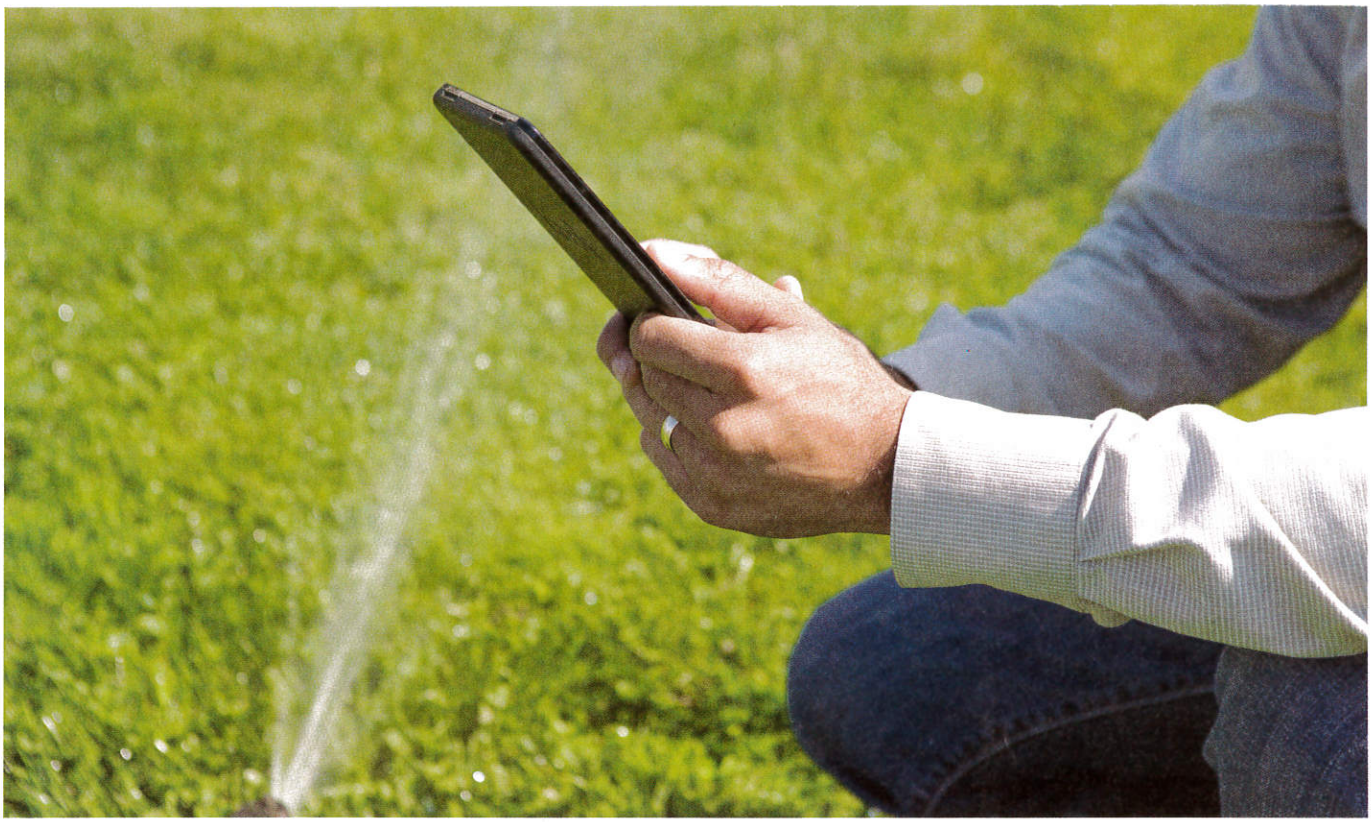

ET WATER

New Technology for Smart Educational Facility Landscapes

There are numerous solutions, ranging from innovative pellets injected under the turf to Internet "cloud" technology.

By William Atkinson

With water shortages becoming more critical, especially in the southwestern states, more and more educational institutions are looking to technology solutions as one of the ways they can reduce the amount of water required to irrigate their turf, and keep it healthy and aesthetically-pleasing.

AQUA CENTS WATER MANAGEMENT

Several years ago, Tom De Lany, CEO of Fresno, CA-based All Commercial Landscape Services, and now also CEO of Aqua Cents Water Management, came up with the concept of Hydrogels, which are copolymer pellets designed to help turf retain water.

