

GCM

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A catch-can test measures irrigation distribution uniformity in the field. Photos courtesy of Underhill

(irrigation)

Weathering long-term drought with improved irrigation

Converting to solid metal nozzles improves distribution uniformity and reduces costs at a top Texas course.

When golf course superintendents misread the weather...it can have serious consequences.

When the weatherman comes up with faulty predictions, no one gives it much thought. When golf course superintendents misread the weather, however, it can have serious consequences, says Texas superintendent Mark Semm.

Semm is the GCSAA Class A director of agronomy at The Clubs of Cordillera Ranch, a resort-style community in Boerne, Texas, 30 miles northwest of San Antonio.

In spring 2011, Semm and his crew were anxiously making plans to deal with another year of drought. Springtime in Texas is typically rainy, followed by long, hot summers, but there was little precipitation in 2011.

"June rolled in with hot, dry weather and a Texas wind that could dry the turf down to its roots," he recalls.

"We tried to update some of our full-circle heads with newer models to improve the distribution uniformity (DU), but weren't getting the coverage we needed. There were lots of dry patches, along with oversaturated areas. (See the sidebar, "What is distribution uniformity?") Meanwhile, summer was fast approaching."

The Clubs at Cordillera Ranch is an 8,700-acre master planned community with luxury residences. The golf club opened in 2007 with the legendary Jack Nicklaus playing the inaugural round.

Cordillera Ranch was recently named the 2014 Course of the Year by the National Golf Course Owners Association, and is consistently rated one of the top courses in Texas (No. 1 in the Texas Hill Country, No. 1 in a Texas Residential Community). Hole No. 16 is recognized as one of the most beautiful in the state.

Nestled in a scenic country setting, the Cordillera Ranch layout meanders through rugged, oak-covered terrain with natural water features. The Guadalupe River adjoins the property with fishing and water sports.

The course's bentgrass greens and zoysia-grass fairways are irrigated with Toro sprinklers and Osmac central control.

With very little rain and another hot summer approaching, Semm had to explore new ways to improve distribution uniformity and keep his course playable during a predicted dry year.

"Along with the DU issues, the crew had to deal with clogged nozzles," says Semm, an 18-year GCSAA member. "We're located in a river valley area with sedimentary soil that can choke up the heads."

After doing some research and consulting with other superintendents, Semm decided

What is distribution uniformity?

Distribution uniformity (DU) rate is typically a barometer of turf condition and indicates whether a sprinkler is delivering uniform irrigation coverage. A low DU uniformity rate of 0.55 or less indicates that coverage is inconsistent, resulting in dry spots, donuts or overwatered, saturated areas. A high DU rate of 0.80 or better shows that irrigation is uniform, resulting in healthier turf and improved appearance. With a higher DU rate, sprinklers can be programmed for shorter run times, saving water and energy.

In tests conducted at the Center for Irrigation Technology at California State University, Fresno, Profile solid metal nozzles were shown to improve irrigation distribution uniformity at a series of golf courses while also reducing water usage by as much as 20 percent. With improved distribution uniformity, superintendents are able to water less often and reduce run times.

—N.H.

to field-test Profile solid metal nozzles on his toughest site — the eighth fairway, which, he says, has always been a struggle to keep uniformly watered.

"I'm a fairly cautious guy and don't like being a guinea pig...but we had nothing to lose...so we switched out a few full-circle heads on the eighth with Profiles. And I was

blown away. Within two weeks, the eighth stood out like a green oasis because there was such an improvement in the distribution uniformity and appearance," he says. "Words don't do it justice....You had to see it."

That's when Semm decided to retrofit all the full-circle heads on his fairways with solid metal nozzles.



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Mark Semm

"By the time July rolled around we were in the midst of one of our worst droughts. But many of our fairways had already been retrofitted...and were looking great," he says.

To date, Semm has retrofitted more than 300 full-circle heads on Cordillera's fairways and perimeters with solid metal nozzles. He has also installed another 75 part-circle high-uniformity heads on the greens where the spacing is a little tighter.

The DU guru

A longtime turfgrass and irrigation consultant and former superintendent, Mike Huck is known throughout the industry as the "DU guru." Huck, who heads up Irrigation & Turfgrass Services in San Juan Capistrano, Calif., has also worked with the USGA Green Section. In that position, he evaluated golf courses across the arid Southwest, offering practical suggestions for improving turf health. His analyses often focused on distribution uniformity.

