Improvement Detected in Moisture Sensors

Irrigation companies are still skeptical about short-term impact of the technology but see future uses growing

By PETER BLAIS

Considered unreliable, inaccurate and too expensive for golf courses for many years, soil-moisture sensors have made huge technological strides recently in all these areas. They are becoming more appealing as a way to help determine irrigation needs for golf courses at a time of growing water shortages.

"It's not a matter of if, but a matter of when," says Dana Lonn, director of the Center for Advanced Turf Technology, with The Toro Co. "From an R&D standpoint, we are monitoring what is happening and evaluating some of the commercially available sensors. We have found them to be quite useful. We haven't actually put anything into product yet, but it's just a matter of time."

The golf industry has long used weather station-based sensors placed above ground to determine irrigation needs. These sensors measure solar, humidity, temperature, wind, dew point and rainfall factors that combine to determine an evapotranspiration (ET) rate. Controllers use the ET information to determine the amount of water loss and how much water should be used to irrigate. Most large, commercial watering systems sold by companies like The Toro Co., Rain Bird and Hunter Irrigation are ET-based, according to Mike Miller, manager of Baseline LLC, which markets soil-moisture sensor-based irrigation control systems.

Miller believes in-ground, soil-moisture sensors are more accurate indicators of water loss than above-ground ET systems because they measure how much water is lost in the soil. In the past 30 years, companies developed all types of soil-moisture sensors, but they didn't work particularly well. However, recent sensor technology that measures the speed of light as it passes through the soil is much more accurate and reliable in determining soil-moisture content than its predecessors, Miller says.

"The golf industry is slowly warming to the idea that soil sensors truly do work," Miller says. "Over the next five to 10 years, we will see a transition from above-ground sensors to in-ground sensors."

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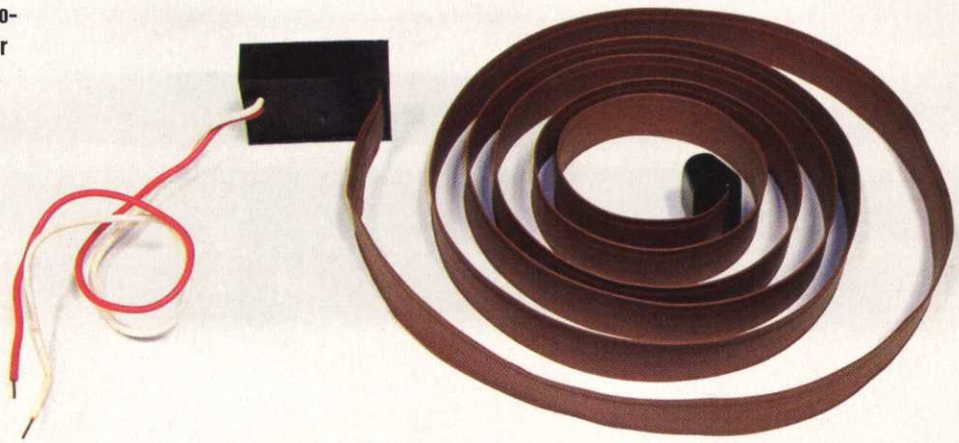

Soil moisture sensors like this one have made huge technological advances since their early days, when they were considered expensive, unreliable and inaccurate.

PHOTOS COURTESY OF BASELINE LLC

According to the Irrigation Association, soil moisture sensors can save an average of 15 percent to 30 percent of water used.

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ET will save an average of 5 percent to 15 percent in water use, Miller says. Soil-moisture sensors will save an average of 15 percent to 30 percent of water, according to the Irrigation Association.

Acclima is a commercial provider of sensor-based, irrigation-control technology that relies on soil-moisture levels.

"We have not pursued the golf market at all," says Scott Anderson, Acclima's president. "Sensors, however, would be suitable for golf once we get our controller support to the level where we can handle large applications."