Hydrogels prevent the problem of deep seepage, which is rainwater or irrigation water that passes on through and below the root zone and thus becomes unusable by the root system. The Hydrogels are designed to capture and hold the water, as well as water-suspended nutrients. Hydrogels absorb 400 times their weight in water and nutrients, and then release 96% of the water and nutrients back to the root system on an as-needed basis.

Since Hydrogels are composed of copolymers, they are environmentally safe. EPA classifies copolymers as "inert ingredients" (under 40 CFR section 1800.1001 c). Aqua Cents has conducted eco-toxicology testing, and results show that there is no evidence of adverse effects of the Hydrogels on animals, plants, soil, or groundwater.

"About four years ago, we were experimenting with Hydrogels on new turf installations, grinding the material out with a fertilizer spreader on the ground, then laying the sod," says De Lany. "We soon realized that the sod was knitting together better, with no burn marks between sod rows, and the installations were also throttling the water back by about 50%."

However, since this was during the downturn in the economy, the company wasn't able to do too many of the new turf installations. Looking for ways to deal with the challenge, De Lany came up with the idea of building a machine that could inject the Hydrogels into existing turf. "We now have a patented technology that delivers the Hydrogels about 1.5 inches below the root zone," he says.

There are other benefits to the Hydrogels. Due to the swelling of the Hydrogels during water intake, the soil volume increases, resulting in reduced soil compaction and increased soil pore volume. With the loosening of the soil,

the roots grow better and increase in length. In addition, since the rainwater infiltrates the soil less rapidly, less water runs off, reducing erosion by approximately 50%. "The system can save about 800,000 gallons of water a year on one acre of turf," says De Lany.

Recently, Aqua Cents received a $50,000 Innovative Conservation Program grant from the Metropolitan Water District, which serves about half of California's water needs. The company used a portion of these grant funds to arrange for the Center for Irrigation Technology (CIT) at California State University–Fresno (CSU–Fresno) to conduct third-party independent testing to further validate the company's claims for Hydrogels, and also complement the three years of testing it had just completed. The CIT subsequently verified water savings of between 48 and 56%.

The actual return on investment (ROI) depends on the cost of water in a given market. According to De Lany, in a $4-per-100-cubic-feet market, with a Hydrogel injection cost of 30 cents per foot, the ROI will occur in 24–26 months. "Since the Hydrogels last five to seven years in the ground, the remaining three to five years provide a net savings on water costs," he says.

Introducing Hydrogels involves a four-step process:

1. Create a baseline assessment, using a data logger for remote sensing, to determine exactly where water is being used or wasted, and how much it is costing.
2. Evaluate system performance and efficiency.
3. Evaluate quality, color, density, traffic, root zone health, and overall viability of the turfgrass.
4. Provide a summary of options and recommendations, including cost and anticipated ROI.

"We have been through seven versions of the injection machine, and it is now set for commercial availability," says De Lany. "In fact, we are now in the process of commercializing everything, getting ready to build the production and injection machines, and finalizing the concept on our trailers and tanks." The company's next step is to expand throughout the state of California by providing licenses to landscape contractors to inject Hydrogels.

To date, Aqua Cents has already performed installations at several commercial sites, hospital complexes, residential sites, and one university: CSU–Fresno. "We have also met with CSU–Northridge, and they are interested in doing some work with us, too," says De Lany.

CSU–FRESNO

CSU–Fresno has become a pioneer in water conservation and management in California. The university pumps and maintains its own water system, and it is

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home to the California Water Institute, the International Center for Water Technology, and the Center for Irrigation Technology (mentioned earlier).

AQUA CENTS

Using the Hydrogel injection machine at a residence

"Our number one water use on campus is irrigation," says Robert Boyd, associate vice president, facilities management.

In April 2014, CSU–Fresno unveiled an aggressive Water Conservation Plan designed to reduce water usage by 20% (approximately 60 million gallons) within a year.

Strategies include: limiting irrigation to 1 inch per week during growing season, transitioning to low-flow sprinkler heads, expanding electronic monitoring of flow in irrigation pipes to determine areas of inefficiency, and changing the fertilizer blend to help turf thrive with less water. "Our Center for Irrigation Technology studies and tests all of the sprinkler applications from various manufacturers, and then determines which is best for each area," says Boyd.

