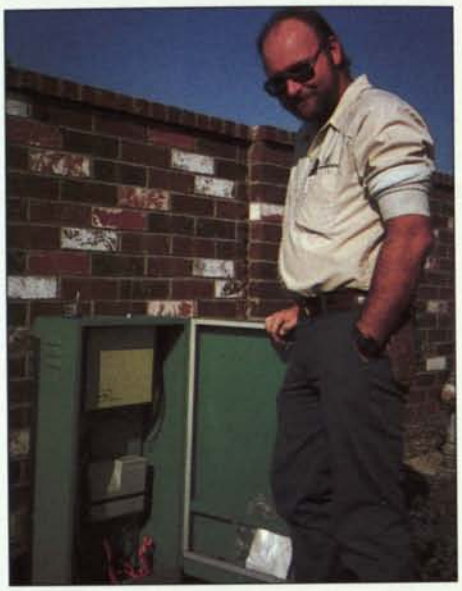
Irrigation Controllers:

SELECTING FOR SUCCESS



Mounting satellite controllers on a wall is usually the least expensive method. Photo courtesy: Milwaukee County Stadium.

By Gaylon Coates

The most important factor in choosing a controller is ease of operation. After all, to be effective in controlling irrigation, the controller must be a useful tool for the maintenance staff. It must be simple to program and schedule, and seasonal changes must be easy to make, without calling the manufacturer each time.

There are basically two major types of controllers available in today's market: electromechanical and solid-state (digital). The electromechanical varieties contain switches, dials, motors, and moving parts to keep the time of day and control operation of the various components. The solid-state digital types are fitted with printed circuit boards, which require no moving parts and therefore cannot "wear out." Digital controllers also afford extremely accurate timing, but are more susceptible to lightning and power surges. When protected against these pitfalls, solid-state controllers are usually the choice today.

The irrigation system designer also must know which kind of valves the controller is going to operate. Again, there are two types: electric- or hydraulic-actuated valves. Generally, the operation of 24-volt electric valves is actuated by providing or suspending electric current to a solenoid fitted on the body of the valve. The hydraulic varieties (either normally open or normally closed) are actuated by supplying a stream of water to or removing it from the valve.

Hand-held remote devices, coupled with computerized controllers, allow field maintenance personnel to energize individual valves without physical access to the controller. Photo courtesy: Hardie Irritrol & Motorola Scorpio.

In selecting a controller, it is also important to know something about the quality and longevity desired by the owner. For instance, there are several brands of controllers, manufactured for the "homeowner," which are inexpensive and basically meant to be replaceable after three to five years. Their quality is such that timing is not accurate enough for commercial projects, and their features are limited. It is crucial that the designer have a working knowledge about at least a few different controller manufacturers' products, so he or she can choose the most cost-effective device for the project. It is also helpful to have firsthand experience with whatever is specified, so you are confident that the piece of equipment you select will provide the control you desire.

Know the Application

There are several criteria to consider regarding the controller application. The first of these is, "How many stations do I need to control?" Today's irrigation controllers (especially solid-state) are manufactured in many configurations of anywhere from four to as many as 52 stations. Many times, these are modular in groups of eight stations, where a new "board" may be added to increase potential capacity. Generally, electromechanical controllers are made

in varying models from one to 24 stations.

It is important to be far enough along in the design to know how many stations will be required before finalizing controller selection. Often, a single "clock" may be utilized; other times, multiple devices will be necessary. A large site, such as an athletic field complex or golf course, may lend itself to standardizing on a single type of controller, which is repeated at numerous locations around the site. If it's necessary or desirable to operate more than one valve on a station, select a clock that has this capability.

Another factor in determining the number of controllers is their desired location or locations. It is a good idea to have the controller fairly near to the valves, so trouble-shooting can be done quickly. Visual control is desirable, but not required. For example, there are times when controllers must be placed in secured locations, in lockable rooms or even in basement mechanical areas. All of these issues must be considered.

There are indoor-mount and outdoor-mount controllers available. For locations that will be sheltered (inside a room or separate enclosure away from rain and dust), there is no reason to employ expensive weather-stripped metal cabinetry. Indoor-mount controllers are made for this purpose.

Wall-mount and pedestal-mount controller cabinets are available. The least expensive method is usually to mount the controller on a nearby wall. Where no wall is to be found (or where required by regulation), a pedestal is placed under the controller as a base for mounting on a concrete pad. Pedestals today are manufactured from steel, stainless steel, and even high-impact plastic.

It is essential to know what types of irrigation will be running on the controller. The irrigation designer should have determined, in a park for example, whether there is turf that will be watered by turf sprays, flower bed areas that will receive shrub sprays, or trees and shrubs that will be irrigated using bubblers or drip irrigation. All of these require different sequencing and durations, and determine the number of "programs" necessary on the controller. If there is only turf, a simple, single-program clock is all that's needed. If all the functions listed previously are needed, it will require a four-program controller to properly segregate the irrigation needs. There are also controllers that have either two or three programs available.

Turf sprays need to run every day (or at least every other day) in summer, while trees and shrub irrigation operates only two to three times per week. Bubblers for annuals must run more frequently than for shrubs, and for shorter cycles. Also, drip irrigation cycles require hours of operation; it is essential that the designer select a controller that has the capability of long timing in a drip situation. The number of start times per day available is also a factor, since germination of seed for turf requires several starts to keep the seed moist.

