A New Generation of Smart Controllers

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Abstract: In the last three decades since the introduction of irrigation "smart" controller technology, the most dramatic innovation has been the recent ability to connect irrigation control to the internet yet few landscape professionals are taking advantage of this technology. With adaption on this new affordable cloud-based smart irrigation controller technology, a landscape contractor will see a dramatic improvement in crew efficiency, repair revenue, and contract accountability. The benefits of an internet connected controller include reduced trips, proactive system alerts, visibility to program changes and system functions, automated communication to a client about their irrigation systems and remote system access. All these benefits contribute to a healthier bottom line for a landscape maintenance professional.

Saving more than water

All the best irrigation technology in the world means nothing unless we know what's going on in the landscapes we manage. The challenge is how to keep our eyes on our landscapes without having to hang out at the site everyday all day.

Fortunately, there are a few irrigation systems which allow the landscape professional to affordably monitor his irrigation systems without having to gas up the F-350 and drive out to the site. In the old days, these were called "central control" systems and meant that the contractor had to load software on a dedicated computer and install highly technical and expensive communication devices to provide monitoring capability to any landscape. Today those systems are pretty much obsolete and have been replaced with simple, more affordable cloud based systems enabling contractors to remotely access irrigation systems from anywhere in the world via laptop, tablet, and even smartphone.

Today's systems have evolved into less "central" control and more "remote" control. The end result is still the same…in that it allows the end user complete oversight of the system and management of all aspects of an irrigation system from a remote location. The key differences with today's solutions are their ability to enable the end user to manage their system from anywhere and the "data" for their system to reside in the cloud vs. on a lone computer which needs to be backed up and whose hardware needs to be upgraded every so often.

Connecting an irrigation controller to the internet has a number of inherent benefits for both property manager and the landscape professional. The key is understanding how to communicate the value of these types of systems to customers and to the landscape maintenance organization.

For those in the landscape maintenance business, even if an irrigation technician is charging the client for driving to the site to make these irrigation adjustments, most are likely not charging enough for the service call. The average billing rate for many is less than half of their total cost burden which makes having profitable irrigation services a real challenge. One of the best ways to improve this is to raise the labor efficiency of the irrigation tech. Taking advantage of affordable remote access irrigation technology is the easiest and most efficient way to do this.

Having the ability to remotely manage an irrigation system saves fuel and hours of travel time to and from locations to adjust irrigation schedules, change time and date for daylight savings time, shut down for rainfall, and other programming issues. Remote control enables these changes to be made quickly. And by installing flow sensing, having remote access gives the contractor the ability to "see" what's happening with irrigation breaks and proactively schedule repairs and order parts quickly. This eliminates the need for the irrigation tech to have to seek out irrigation breaks and thus reduces his or her time spent looking for problems.

Additionally, using remote access to eliminate trips to the site to adjust irrigation doesn't necessarily mean maintenance professionals have to forego billing the client for a service call. As we have seen in other industries, customers are willing to pay for valued services even if those services are made much more efficient through the adoption of new technology (think computer hardware and software support). Taking advantage of technology still allows the irrigation tech to provide a service and therefore bill for the service; but he can do so at a much more efficient cost. The idea of a lower cost, higher profit "virtual service calls" is something a maintenance provider could begin offering clients. Most clients would also be supportive of an effort to reduce the amount of dollars they spend on irrigation service calls. As an example: if you originally charged $80/hr for a service call but your labor burden was $75/hr (actual cost burden is likely much higher than $75/hr), you made $5. But even if you charge a flat $50 for a "virtual service call" but your labor burden was reduced to $25/hr because of remote access, your net gain would likely be $25. And reducing your irrigation service calls from $80/hr to a flat $50 for irrigation adjustments would likely please your client as well.

Having the ability to remotely make adjustments to a client's irrigation controller wouldn't entirely eliminate the need to drive the property to look at irrigation but it can eliminate a good number of trips per year per controller.

Overall, eliminating any trips to the controller reduces labor costs, fuel use, maintenance on vehicles and a company's carbon footprint therefore contributing to a sustainable company image.

