conclusion, maintaining fairways requires a high level of knowledge and skill to understand the potential turf variations across such a large area. The more you can understand about how your mower interacts with the natural variations of the turf, the better

equipped you will be to deliver the quality experience your golfers expect. The adjustments highlighted above are only guidelines. They work well in most conditions, but additional adjustments may be necessary to meet specific requirements or circumstances.



Coming next month:

“Aftercut Appearance Part 2: Demystifying Step Cut Appearance”

— where we will explore the most common types of step cut, review diagnostic tips, and provide directional recommendations to optimize the aftercut appearance of your fairways.