Soil Moisture Sensors Provide a Dramatic Reduction in IRRIGATION WATER USAGE

By Kingsley R. Horton

The Problem

Back in late 2012 a property management firm in central California realized they had a big, expensive problem. The manager had a property that was using a lot of irrigation water to keep it looking lush and green. Having the property lush and green was an absolute necessity, but this need was generating huge water bills in the thousands of dollars every month. The billing rates were graduated, so the more water the property used, the higher the billing rate. This problem was unsustainable and needed to be rectified very quickly. Dennis Bryan, President of Water Savers, a water-auditing and consultation firm in central California was contacted by the property manager to see if he could help find a solution. ☞ www.acclima.com

The Solution

Bryan relates, "As I did the site-survey, I knew that the problem would be easily resolved with Acclima® soil moisture sensors and Acclima controllers working in a closed-loop feedback method that allowed the lawn to receive the exact amount of water it needed - no more and no less. I had used Acclima systems in many other similar cases and realized good savings for my clients."

Water Savers installed five Acclima controllers and one or two sensors per controller at the site. With the help of the Acclima systems they were able to pinpoint water distribution weaknesses in the sprinkler heads and replace those sprinkler heads with heads that gave a more even distribution of water over the property, further enhancing the savings.

The Results

"I was expecting pretty good savings," says Bryan, "but I was very pleasantly surprised when the savings turned out to be around 85% the first month after the installation back in January of this year over what had been used in January the previous year." Bryan further observes, "The average savings over the course of the last ten months (January through October, 2013) has been approximately 40-50%."

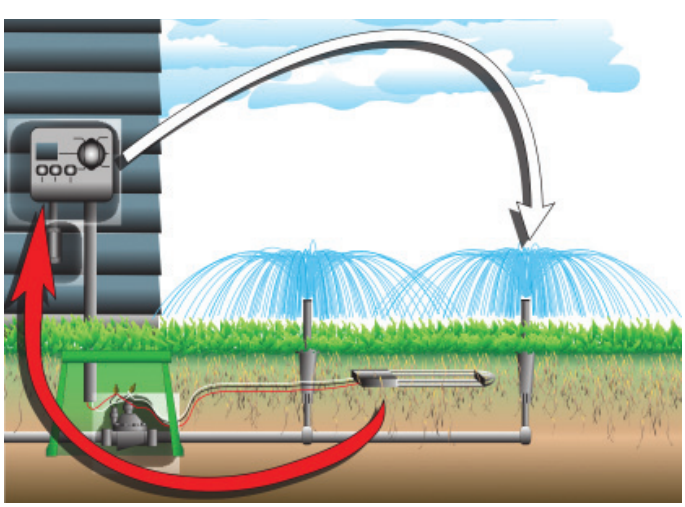
"A four-year joint (university) study concluded that these Acclima® sensor-based systems had the best performance and yielded up to around 80% savings."

"That is a very fast return on the client's investment. I have had other clients so pleased with the results of these sensor-based systems and our efforts to improve the distribution that they have actually sent us checks in the mail as kind of a tip so to speak. It's very gratifying to have such happy clients."

Asked how he came to learn about the Acclima system, he says, "I had been researching methods to improve the way people irrigate their lawns. I ran across several university studies that talked about the superior performance of the Acclima sensors over other types of sensors. One study, a four-year joint study by University of Florida and North Carolina State University showed that these Acclima sensor-based systems had the best performance and yielded up to around 80% savings. Naturally, I became very curious to see if such a thing were possible. I immediately contacted Acclima and the rest is history."

The Technology

The question should also be asked, why does the Acclima® system work



Closed Loop Controllers Sensor

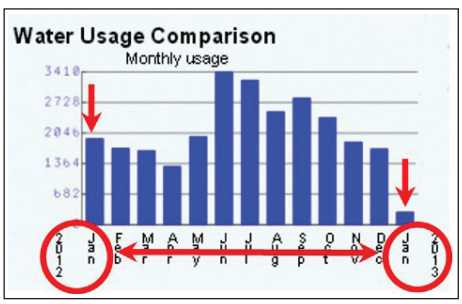
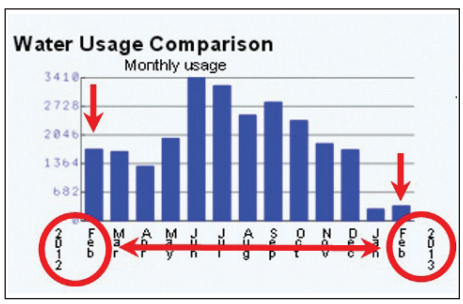


Figure 1



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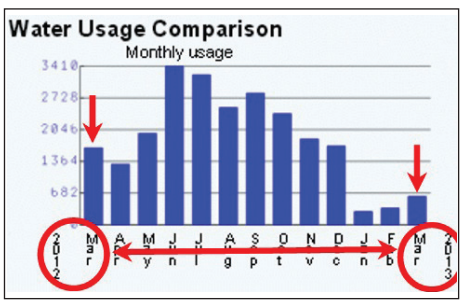