I've got my eye on you

This brings us to the point of this discussion. The success of any smart control system is dependent on our ability to keep the system operating as intended. To do so we must insist that the system is monitored by multiple users to verify the system is doing what is supposed to do. A connected controller allows multiple users to monitor and change the programming. By doing so we introduce a level of accountability that is not only beneficial for the end user but also for the maintenance contractor. Essentially it insures both end user and landscape professional are on the same page regarding what is happening in the irrigation system. Visibility to how the connected controller is programmed and whether the controller is running in "smart" mode or the rain sensor is working can be monitored and remedied should any settings be changed. Too many "smart" systems have failed to accomplish any significant water savings because it is too easy to intentionally, or unintentionally, turn the smart features off without anyone's knowledge. This is often a reaction to the system doing something the user doesn't understand.

Therefore, the more eyes we have on the site, the more efficiently we can manage what we see. Visibility by multiple users insures our landscape and irrigation system is monitored regularly and alarms are attended too quickly. After all, what good is a flow sensor which reacts to a sprinkler break or a

pump failure if it has no way of telling us what is going on? Without remote communication, our irrigation system has no way to talk to us to tell us something is wrong. In such a case, we wouldn't know we had a sprinkler break until someone notices the plant material slowly dying because it isn't getting any water (due to the flow sensor repeatedly shutting down the zone during each irrigation cycle).

The challenge we face in enabling multiple users to have access and more importantly to know when a system is doing what it was designed to do, is our ability to interact with the system without the need to seek out information about system status. Essentially, we need a system which proactively "talks to us" when there is a problem. A cloud-connected control system provides the benefit to a maintenance provider of proactively alerting a user to system operation and system failures. Knowing about system problems early also has the benefit of increasing the number of repairs needed on a given site because issues on an unmonitored system can go on for weeks if not months before someone notices.

Key to efficient monitoring is automated, system generated, notification of alerts and alarms requiring user attention. These types of site alerts can include flow sensor alarms for high and low flow, irrigation program changes, changes from smart mode to standard mode, rain shut down, system off mode, irrigation component failures, and other issues which require user attention for the system to operate efficiently.

Irrigation conditions such as high and low flow alarms, electrical issues, communication issues, valve failures, and notification for automated rain shutdown, change to non-ET mode, and controller off mode, are important circumstances that site managers and owners need to know about quickly.

Even if most stake holders don't monitor every detail of a system each day, having the ability to proactively notify them of important changes to the system can eliminate missed opportunities to manage the system as expected.

We have something to prove

Complementing the ability to remotely monitor our irrigation system is our ability to document our progress toward water conservation. Ideally, we need to prove we are accomplishing the intended goals for the site regarding water savings and restriction compliance. To do this our system needs the ability to generate basic water use data and reports. Too many times irrigation systems are installed or upgraded to smart control with the promise of water savings only to fail to deliver because no one was monitoring day to day water use information. A key component of a successful water management strategy has to include benchmark objectives that can be verified throughout the year to insure goals are met at the end of the year and beyond.

Using a cloud-connected controller's software environment allows for the implementation of various valuable tools to enhance the systems reporting capability. Among these are the ability to document water use data and compare it to benchmark data to verify water savings and make adjustments throughout a growing season. Water use by zone, by controller, by site, and global for custom time periods is typical of the reporting tool. Without this information, the user must rely on the monthly water bill to determine his water conservation process is saving water.

An additional tool of a cloud based system allows the user to map the different assets of a site using GPS coordinates. This "Asset Mapping" enables the user to document the different elements (or assets) within a landscape adding pictures and notes. These assets can be backflow devices, water meters, pumps, irrigation zones, and any other landscape related items.

A complete cloud-based site profile enables the landscape professional to save a lot of time and frustration. Mapping an asset's location on a site can save a landscape professional a lot of time if he is unfamiliar with the property. With pictures and other important asset related documents saved in the cloud, a technician can also retrieve and review information related to these assets without having to bring the information with him or wait until he returns to the office to look something up.