Certain designs may require specialized functions such as pump-start or master valve capabilities. When low water pressure is available and a booster pump is necessary, a pump-start circuit and wiring and will allow a pump to energize whenever the controller starts its cycle. A master valve is usually used in the same way with the same circuit, allowing any individual station to operate only if the master valve

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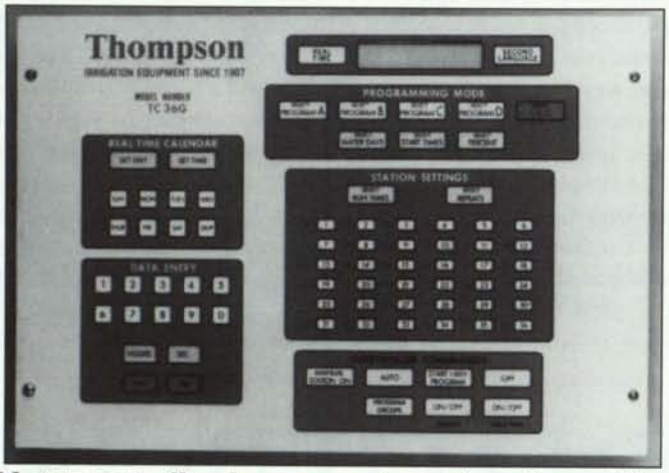

Solid-state controllers have no moving parts and cannot "wear out". Photo courtesy: Thompson Irrigation Equipment.

is energized. This concept is used in cold climates, and in certain instances with water-sensing controllers.

Holding the Power

All clocks require some type of power. While the most commonly used source is 120-volt electricity, there are controllers that operate on solar or battery power. These are available for use where no electric power exists or isn't planned. There are companies that manufacture solar panels that will operate any controller, and are reliable but still somewhat expensive.

In countries where 240-volt is prevalent, controllers that operate on 240-volt power are available. Where the power source is from a 220- or 440-volt power drop, transformers must be used if 120-volt is desired. This 240/120-volt conversion is usually specified by the electrical engineer, but the designer must be aware of the need. If part of a pump station, be sure the pump specification lists a stepdown transformer for power to the controllers

The most important safeguards for the control system, which are often forgotten, are lightning/surge protection and grounding. The irrigation designer must specify this equipment and can't assume the manufacturer or contractor will provide it. Most often, surge protection is an option, and in today's bidding wars can get bumped out of the price. Solid-state controllers are sensitive to power variations and lightning, and it can't be overemphasized how important it is to provide protection on the 120-volt side. Many high-end controllers contain this as standard equipment, and some even include protection on the 24-volt side.

Grounding is essential to dissipate extreme power surges such as lightning strikes to keep the controller from being damaged. Copper-clad rods (5/8 inch by 8 feet), driven into the ground and connected to the controller using bare copper wire, are the most common way of providing this protection. Ground resistance must be conducive to distributing the charge (10 ohms or less). One other way is to use a length of bare copper wire (about 100 to 200 feet) trenched into the turf, rather than using a rod.

Options to Consider

Water and time management have been considered in the development of several optional features in various controllers, and these may be helpful. Water management can be made easy with the adaptation of the "water budgeting" feature. Sometimes known as the "percent," this feature allows the user to increase or decrease a station, or the whole clock, in small or large percentages. Some controllers also allow for skipping a certain number of days between waterings. This is helpful since most controllers are either seven-, 14-, or 16-day cycles that repeat.

It's important to know that most high-end controllers include a built-in, fail-safe program that, if the power goes out and wipes out programmed information, operates a nominal time on each station. Some even have a non-volatile memory so they don't "forget." Clocks with fewer features may be reprogrammed in this condition. Electromechanical controllers just stop running for the duration of the power outage, and then resume when power is restored. They are behind by the length of the delay, so are not accurate on start times.

Some controllers today are capable of monitoring or being overridden by remote sensors. Moisture sensors, rain gauges, pressure switches and the like may be used in irrigation systems with certain controllers to attain the ultimate in efficiency and water conservation. Some of these controllers are computers in themselves, while others are satellites to more centralized master computers.

Sometimes the communication between the master central and the satellites is by telephone modem. It's also possible to control the satellites by the use of radio signals. Usually restricted to large, open areas where these signals aren't interrupted by mountains or buildings, this technology is most common today in the use of hand-held remote devices. These units can be used by maintenance personnel to energize individual valves from the field, without physical access to the controller.

Plan Prudently

Obviously, there are many choices involved in selecting irrigation controllers. In our experience, the irrigation designer must employ exact controller descriptions on the plans (legend), on the details, and in written specifications to wind up with what is desired. Generic or incomplete specifications may allow the contractor to supply something other than what is required for optimum efficiency and effectiveness.

Once a controller is selected, go to the catalog to be sure of the precise model number you want (or performance specification if required). Be sure to include all options in the description. If you have spent the time necessary to carefully tailor the controller to the needs of the system, it will be a tool that will help effectively manage water use for many years to come. ❑

Editor's Note: Gaylon Coates is the principal of Coates Irrigation Consultants, Inc., based in Scottsdale, AZ.