Over the last five years, even before the implementation of the Water Conservation Plan, the university's farm has been able to reduce its water usage by more than 40%. Orchards are watered with micro-sprinklers, and vineyards and vegetable crops are watered using drip irrigation.

Future building projects are being dual-plumbed to use nonpotable water where possible. Ground around new buildings will not include berms, but rather will feature drought-tolerant plants. The university is also requiring that other new landscapes be planted with native or low water species, and is also replanting with such species in certain areas.

Aqua Cents' Hydrogels have also recently become part of

the university's water conservation efforts. Boyd became familiar with Aqua Cents through the Water, Energy & Technology Center ("WET Center") at the nearby Central Valley Business Incubator, which works with startup businesses. "They told me about Aqua Cents," he says.

Over the years, Boyd has heard a lot of companies make claims and promises in terms of what they could deliver. "As such, I decided to put Aqua Cents to the test," he says. The first experiment occurred in March 2013. "We tested it on some topographical mounds that we had landscaped into the Peace Garden near the university library."

The problem in that location was that it was difficult to keep the tops of the mounds sufficiently watered, without having to overwater (which would subsequently turn the surrounding lower areas into "swamps"). It was also difficult to avoid wasting water.

The experiment worked. "After a rain, the top of the mounds would actually be wet, even muddy, which I have never seen before," says Boyd. "Always before, even after a rain, the top of the mounds would remain rock hard."

Boyd found another benefit to the experiment. "Initially, when we experimented with the Hydrogels, I was thinking more in terms of water retention than water efficiency," he says. "After the injections, though, I realized that we would be able to manage 'clock time' and settings more aggressively, forcing the grass to 'drink differently.' It had been used to getting water every day. At the time, the roots were only a couple of inches deep. With Hydrogels, our goal became to stretch the roots down 4 or 5 inches."

Hydrogels are currently in place in five locations around campus, with an emphasis on challenging areas, such as hills and high-traffic areas. Besides the Peace Garden, for example, Hydrogels have been injected into the outfield berm at softball field, as well as the expansive and high-traffic Maple Mall on campus. Some weekends, the mall is host to 100,000 people, causing serious compaction issues in the past, a problem that has been eliminated with Hydrogels. Overall, the university has been able to reduce its watering in excess of 40% in areas where Hydrogels have been injected.

"California has a mandate to save 20% of water usage by 2020," says Aqua Cents' De Lany. "CSU–Fresno is already beating that." According to Boyd, the university saved about 60 million gallons of water in 2014.

RAIN BIRD

Rain Bird offers a number of technologies designed to improve water management and conservation. When it comes to educational institutions in specific, Julie Zigler, Florida area specifications manager and public agency area manager for Rain Bird, finds that two technologies stand out as being the most popular—the IQ v2.0 Central Control, and the ESP-LX Series Controller.

"We are seeing a lot of use of our IQ Central Control for water management services," she says. The IQ v2.0 Central

Control Software is an irrigation control solution that offers command and control features in an easy-to-use interface. It offers modular satellite controller capabilities. It provides remote programming, management, and monitoring of the company's ESP-LX Series Controllers from a computer. The technology is effective for schools of all sizes—from small elementary schools to extremely large universities. "It can manage up to 16,000 controllers from one location," she says.

The company's ESP-LX Series Controller, a two-wire system, can handle between four and 200 stations. "The two-wire system offers the flexibility of being able to add on to a project easily," says Zigler.

Both of these technologies are being specified more and more by schools, according to Zigler, because they can offer significant cost and labor savings on projects, and are very user friendly. "Customers usually see an average of 30 to 40% water savings," she says.

One satisfied Rain Bird customer is Miami Dade County Public Schools (Miami, FL), which is the fourth largest school district in the US, with over 360 school sites, including 48 senior high schools with athletic fields.

Dwayne Willis, Supervisor II in the central operations and resource management department of the district, realized the need for centralized control of irrigation about a dozen years ago, when he was working at a senior high school trying to bring the field back. "We had implemented turf repairs, we were fertilizing and mowing, and we had set up an irrigation program," he says. "We watched the field on a daily basis, and, over a seven-day period, we noticed that the controller was being changed up to six times a day, every day."