One golf company that has already made a major investment in soil-moisture sensor technology is Signature Control Systems, according to Drew Ferraro, the company's marketing manager. Soil-moisture sensors are connected directly to Signature's field satellites, which use patented technology called peer-to-peer communication, allowing all the satellites on a golf course to share information rather than relaying the information through a central computer.

"The satellites then use that information to adjust irrigation on the golf course," Ferraro says. "The satellites can also radio that information to other satellites."

For instance, instead of having 18 moisture sensors on 18 different greens, a superintendent could determine green No. 6 is fairly representative of other greens in full sun, while the 16th green represents other greens in partial or full shade. A moisture sensor placed on No. 6 could be wired to the satellite on that hole. That satellite could then radio moisture information to Nos. 2, 4, 8, 12, 18 and the practice putting green because they have sunny surfaces like No. 6. Then the controllers could automatically make irrigation adjustments.

Likewise, a moisture sensor wired to the satellite on shady No. 16 could radio that information to other shady greens.

Signature Controls also makes controllers for Advanced Aeration Systems, a designer and manufacturer of subsurface aeration systems, Ferraro says. Advanced Aeration uses moisture sensors, and improved sensors will soon hit the market, according to Dave McIntosh, a turfgrass consultant with Advanced Aeration.

"Moisture sensors tell you exactly what is going on in the soil," McIntosh says. "In my experience, most weather stations are either nonfunctional or in areas that are not representative of a golf green. The data they gather to help with ET is at best haphazard or not specifically tailored for particular microclimates. With sensors, on the other hand, we can put them in specific locations around the course. Then we have a weather station capable of telling us what the microclimate of a specific spot is."

While acknowledging soil-moisture sensor technology is improving, major golf irrigation companies like Rain Bird and Toro are not about to cast their ET systems aside.

Rain Bird product managers Randy Mills and Bruno Quanquin note that although the company has the ability to use moisture sensors with its central-control systems, it is not currently doing so.

"We have not been involved in use of sensors in the past because it has proven difficult to find reliable sensors," Mills and Quanquin

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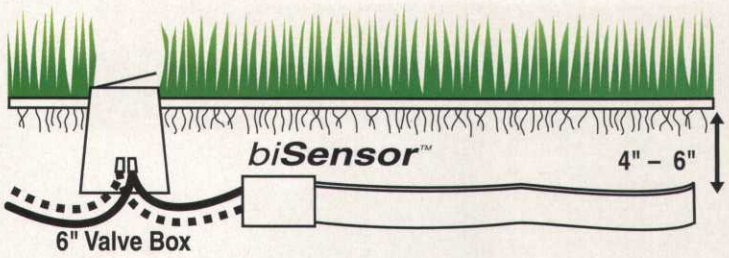
"It's not a matter of if, but a matter of when [soil-moisture sensors will become standard on irrigation systems]."

DANA LONN

THE TORO CO.



In the system pictured above from Baseline LLC, two wires send information back to a central controller, which determines whether the turf needs water and manipulates the irrigation system accordingly.

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explain. "End users have been disappointed in the past by the poor results. An inexpensive, accurate and reliable sensor would be successful in golf if there was one."

They also believe ET-based systems are likely to continue as the standard way to determine water needs for the foreseeable future.

"Soil-moisture sensors give us soil-moisture information about a specific point in the soil profile," Mills and Quanquin say. "While there are methods to use moisture sensors for irrigation in agriculture, turf and golf applications have not tended to use them. ET from a weather station is a more general value and can be approximated throughout the golf course using some simple yet accurate methods."

Toro's Lonn agrees that soil-moisture sensors are an emerging technology, noting their use in primarily specialty crop agriculture. Those who have tried them in the golf business generally found they didn't work well, he says.

"But the technology has improved a lot," he adds. "People use different principles to measure soil moisture."

According to Lonn, the best approach for predicting water need is combining evapotranspiration with moisture sensors, which together give both an estimate of the environmental load along with measuring moisture in the soil. Indeed, Lonn believes irrigation's future is in a combination of ET and soil-moisture sensor technologies.

"The important point is that the whole water conservation issue is moving higher on everyone's radar screen," he says. ■

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