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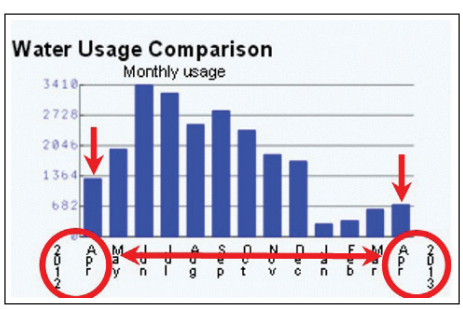

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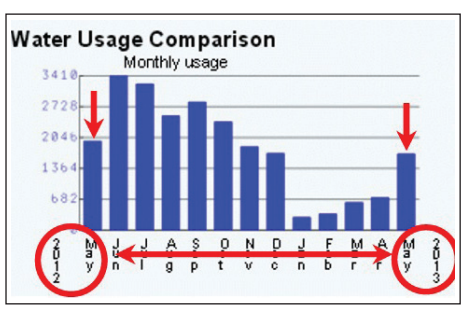

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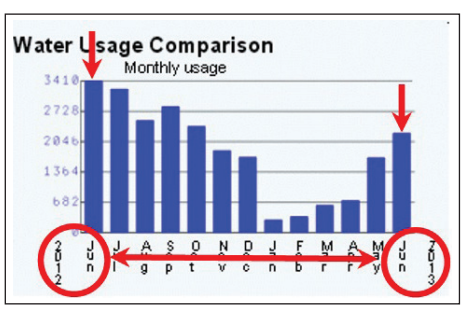

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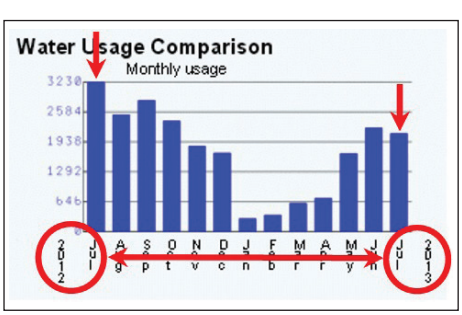

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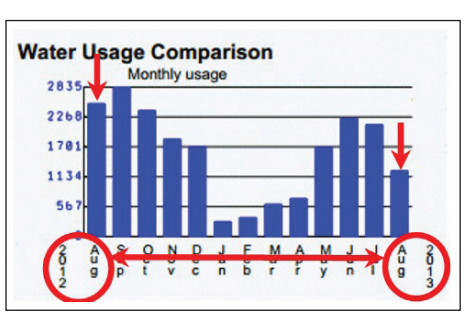

Figure 8

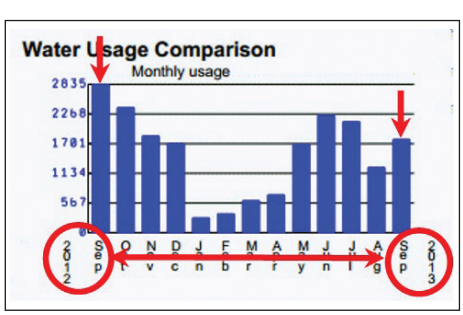

Figure 9

so well? Scott Anderson, President and CEO of Acclima, explains, "The Acclima soil moisture sensor uses a technology called Digital TDT® or time domain transmissometry. It measures the time that an electromagnetic wave takes to follow a waveguide through the soil. Acclima digitizes the wave-form so that the effects of electrical conductivity are excluded. This yields an accurate and stable reading of the permittivity of the soil which translates into a consistently accurate reading of the volumetric soil moisture content. Without this patented approach the readings from an electronic soil moisture sensor are subject to errors caused by the electrical conductivity of the soil and by soil compaction. This lack of stability can cause gross over-watering or under-watering."

Asked if there are any other known benefits besides saving water and money, Anderson asserts, "As a matter of fact, one of the most frequent comments from our customers is that while they have observed significant water savings with our technology, they are puzzled that their lawns and plants become healthier and greener. It seems a little paradoxical to them. But it all makes sense when we explain that the plants› roots receive much more oxygen and nutrients if they don›t get over-watered - the nutrients don›t get washed away into the subsoil."

How the System Works

Like a thermostat monitors that controls the temperature in your home, Acclima® soil moisture sensors and controllers work together to monitor and control the moisture of the root zone of your lawn and other landscape plants. The moisture threshold is set to the percentage equivalent to slightly below the "field capacity" or moisture holding capacity of your soil. The controller will apply water if the moisture reading is lower than the designated threshold. If the moisture reading is above the threshold, the controller will not allow watering until it falls below the threshold. The optimum threshold of the particular soil can be easily calculated using data collected by the sensors which can be programmed into the controller.

