

WaterSense® Labeled Weather-Based Irrigation Controllers

Technology Description

What Are They?

Weather-based irrigation controllers (WBICs) are a new generation of smart irrigation controllers that use current weather data to properly adapt irrigation schedules. The U.S. Environmental Protection Agency's (EPA's) WaterSense program labels WBICs that have been certified by a third party to meet efficiency and performance criteria detailed in the *WaterSense Specification for Weather-Based Irrigation Controllers*. WaterSense labeled controllers must be able to adequately meet the watering needs of a landscape without overwatering.

How Do They Work?

The weather-based technologies in WaterSense labeled controllers adjust the irrigation system's station run times based on plants' watering needs rather than on a preset, fixed schedule. A WaterSense labeled controller automatically reduces the watering times or days when less water is needed, typically during the cooler months. As outdoor temperatures increase or rainfall decreases, labeled controllers adjust irrigation systems' watering run times or schedule to compensate for the fluctuation. They will automatically alter their irrigation schedules daily or weekly based on site-specific variables, such as soil type, sprinklers' application rate, and local weather changes. WaterSense labeled controllers have the potential to save homeowners across the United States 110 billion gallons of water and roughly \$410 million per year on utility bills by continually balancing plants' changing requirements with environmental changes.

What Product Types Are Available?

There are three basic types of WBICs: stand-alone controllers, add-on devices, and plug-in devices. All three types of WBICs are available in a variety of sizes appropriate for small residential and large commercial applications. Add-on and plug-in devices connect to standard clock timer controllers and modify their irrigation schedule. Light commercial products often have the same features as the residential products, but with greater station capacity. Computerized central control systems are typically used for large properties, such as parks, school districts, and golf courses, and are not discussed in this fact sheet.

There are two primary technologies employed by WBICs: onsite sensor-based control and signal-based control. Onsite sensor-based controllers use real-time measurements of locally measured factors (e.g., temperature, humidity, solar radiation) to adjust irrigation scheduling. An onsite sensor-based system may have historic weather information for the site programmed into memory, which it can use to modify the expected irrigation requirement for the day or calculate onsite evapotranspiration (ET) for the landscape. In contrast, signal-based controllers receive a regular signal of prevailing weather conditions via radio, telephone, cable, cellular, Web, or pager technology. The signal typically uses data from local weather station(s) to update the current schedule for the controller.



Weather-based irrigation controller



Weather sensor

One Piece of the Puzzle

An irrigation system is a collection of pipes, fittings, valves, and sprinklers. At the core of an irrigation system is the controller, or “clock,” where electronic signals that turn on and off irrigation valves are generated and irrigation run times and run days are set. The controller is the key interface between the irrigation system and person in charge of operating that system, or the end user. It controls when and how much water is applied to the landscape. The controller is important, but even the best, most water-efficient controller cannot compensate for poor irrigation system design, installation, and maintenance. A holistic approach to irrigation systems, landscape design, and maintenance is required to achieve the full potential of water savings.

Using the Controller

Installation

Instructions for installing WBICs are available within the product packaging and online. Most manufacturers also provide training on the installation and operation of their irrigation controllers for professionals to learn more about installing these products.

Programming for Water Savings

Correctly programming the controller is necessary to achieve water savings. Many controllers have default settings to water plants at levels sufficient to meet 100 percent of a plant’s theoretical water needs (i.e., 100 percent ET). These theoretical water needs have been calculated based on a single crop type in a single microclimate, where the focus was on maximizing yield. Landscape plants, however, should be treated differently than crops because a landscape typically reflects a mixture of plant species with varying vegetation density and microclimates, and most plants will require less than their theoretical water needs to maintain proper health and appearance. Thus, a WBIC can be adjusted to better reflect the plant’s water needs. Providing the correct programming inputs on these controllers using the site-specific parameters is imperative to achieve an appropriate watering level. The percent adjust, or water budget, feature present on all WaterSense labeled controllers is a simple way to adjust the amount of water that is applied to the landscape. This feature should be a simple dial or button to allow more or less water to be applied to a specific irrigation zone.

Maintaining Savings

Once a WaterSense labeled controller is installed and programmed, the controller automatically takes care of seasonal weather- and site-specific adjustments, thereby not requiring constant monitoring. However, it is important to communicate to the end user that no irrigation control system should be installed on the basis of “set it and forget it.” Users will need to

Concepts Unique to the Technology

- **Evapotranspiration (ET):** WBICs use real-time weather data to schedule irrigation based on local ET. ET is defined as the quantity of moisture that is both transpired by the plant (i.e., the water vapor released from its leaves) and evaporated from the soil and plant surfaces. As demonstrated in the figure below, ET is a function of weather conditions and plant type.
- **Signal Fee:** Some controller technologies require the owner to pay an annual fee to receive a signal that adapts the irrigation schedule to prevailing local conditions. Failure to pay this signaling fee transforms a signal-based smart controller into a conventional controller.
- **Rainfall Device:** This device senses or measures rainfall to reduce or interrupt irrigation in response to rain events. The technology includes, but is not limited to, rainfall interrupt devices and tipping bucket rain gauges.