As many in the irrigation industry can attest, most new irrigation systems are designed and installed with the best intentions, only to fail to meet expectations long term because no one verified that the system maintained operational efficiency through the next few years.

Unfortunately, many of us still don't trust the "smartness" of these systems which, ironically, are only reacting based on the preferences we have set up. As the well-known quote from the 1950's comic strip Pogo immortalized; "we have met the enemy and he is us".

This is the biggest issue with the water saving goals of LEED, Sustainable Sites Initiative, California's MWELO (AB 1881) and others. Without verification or enforcement to maintain the certification status of these irrigation systems, most will fail to achieve what the system was designed to achieve.

I recently had the opportunity to audit the LEED Silver Certified sustainable flagship location for a large hotel chain. Although the design for the project was well intended, there was a significant issue which would have disqualified the property from being considered landscape water efficient.

Most of the property was watered using efficient drip irrigation however a few zones near the front entrance utilized rotating nozzles on 4-inch pop-up sprayheads. These front zones were irrigating a 21-degree slope with cool season turf grass planted in clay soil. I was curious to see how these zones were programmed. What I discovered was similar to what most of us see every day in our business. Although the run time was segmented into 4 cycle times per day, the run time for each was programmed for 16 minutes. After reviewing my soil/slope chart I determined the run time was 13 minutes too long for each cycle and thus the system was wasting 80% of the water it was applying each time it ran. After some quick calculations, I determined these few zones were wasting $4,200 worth of water per year. In addition, the 1-year old parking lot which the slope drained to, was already showing signs of water damage.

Adding insult to injury, while checking the run times at the controller location, I noticed a couple of wires disconnected from the controller. Tracing these wires back to their source I discovered the rain sensor had also been disconnected. Needless to say, the general manager of the hotel was anxious to have us remedy these issues as quickly as possible and have monitoring and reporting established to verify the irrigation system is maintained efficiently.

The most important point of this scenario is how these issues could have been prevented had there been a process in place to verify system efficiency after the initial installation.

By remotely monitoring a client's site and providing water use reports to the client, most irrigation professionals can easily insure most of their landscapes stay at a water efficient peak performance.

Site Unseen

Even with all the technology and efficiencies of a smart irrigation system, each property being managed still needs to be visited regularly. No amount of technology will reduce the need for observation of what is happening on the site. Sprinklers can still be misaligned so they are watering the parking lot or the high efficient nozzle can be clogged or obstructed by a tree or a sign. Plant material as it grows may start to interrupt the sprinkler's nozzle stream leading to brown spots or flooding of an area. The maintenance crew may have replaced a broken sprinkler with a new one with the wrong nozzle.

A sprinkler and landscape walk-through can quickly diagnose many of these types of problems and eliminate the embarrassment of promising a client a smart system that wastes water, floods a street, or wipes out plant material.

Without a reliable, regular and thorough sprinkler check, a site's irrigation system cannot be maintained at its peak performance. Many maintenance contractors don't realize that by taking advantage of technology to do regular sprinkler checks, they can improve not only their sprinkler techs efficiency, but also dramatically improve their bottom line.

For example, with some cloud-based irrigation control systems, the sprinkler check process is an integral part of the programming software. With a cloud-based sprinkler check process, a sprinkler tech can quickly and efficiently run through all zones and document problem areas (including pictures) for his follow up repair and even send a quick email work order proposal (using the integrated pricing component) from the field to the property manager for approval.

In addition, having a calibrated flow sensor eliminates the need for a tech to have to look for breaks. This strategy alone has a huge impact on a contractor's ability to be profitable in his maintenance activities. Most sprinkler techs who are regularly checking each of their system's sprinklers, can waste inordinate amounts of time just finding problems. This "search and fix" strategy is not only inefficient but typically limits the number of sites a sprinkler tech can check in the average day. This is why many sprinkler breaks are first spotted by a tenant rather than the sprinkler tech.

