Irrigation Application Technologies

Just as in the consideration of alternative water supplies, the growing demands of the drought depleted supplies has driven product development and national programs to better use water efficiently in the landscape.

The Environmental Protection Agency (EPA), in conjunction with organizations from across the nation, has implemented the Smart Water Application Technology (SWAT) program. This program provides a test of new theories and products with well developed and consistent evaluation protocol. It allows manufacturers and users to implement the product use with a sense of continuity and technical correctness. Products under review have been weather-based controllers, rain- freeze sensors, pressure regulated valves, and drip lines. For more information, visit www.irrigation.org/swat. This program is moving forward with the intention of rivaling the electricity conservation program, Energy Star. As with Energy Star, the SWAT evaluated products will be labeled with their water conservation ratings.

Recent development yielding water efficiencies include:

- **Stream Rotor Nozzles** – which allow more consistent and slower application of water
- **Adjustable Arc Nozzles** – which allow precise coverage by individual irrigation heads
- **Pressure Regulated Heads** – which allow water to reach ground rather than evaporate
- **Smart Control Systems** – that match real-time landscape water demands with application
- **Variable Frequency Drive (VFD) pumps** raise and lower pump speed based upon pressure and flow, as compared to constant drives that produce the same regardless of demand.
- **Automatic Flush Filters** – filters that automatically reverse flow and self-clean when debris accumulates inside the filter. No cartridges or filter materials are involved. This allows the use of lake water, well water and other sources that typically clog irrigation components.
- **Drip Line** – pressure-regulated emitters, self-flushing with built-in check valves that eliminate operational problems and prevent drainage of the entire system when the valve is turned off. Drip lines also use copper rather than herbicides to prevent root intrusion.

Departing from all of the new concepts and products, let's discuss the demand/application relationship. The key to irrigation of a healthy well rooted landscape is to apply water, let the landscape dry to a determined stress level, and then in a timely manner, apply additional water. This is referred to in the irrigation and agricultural industries as managed allowed depletion. This requires on-site inspection and manual programming or it can be automated through instrument measuring and automatic irrigation.

First, let's discuss measurement. This can be done with a finger in the ground, a handheld moisture meter, moisture sensors and weather stations. The contact measurement of moisture is rather obvious. The moisture meter and electronic sensors should be used at depths below one inch. The weather stations measure radiation (sunlight), temperature, humidity and wind speed to establish a demand factor called evapotranspiration.

The weather, especially radiation, impacts plant transpiration through photosynthesis. The more sun, in both hours per day and season, the more the plant will transpire and, combined with evaporation, will demand more water. To quantify demand, evapotranspiration is measured hourly or daily to yield an amount that can be replaced.

(Measurements made by weather stations and soil sensors of the demand, automatically create irrigation programs to meet the demand.)

Determining supply can be as simple as maintaining manual rain gauges and comparing rainfall quantities to recent conditions. Rainfall is also measured using automatic and electronic rain gauges. By measuring rain and deducting this amount from the total demand and communicating that information to automated controls, allows irrigation systems to be programed to allow cycles to run as needed. This is not the same concept as rain sensors, because rain sensors do not measure rainfall quantity, they only interrupt current rainfall.

Measuring the amount of water applied by an irrigation system can be considerably more complex than measuring rainfall. The amount applied varies, based upon irrigation components, pressure, spacing of components and overall condition of the irrigation system. The application rate is referred to as precipitation rate and is measured in inches per hour. Each zone has its own precipitation rate based upon its own factors. This requires programing different runtimes for the specific zones. A water budget calculation can be estimated from a plan by taking the gallons per minute the zone is running and multiplying it by 96.25 and dividing that by the total zone square footage. An even more accurate determination of precipitation rates is an irrigation audit. Catch cans are evenly placed within a zone and the quantities are then used to determine required system runtimes by dividing the precipitation rate (such as two inches per hour) into the amount of water needed (such as 0.5 inch) and multiplying the result by 60 to yield the needed runtime in minutes to apply half an inch. You can also use the small yellow catch cans given to everyone and follow the instructions.

Summary

After some 12 hundred irrigation system evaluations and 600 irrigation projects in the last three years, there is one overwhelming conclusion: most of our clients want healthy turf, shrubs and other landscape materials to enhance property values and yield shade, lower temperature and create aesthetic pleasure. These clients do not necessarily want irrigation, nor do they want large water bills or have to learn irrigation. They do, however, want to use the least amount of water needed to maintain a healthy landscape. Programming was found to be 60 percent of total water waste.

(The concept is of the person who buys a hammer at Home Depot, but does not really want a hammer, he only wants a driven nail.)

That leads us to our role as green industry professionals in providing the ultimate value to our clients and the environment. By using technology and our senses, we can do that. The definition of new technology is a new system of delivering a process. Webster's defines technology as the application of scientific knowledge.

(The smartphones are not just handheld devices, they include software, transmission satellites and more).

(In 2002, I attended the International Irrigation Show in New Orleans. This was the launch of the smart controller by several manufacturers and was hailed as the dawn of automated control and water conservation. Technology was touted to be an all-encompassing solution to total control and water conservation problems. Four years later, I attended the International Irrigation Show in San Antonio. The focus had shifted from the equipment and product being the value, to the education of irrigation and horticulture professional to use the technology as a tool. The fact is, most of the technology creates no value unless properly applied.)

You, the horticulturist and irrigator, are the key component of all the technology we have discussed.