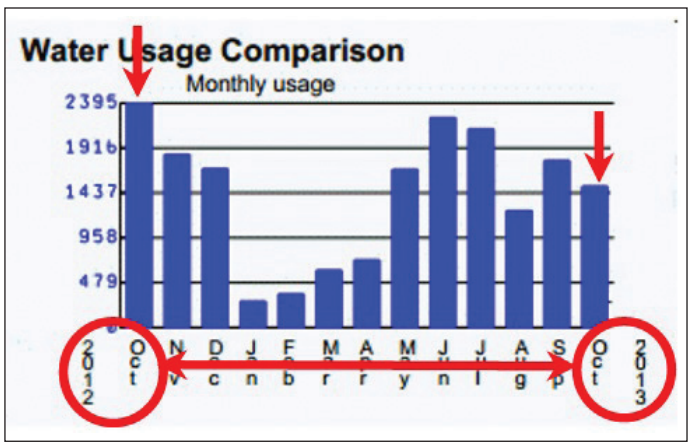

Figure 10

What Independent Researchers Have to Say

Here are the conclusions of several different independent studies performed by various researchers who examined Acclima® soil moisture sensors and the attendant Acclima closed loop irrigation controllers:

A 2005 University of Florida and North Carolina State University study of 4 residential soil moisture sensor irrigation systems found that Acclima›s sensor «had the best performance» saving up to 88% in irrigation water. The study went on to say, "These results clearly demonstrate that the use of SMSs (soil moisture sensors)…can lead to important water savings."

"Sensor-Based Control of Irrigation in Bermudagrass" - By Bernard Cardenas-Lailhacar, Michael D. Dukes, Grady L. Miller (Written for presentation at the 2005 ASAE Annual International Meeting Sponsored by SAE, Tampa Convention Center Tampa, Florida 17 - 20 July 2005)

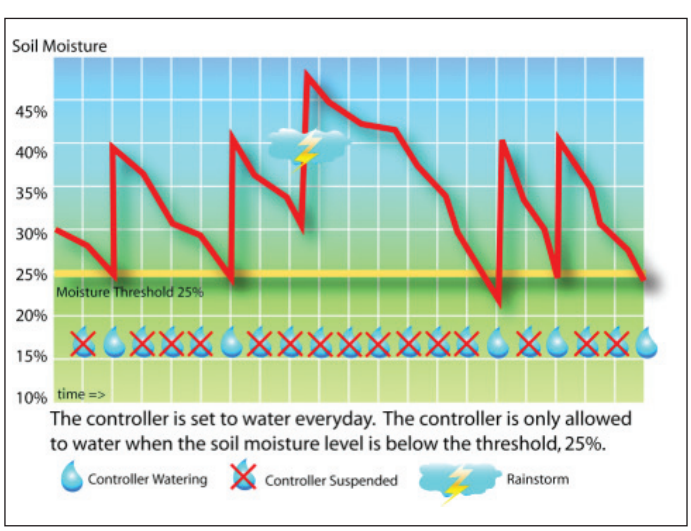

Figure 11: Suspended Cycle Diagram

In a subsequent report by Dr. Michael Dukes, he stated that rain sensors alone can save 30-40% compared to a recommended homeowner schedule and that soil moisture sensors can save 80-90% under optimum conditions.

"Irrigation System Technologies and Trends" - By Michael D. Dukes, Ph.D., P.E. (January 29, 2007 AWWA Water Conservation Workshop, Savannah, Ga.)

Commenting on the Acclima® soil moisture sensor's accuracy in soils with varying degrees of electrical conductivity (i.e. fertilizers) researchers from the Center for Irrigation Technology concluded: "For the tests conducted...with the application of increasing salt solutions on a sandy loam soil, there was excellent correlation between the volumetric water contents measured with the Acclima® Digital TDT® sensor and the calculated values."

"Response of Acclima® Digital TDT® probe to Soil Moisture and Electrical Conductivity" - By Diganta Adhikari and Dave Goorahoo (Center for Irrigation Technology, CSU-Fresno)

About the Author

Kingsley R. Horton is currently the Communications and Marketing Manager for Acclima, Inc. in Meridian, Idaho, USA. He has worked in the irrigation industry for the past 10 years. He has also been extensively involved in technical aspects of the healthcare and IT industries. He has a B.A. in Communications from Brigham Young University (1990).

Acclima® is the developer of an ultra-stable TDT® soil moisture sensor that accurately reports absolute volumetric soil moisture content. Because of this stable technology Acclima® irrigation controllers have been able to save between 40% and 80% in water usage over conventional controllers according to several university studies. Both research scientists and property managers have been positively impressed with the performance of Acclima® sensors and irrigation controllers.

To know more about the author, you can write to us. Your feedback is welcome and should be sent at: mayur@eawater.com. Published letters in each issue will get a one-year complimentary subscription of EverythingAboutWater Magazine.