On a side note, I've often heard many landscape maintenance company owners tell me that their mow crews are an integral part of the process to spot broken sprinklers. While some breaks (or the damage left behind) can be spotted by driving through the property on a mower, the reality is most mow crews are moving so fast that they miss a lot not to mention the fact that most sprinkler breaks can only be spotted when the system is running.

The bottom line is; there are more problems with the typical irrigation system than a very busy sprinkler tech or mow crew can identify and fix in a given day. Taking advantage of technology greatly reduces the amount of time needed to check an irrigation system and may dramatically improve a sprinkler technician's ability to do more in less time thereby increasing repair revenue.

As landscape industry professionals look for ways to add value to their service offering, technology can go a long way toward helping differentiate from competitors. Offering the value-added services to an existing clients which a cloud-based irrigation system can provide gives a landscape professional a

"sticky factor" with his clients. This makes them less willing to bid out their projects for fear that they won't get the same quality of service. This is especially key when a contractor is already saving a client water and reducing the headache of on-going irrigation problems.

Another important distinction of today's cloud based systems is that they can be updated remotely when changes are needed such as adding a new feature or fixing a software bug. Typically done through an overnight update and usually is unseen by the end user. Having the ability to update a system has a significant value in keeping the system current and eliminating the need to upgrade in the years to come.

Of significant benefit is also the ability for manufacturers to assist in troubleshooting issues in the irrigation system. Remote access allows a manufacturer's technical support representatives look at what a contractor is seeing and help make adjustments or correct issues over the phone thus eliminating costly trips to a supplier to assist in remedying a system.

Get smart

Today's central control systems have truly evolved into "smart" control systems. Smart has been redefined in recent years to mean more than ET. For a system to be smart today, it must be able to manage the many aspects of an ever-changing landscape by automating the appropriate reaction to a given situation. It is all part of what is becoming known as the Internet of Things (IoT). In other words, smart devices do the thinking and reacting for you based on a user's preferences.

Lastly, because many of these cloud-based systems are modular in their architecture, the cost for the average size system is much more affordable than even a few years ago. This enables landscapes of any size to be upgraded to smart technology which can greatly improve the system overall efficiency as well as lead to improvement in the maintenance crews' ability to manage the site more profitably.

The Future of Cloud-Connected Irrigation Controllers

The future of cloud connected controllers will also enable us to connect other parts of the outdoor environment. We are already seeing this with landscape lighting. In addition to irrigation and landscape lighting, this will likely expand into connecting pumps, water features, holiday lighting, sound systems, and outdoor kitchens gadgets. Providing the end user and the landscape professional with a "dashboard" of all the connected devices enables better management of systems and sensors and encourages regular communication between customers and property owners

Understanding cloud-based technology

Over the past 24 months, the irrigation industry has seen a dramatic rise in the number of these options based on Wi-Fi technology. With this "new to the industry" technology comes different challenges for the landscape professional. These challenges are created by the need for the anyone installing or maintaining these controllers to understand the technology behind them being connected to the internet.

The smart home savvy consumer is now driving the growth we are now seeing in connecting irrigation controllers to their Wi-Fi networks. For most contractors, this means venturing into the strange new world of internet connected devices. While most of us understand the basics of Wi-Fi connected

devices, the real challenge for us is understanding that its less about Wi-Fi and more about connecting the irrigation system to the cloud.

While most of the industry is focused on "Wi-Fi" as a solution of connecting the controller to the cloud, there are other alternatives. The type of connection device is largely dependent on the scope of the project and what type of internet connection is available at the location.

WIFI: Wi-Fi works great where a client will allow access to their Wi-Fi network. Set up is typically simple by joining a Wi-Fi network and entering the network password. Most end-users have a basic understanding of how Wi-Fi works so they should be able to reset the network should a connection issue arise. Some Wi-Fi controllers also allow set up to be configured as an ad hoc connection which basically means the controller and smart phone application are connected directly to each other through the wireless network without an internet connection thereby creating a secure closed network.

Deciding whether or not to use Wi-Fi to connect an irrigation controller is largely determined by the distance between the controller and the Wi-Fi router and the stability of the Wi-Fi network.