It turned out that different people, all of them well-meaning, were going in and changing the settings on the controller to what they thought would be the correct setting. "These were not turf professionals," says Willis. "They included the assistant principal, the athletic director, coaches, a custodian, a security officer, and even a parent. At one point, someone set the controller to water the field for 23 hours."

It was at this point that Willis and his team realized that his department needed to lock everyone out and manage the irrigation from a single point.

Subsequently, the district made the decision to install a water efficient irrigation system, starting with several of the heavily-used athletic fields, with plans to expand to all of the high schools, as well as eventually to the elementary and middle schools. The fields—each consisting of a football field, running track, baseball field, and softball field, plus other all-purpose fields—feature Bermuda or Celebration grass. The fields demand precise scheduling, management, and rapid troubleshooting at the multiple sites, and all of this must be accomplished with a small staff on a tight budget.

Key to the success of the water efficient irrigation system was the ability to provide centralized control. One reason, of course, was to eliminate the problem that had occurred in the past, with unauthorized people having access to the local controllers. In addition, the senior high schools are separated from one another by up to 8 miles and are located more than 10 miles from the district's central control computer. With plans to eventually have all 360 school sites on a central control system, the district needed a system that would be affordable, but also allow for significant expansion, central control, and water savings upgrades.

"It was at this point that I found out about the centralized controllers offered by Rain Bird," says Willis. "One reason we selected Rain Bird was because it was a large company that offered high-quality products with a lot of support. In addition, the products are very easy to install and program. I was also very impressed with the continuous R&D [research and development] the company does. One commitment the company has is that, when it comes out with an updated version of a product, everything is adaptable to its existing product."

The district ended up installing a Rain Bird IQ v2.0 Central Control, as well as ESP-LXME Controllers. "The ingenious design of the IQ v2.0 and the ESP-LXME Controller allows for easy installation and training at each individual school site," says Willis. "By utilizing each school's existing phone system for communication between IQ v2.0 and the controllers, we were able to add central control without an added monthly cost." In addition, the built-in forward and backward capability of Rain Bird products provides the district with the ability to adapt and improve with any irrigation scenario, regardless of budget or scope.

"In recent years, our goal has been to work smarter, not harder," says Willis. "As such, another reason we needed a centralized system was to be able to improve our efficiency and effectiveness. For example, in spring, summer, and early fall,

we have a lot of afternoon showers. We need central control in order to manage the response to these. If we know a storm is coming through, within a matter of minutes we are able to connect into our system and put a 'rain delay' on all of the sites that we have online."

Results have included improved athletic field quality, fewer repairs, and streamlined maintenance procedures. In sum, the IQ v2.0 and ESP-LXME controllers have reduced the number of man-hours required to maintain the facilities. "We couldn't do what we do without IQ," says Willis. "It is an incredibly awesome system."

ETWATER

For irrigation programs, ETwater offers an intuitive solution that automatically determines the ideal watering schedule to keep sites looking their best—without wasting water. It combines Web-based irrigation management, real-time weather data, and wireless-connected smart controllers to manage irrigation based on the unique needs of each landscape.

"We offer a cloud-based solution, which allows us to extract data from numerous sources and then transform that into meaningful information that allows private businesses, schools, and other public agencies to better manage their irrigation systems," says Pat McIntyre, CEO. "We came up with the concept in 2002 and commercialized it in 2006, as the first company to have the 'smart water' application technology certification."

The technology calculates an optimal irrigation schedule "in the cloud," based on the local landscape parameters, and then sends that information back down to a controller every day. The irrigation controllers are accessible from an Internet-connected device.

ETwater offers a variety of products for this purpose, from simple to more complex—from plug-and-play units to full-featured smart controllers.

In specific, the system works this way:

1. Use the ETwater Manager, an online management system, to set up an account by entering landscape profiles.
2. A local weather station provides daily weather and rainfall data.
3. ETwater servers access the weather data, compute evapotranspiration, and generate daily water schedules for each landscape profile.
4. Servers connect wirelessly to ETwater smart controllers to exchange schedules and data.
5. ETwater smart controllers execute daily irrigation schedules.

Using predictive modeling based on weather forecasts, the technology can save school districts and other public agencies approximately 50% of their landscaping water costs. "Payback is almost immediate in most cases, and it actually is immediate in some circumstances," he says. "Of course, schools with larger geographic footprints, such as those with a large number of schools in the district, or a large university campus, will have a more cost-effective experience." WE

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