

COMPLEXITY CONTROL

By Don Talend

As water conservation managers strive to optimize irrigation scheduling, online system monitoring helps them manage increases in variables.

Achieving optimal irrigation efficiency in commercial applications is not a matter of simply implementing new technology. Two water conservation managers who recently discussed their use of optimization-enabling technologies with Water Efficiency indicated that high-tech tools do not replace sound management practices.

Scheduling irrigation according to evapotranspiration (ET) rate—the rate at which water is transferred from the earth to the atmosphere by combined evaporation of water and transpiration from plants—is becoming an increasingly common practice, and technology providers are making increasingly powerful tools available for this task. Foremost among these tools is the smart controller, which processes historical or real-time weather data variables and activates irrigation systems at the local level based on these data.

To the old axiom that information is power, however, one might add the corollary that a manager's failure to process information variables can have a counterproductive effect. What is needed is a management tool to best manage information. An example of this is online monitoring of smart irrigation tools. This service allows water conservation managers to address operational exceptions and tweak irrigation schedules according to localized variables from one central location.

Managing Special Conditions

Karen Guz, director of the San Antonio Water System (SAWS) Conservation Department, faces some unique and amplified challenges as a result of managing two sites with the aid of online system monitoring capability. These include drought-necessitated watering restrictions, the need to reuse onsite recycled water in numerous irrigation zones, highly variable local weather, and SAWS's public image in setting an example for water conservation.

SAWS owns two buildings, including a main building on a large campus purchased from an energy company in 2005. This 300,000-square-foot building features a system designed to reclaim water from the air-conditioning system and store it in large holding tanks. SAWS is using this water for the entire irrigation of more than 30 landscape zones on the property while in the midst of a two-year drought.

San Antonio residents have been restricted to outside watering via the city aquifer to one day per week throughout the year on an alternating, address-based basis. For its part, SAWS has been able to conserve water by alternately irrigating the numerous zones on its main building's property using a combination of the reclaimed water, perched groundwater, and stormwater from the property every two days.

"We had so much water in our aquifer the first summer that we didn't have restrictions, and then this last summer, we went into restrictions and we still haven't come out, unless they have some rain," says Guz. "We're heading into our second summer of restrictions; there might be more restrictions than last summer. Our rules are designed to get everybody to cut back and they're designed to reduce outdoor watering."

The restrictions are requiring the district to sacrifice much more on its own building sites than residents do, says Guz. "If you're a homeowner, you can easily water an acre too much during that watering window. Our campus is big enough that we can't water to 100% of ET on one day between 10:00 a.m. and 8:00 p.m. We can manage, but we can't keep everything lush on that allocation of time to water."

The best way to conserve water and make use of the recycled water on the site is to rotate irrigation of the 30-plus zones roughly in groups of 10. SAWS is using smart controllers and ETwater Manager—a subscription-based online monitoring service from ETwater LLC—to keep track of all of these zones and so many irrigation variables. The utility enters its landscape variables on a computer screen, and the service provider collects climatologic data from a weather station located near the buildings and continuously adjusts the irrigation schedule for each zone accordingly. Guz particularly likes being able to manage so many variables from one location. "So far, it's been working pretty well for us," she says. "It's awfully nice because it is more intuitive to most people to see a table with all of their zones and a little description of the landscape, what it is, and the location. You can open up the screen and you can see that Zone 1 is full sun and grass and the slope is whatever. You can open that and see that all at a glance instead of standing there with, hopefully, an as-built zone map and toggling through zone by zone."

The drought and resulting water restrictions do result in some extra programming, Guz adds. "Watering to ET is reasonable in San Antonio; if everybody did that, we're OK," she says. "We normally would [water to ET] and we normally would ask everyone to water to ET, but we're going to a bit of deficit irrigation to try to set a good example." Guz customizes irrigation time per zone based on the address rotation or, in the case of the building property irrigated with recycled water, grouping the zones. When a zone is programmed for deficit irrigation, the system alerts Guz that the watering time is below ET replenishment level and requires a confirmation. "It'll do what I want; it won't override me, but I can override it," she says.

One variable that a "smart" irrigation system must account for in maintaining an appropriate irrigation schedule is crop coefficient in a given zone. Crop coefficient essentially means a plant's own ET variability. SAWS's system does account for local crop coefficients that, Guz points out, are largely allowing the San Antonio area to withstand the drought. "The idea is that we put in the basic parameters," says Guz.

"Once I agree that that [crop coefficient] assumption in their programming is one that I agree with, then all I have to do is tell the controller this zone is established shrubs and I tell it the slope. The controller

should be smart enough to set the cycle and soak mode so we don't have runoff and automatically, based on real-time weather, adjust up or down. So it's built in so that when it waters, it's going to turn on and off enough times that we don't have runoff, and we just got rain, so it's not going to need to be watered for whatever length of time—that's got to automatically happen if it's going to be a product that I'm going to be happy with in the long run. I would say to the consumer, 'You've got to ask all of these things; don't assume what the thing called the smart controller does or doesn't do—ask.'

It seems as though Guz could not imagine managing all of these variables without the ability to view the status of each zone from the central location of a computer screen. "We'd be going outside a lot; every time there was a problem, someone would have to go downstairs, walk out there, look at the controller, toggle through to the zone, and change the setting," she says.

Besides needing the ability to adjust settings for drought conditions, Guz notes that weather in the San Antonio area is inherently more variable during the spring and fall, which makes the real-time data that are available through her smart system particularly valuable. "We know summer's going to be hot," she says. "The rainfall is variable here all the time and in the spring and fall, we can have 90-degree-plus days continue into October, or October can be in the 70s. Same with the spring: On the first day of spring, we can have a 90-plus day where it's incredibly hot, or it can be lovely and in the 70s."

"In order to get the full benefit of a smart controller, we need something that uses what's going on right now, one way or the other, whether it's soil moisture, whether it's a full weather station or partial weather monitoring. To cut back when it's cooler and wetter, we need it to be watching what's happening right now and not what it's historically doing in March or October."

Yet another reason why online monitoring of the SAWS property irrigation is practically essential is that the utility must maintain a good public image regarding its own environmental stewardship in an area where water conservation is paramount.

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