"There are both visual and practical components to improving DU," he says. "The vi-



Updating the irrigation system nozzles allowed The Clubs of Cordillera Ranch in Boerne, Texas, to improve distribution uniformity and coverage. Mark Semm is the GCSAA Class A director of agronomy.

sual components are obvious: fewer dry and wet patches and a firm and uniform green playing surface.

"The practical components are realized over time: healthier, more disease-resistant turf and real potential for water savings. For example, for every 2 percent improvement in DU, we typically expect a 1 percent savings in water usage.

"If a course goes from a poor 73 percent DU rating to an optimal 83 percent in DU, that's a 10 percent improvement. This can translate to 5 percent in water savings. In coastal Southern California, it is common to have a water bill of \$500,000 annually, so a 5 percent improvement can amount to \$25,000 a year in savings," he says.

Huck's experience with Profile solid metal

nozzles goes back to the first prototypes introduced by inventor David Malcolm in the early 1990s. As a superintendent, Huck had a 1960s-era system with poor DU. He decided to switch a few zones of his nozzles to Profiles as a test...and saw immediate improvements.

Advantages of improved DU

Before Huck could complete the retrofit, however, he joined the USGA. His successor completed the installation and reported dramatic results.

After seeing the improved fairways firsthand, Huck was prompted to write a USGA Turf Tip entitled "Having Your Morning Coffee Without Donuts." The presentation and article illustrated the importance of distribution uniformity and ways to achieve it.

Huck found that courses retrofitted with Profile nozzles have a real advantage in improving distribution uniformity.

"Profile nozzles perform consistently across a range of pressures and still deliver a similar pattern, a key component in having a more efficient system," he says.

"I often recommend that superintendents try Profiles on their most problematic areas. The Profile nozzle orifice design and solid metal construction deliver greater consistency and durability and are less prone to clogging. The nozzles are engineered specifically for popular golf heads and can extend their useful life."

Huck also advises that an irrigation system requires uniformity in spacing and pressure, and recommends equilateral triangular spacing, rather than a square or rectangular layout,

Test shapes and performance characteristics for equilateral triangular spacing

- Slope or wedge. Most forgiving and desirable for optimizing coverage.
- Stepped. Second-most desirable if length of each step is properly proportioned to its inverse counterpart when overlapped.
- Flat. Undesirable — creates an excessively wet or dry donut surrounding the sprinkler.
- Valley near head. Develops into a dry donut a few feet from the sprinkler as the season progresses.
- Sharp peak near head. Develops into a wet donut near sprinkler as irrigation season progresses.

— N.H.



At Cordillera Ranch, retrofitting full-circle heads on the fairways with efficient solid metal nozzles cost around \$6,000.

for best coverage.

He notes that the best way to fully evaluate an irrigation system's distribution uniformity is either an on-site audit or a laboratory evaluation at the Center for Irrigation Technology. Using catch-can tests, overall distribution uniformity can be measured in the field, while in the lab accurate data can be collected and transcribed into a "profile" that can be used with software that projects performance when overlapped. The profile represents the shape of applied water along the length of a single sprinkler's throw. It is visually displayed as a sloping wedge.

A best-case profile shows heavier irrigation coverage near the head and less output farther out. If the profile shows peaks and valleys, those both can be problem areas. Peaks indicate potentially oversaturated turf; valleys indicate possible dry spots. (See the sidebar, "Test shapes and performance characteristics for equilateral triangular spacing.")

If the distribution uniformity doesn't improve with the solid metal nozzles, Huck says, then the problem may be a hydraulics or programming issue, resulting in inadequate pressure caused by small pipe size or other installation issues.

Back at the ranch

Meanwhile back at the Cordillera Ranch, Semm says that, although the course has multiple sources of water, including an on-site treatment plant for recycled water, they have to be conservative.

"We are in the midst of a three-year drought, but since installing Profile nozzles, we are actually saving water and estimate that we are using 25 to 30 percent less because of improved DU. We've also seen energy and labor savings. The pumps aren't working as long or as hard and the crew spends less time hand-watering and un-clogging nozzles.

"The ... retrofit cost approximately \$6,000. Our other option was to replace all the full-circle heads at a cost well over \$30,000. Dollar for dollar, the solid metal nozzles were one of the best investments we ever made. (They) paid for themselves in water, energy and labor savings."

Nancy Hardwick is the principal at Hardwick Creative services and has written on irrigation issues for many national publications.

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