900 MHz: Another option being offered by some manufacturers is 900MHz. This type of communication also requires use of the client's internet connection but bypasses the need to connect to the Wi-Fi router. The 900 MHz device is connected directly to the internet modem using a standard Ethernet cable. The device then broadcasts its own 900MHz wireless network thus enabling any irrigation controller with a 900MHz radio to connect to the internet.

While a 900 MHz connected controller is connected to the same internet connection as a Wi-Fi connected controller, it broadcasts its own 900MHz wireless network so interference from other devices is limited to old cordless telephones and baby monitors which used the same frequency. Also, the range of a 900MHz signal is much greater than the 2.4GHz of a Wi-Fi signal. Typically, 900 MHz can travel up to 1,500-2,000 feet and has very good diffraction abilities which allows the signal to bend around obstructions. 900MHz is a good choice for locations where the irrigation controller needs to be located beyond the range of a Wi-Fi router.

CELLULAR: A third communication option for connecting an irrigation controller is cellular. The advantage of cellular is that it does not rely on connecting the controller to the client's internet connection making it an ideal choice for locations where the client does not have internet available or does not want to allow a third-party connection to their wireless networks. The range of cellular is measured in miles but is dependent on the type of cellular technology used (CDMA and GSM) and the location of the local cellular towers. The benefit of a cellular connection is that the network equipment is maintained and serviced by the companies offering cellular service making the cellular platform the most reliable and up-to-date option for connecting irrigation controllers.

Other Options: Other communication options are just over the horizon. These new methods to connect and irrigation controller to the internet will only add to the industry's ability to provide affordable and reliable communication options to the client. Technology such as Z-Wave and Zigbee will allow multiple communication options to be used on a single site or allow one internet connection to be shared with multiple devices.

Future irrigation connectivity solutions must be able to support either network configuration and enable users to access their systems as preferred by each individual project.

For each project, a contractor or end user will have to determine the best options for their system. Deciding on whether to use Wi-Fi, 900MHz, or cellular should be based on whether the site is a single user or multiple users; a single site or multiple sites; how secure the network needs to be; whether to use on-site or off-site weather and whether to incorporate a flow sensor for logging water use and shut down. While Wi-Fi-based irrigation controllers provide easy access to remotely monitor and adjust the irrigation controller's performance, Wi-Fi won't work in every application. Alternatively, other methods of connecting the irrigation controller to the internet are available and should be considered before a connected controller option is selected.

Summary

As the momentum for connecting irrigation controllers continues to accelerate, the irrigation industry will be challenged with "getting up to speed" on all this technology. The tech savvy customer will expect the irrigation professional to be more knowledgeable and proficient in implementing smart connected solutions and the opportunity to provide expertise to our customers has never been greater.

All this being said, water is becoming much more valuable and deserves to be managed appropriately. We can no longer waste water as if it is an abundant resource. With hundreds of thousands of people in communities around the country each year in a severe drought and 750 million people around the globe living without clean and safe drinking water, we as a landscape industry can no longer justify or afford to NOT be the leading stewards of this resource. Good water conservation practices represent a golden opportunity to improve the profitability of most irrigation professionals simply by managing water appropriately.

Many of the water conserving strategies we all know have been around for more than two decades. Yet with all this water conservation knowledge, most irrigation systems continue to waste absurd amounts of water. Thousands of "smart" controllers and water efficient sprinklers are installed each year, some resulting in a reasonable amount of water savings. The vast majority, however, fail to provide a long-term water saving solution and further damage the reputation of the landscape professional to solve the problem. It is with this in mind that we as an industry must do better.

Installing cloud-based smart technology is an easy way to fix what's broken in our irrigation systems and greatly improve any landscape professional's business opportunities and profitability.

The moral to this story is simple…fresh water is finite and if we are to use our drinking water to water our plants, we must do so judiciously and with the next generations in mind.

Why do we think water matters more than any other resource?

Because water is life. And it is the one resource we cannot reproduce.