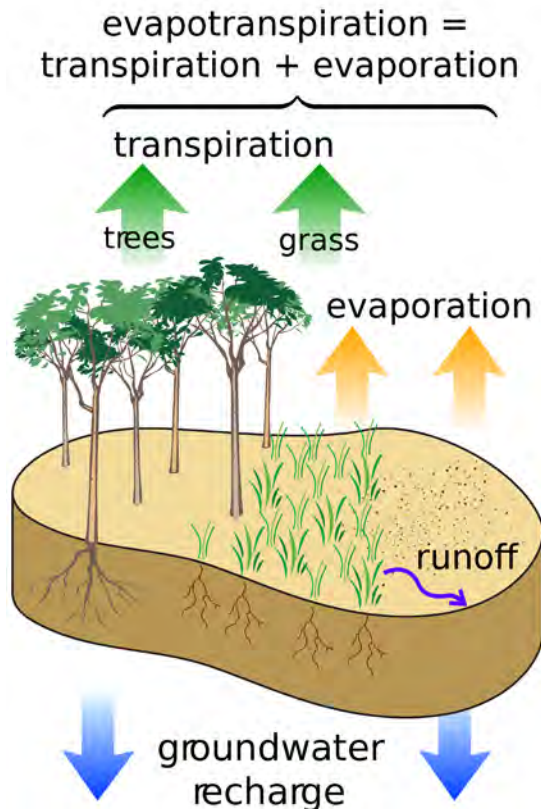


Image Source: http://en.wikipedia.org/wiki/File:Surface_water_cycle.svg

periodically inspect the landscape to ensure that the irrigation system is performing properly. This is especially important after originally installing the controller. Inform users that they should spend a couple of weeks monitoring their landscape. If everything looks lush and green, they can try dialing down the water budget feature on the controller. Users should continue to adjust the controller's water budget feature until they find a balance that is both water-efficient and healthy for their plants.

Performance

WaterSense labeled controllers have many capabilities that allow them to be water-efficient, including the following features:

- Non-volatile memory ensures that information regarding the irrigation program and settings are retained when the power source is lost and no backup battery is available.
- Zone-by-zone control successfully manages landscapes that have multiple areas with various watering requirements that need to be managed separately.
- User notifications alert the user if the controller is not operating in smart mode (e.g., if there is a problem with the signal or local sensor input that is prohibiting it from automatically adjusting irrigation).
- The ability to connect to a rainfall device is an important component of an efficient irrigation system in many climate regions. Multiple states have mandated the inclusion of these devices by law.
- The accommodation of watering restrictions addresses users' need to comply with local utility mandates.
- The percent adjust (water budget) feature allows users to adjust water applied to the landscape without changing the detailed settings in the controller's program.
- The ability to rely on a conservative watering schedule if the product loses real-time weather input or a weather signal is accomplished by using a proxy of historical weather data or a percent adjust (water budget) feature.
- The controller has the capability of automatically returning to smart mode if switched to manual mode. Controllers are often turned to manual mode for troubleshooting or other reasons and not returned to smart mode. This requirement ensures the controller will automatically return to smart mode within a specified time period as designated by the manufacturer.

For a list of WaterSense labeled controllers, visit the WaterSense website at www.epa.gov/watersense.

Communicating the Benefits to Consumers

A properly designed, installed, maintained, and operated automatic irrigation system can provide appropriate application of water across a landscape, as well as convenience to the user. The controller is fundamental to the operation of the irrigation system, the amount of time each zone operates, and, consequently, the amount of water applied to the landscape. Installing a WaterSense labeled controller:

- **Provides a healthy, beautiful landscape:** WaterSense labeled controllers help landscapes flourish and remain healthy by providing the right amount of water for each plant zone.

WaterSense created criteria to label high-performing WBICs.

WaterSense labeled controllers are certified to meet plants' water needs without overwatering. All labeled controllers have an irrigation adequacy greater than 80 percent in each irrigation zone and an irrigation excess less than 5 percent averaged across all irrigation zones. This means that the controller applies sufficient water to meet plants' needs (adequacy) without watering beyond those needs and thereby generating runoff (excess).



Many times, overwatered landscapes are unhealthy and unattractive.

- **Saves money:** WaterSense labeled controllers help end users eliminate overwatering and may lower water-use expenses. However, controllers must be programmed carefully to achieve their expected savings.
- **Reduces water waste:** By properly scheduling irrigation events to meet plants' needs, WaterSense labeled controllers help consumers to efficiently use limited water resources. These irrigation controllers also reduce water runoff from the landscape, helping to keep local water bodies clean and healthy.



- **Provides convenience:** Properly programmed WaterSense labeled controllers save end users the time and effort required to continuously monitor and integrate current weather data into irrigation schedule adjustments.

Measuring Water Savings

One way to calculate the water savings provided by a WBIC is to compare water bills before and after the installation. Comparing water bills will provide you with an estimate of how much the controller has saved. Changes in other water-using habits or appliances will also affect water use and should be taken into consideration, as should changes in rainfall amounts. Weather in the years prior to installation will significantly impact how much water was applied to the landscape and should be considered when calculating water savings.

Resources

- Information on Contractors Certified Through WaterSense Labeled Programs: www.epa.gov/WaterSense/outdoor/irrigation_professionals.html
- WaterSense Labeled Controllers List: www.epa.gov/watersense/product_search.html?Category=5
- WaterSense's Outdoor Tips: www.epa.gov/watersense/outdoor/index.html
- WaterSense Labeled Controllers Specification Information: www.epa.gov/WaterSense/partners/controller_final.html

