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Is A Smart Irrigation Controller for You?

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Irrigation controllers that set and adjust water application in response to changes in the weather or soil moisture content are now available at competitive prices for residential and large-scale landscape use. These devices are commonly termed “smart”, “ET”, “weather-sensing", or “weather-based” irrigation controllers, and the technology is collectively referred to by the irrigation industry as Smart Water Application Technology, or *SWAT*.

Smart controllers offer some potential benefits to a site’s owner and its landscape manager. However, water savings are not guaranteed by any of smart controller manufacturer or installers because there are many factors that influence the amount of water applied to a landscape. The greatest benefit of these controllers is they are capable of automatically changing runtimes as plant water demand changes during the year.

How They Work

While any standard automatic irrigation controller can be set and adjusted so its irrigation schedules reflect changes in plant water needs in response to weather changes, many of the new smart controllers allow input of plant material type, precipitation rate of the irrigation system, and/or climatic data correlated with plant water use. They automatically determine and adjust irrigation schedules through proprietary algorithms that incorporate this input data. In this way, a smart controller can reduce or eliminate the laborious and sometimes complicated irrigation runtime and frequency calculations required to set and adjust a controller to implement irrigation budgets and schedules in line with local site conditions and seasonal weather changes. The scheduling calculations by smart controllers are designed so that plants will be provided with adequate water for good growth and appearance which may not result in water savings in a given landscape.

Devices vary in whether they use historical climatic data stored within the controller, current weather. data from on-site sensor readings, or weather data downloaded periodically from a support service via a telephone or pager system. Some of the controllers also adjust irrigation frequency and cycling based on user inputs that describe the soil type and slope of the site. A few products offer a Web-based interface to set up and manage the controller. Many smart controllers can be set to run on specific watering days and for maximum runtimes prescribed and required by some local water providers which thereby overrides the automatic adjustment capabilities of the devices. New smart controller products are being introduced regularly, and it is possible that the best technology or product has yet to emerge.

How Well They Function

In theory, the use of a smart controller simplifies and improves accuracy of landscape irrigation scheduling which results in measurable water conservation. Manufacturers often claim documented water "savings" of 20% or more after one of their devices is installed and set up. In practice, users report variable experiences in how well they achieve the goals of improved water management and conservation and how easy these devices are to set up. Potentially, the use of a "smart" device automatically and accurately schedules weather-based irrigation to various landscape plantings thereby taking irrigation management decisions out of inexperienced peoples' hands, reducing human errors in making irrigation schedule calculations, reducing visits to update controller programs with weather changes, and automate irrigation cycling as a tool for preventing runoff from the site.

The accuracy and performance of a smart controller are dependent on the quality and precision of the user-supplied set up information about the site, irrigation system, plant material in each valve station, and other required information. After a smart controller is initially setup, the irrigation schedules it produces must be carefully evaluated to determine if the correct amount of water is applied at the correct interval for the plants in each valve station. It requires someone with technical knowledge in horticulture and water management to verify that the irrigation schedules match plant's water needs.

Whether or not installing a smart controller will save water in a given site depends on multiple factors. Most important are the current amount of water being applied to the site, the effectiveness of the irrigation system in distributing water uniformly to plants, and how closely the irrigation schedule matches the plant's minimum water needs. If the present irrigation scheduling closely matches plants' minimum water needs or if the irrigation system distributes water so unevenly that some plants are always too wet while others are too dry, or the smart controller produces irrigation schedules that apply more water than the

plants need, then installing a smart controller is *unlikely* to result in significant water savings. On the other hand, if the landscape is being over irrigated and the irrigation system uniformly distributes water, then installing a smart controller is *likely* to result in significant water savings. Keep in mind that overwatering can be easily remedied using a traditional controller by simply reducing the valve runtime, irrigation frequency, or both. To realize the water conserving benefits from a smart controller or from simply reducing irrigation runtime and frequency in a standard controller, the irrigation system (filters, valves, water lines, sprinklers and other water emitting devices) must be well-designed and installed properly so that it applies water very uniformly and minimizes the occurrence of drier or wetter areas when the correct amount of water is delivered. The irrigation system must also be meticulously maintained.

Although there have been several studies on the performance of various smart controllers, few of them provide scientific analysis of a product's performance or relate the amount of water used (or water saved) objectively to the performance of plants being irrigated. In 2009, after an extensive review of available studies and reports on smart controller performance the California Energy Commission (Docket No. 09-AAER-1A, July 29, 2009) determined "*….recent studies have shown that the use of ….Smart Controllers frequently increases water use as well as energy consumption. The only industry accepted test methods available for controllers do not test for water conservation, but rather measure the efficiency of applying adequate amounts of water supplies to landscapes….*". A controlled, scientifically designed study in 2003 by University of California Cooperative Extension involving three smart controllers using distinct technologies demonstrated wide variation in their abilities to irrigate accurately and effectively tall fescue (cool-season) turfgrass, trees/shrubs, and annual flowers. Overall findings and conclusions from the study were:

- Use of weather-sensing controllers does not assure landscape water conservation or acceptable landscape plant performance.
- Greater complexity and technicality of required setup information does not necessarily result in more accurate, water-conserving irrigation schedules.
- Adoption of a smart controller will not eliminate human interaction in landscape irrigation management.
- Weather-sensing controllers will require professional monitoring and follow-up adjustment of their initial irrigation schedules.