CHALKBOARD

TIPS FROM THE PROS

NIGHTTIME VS. DAYTIME IRRIGATION WHICH IS MORE EFFICIENT?

By Daniel Scaliter

"Game called on account of sprinklers!" Sound ridiculous? It has actually happened. It's one thing to end a game in a downpour, but when the source of the downpour is man-made there's a lot of explaining to do.

As parks and golf courses across the country install irrigation systems to protect valuable sports turf from drought damage, the chance of irrigation disruptions increases. One way to provide an extra margin for error and conserve valuable water is to irrigate at night.

Perhaps if more superintendents in charge of turf irrigation systems were aware of the advantages of nighttime irrigation as compared to daytime irrigation, they might alter their current watering practices. By doing so, they not only reduce the chance of daytime disruptions, but they cut water waste to a minimum.

Nighttime irrigation has a key benefit over daytime irrigation—the general efficiency of the system will be higher during the night. Any mechanical system can be rated for efficiency. The higher the value of efficiency, the less costly and more efficiently the system will operate.

In sports turf maintenance, we must provide the turfgrass with a certain amount of water. However, due to different losses in the process of irrigating, we must deliver *more* water than the grass actually needs. By reducing these losses, the total system efficiency increases. While not all losses listed below are associated with daytime irrigation, a number of them definitely are.

Refilling the Pipe—Every time a valve opens, a certain amount of water drains out of the sprinkler heads until the pressure in the pipe builds up and the system starts working at operating pressure. This volume of water is lost because it serves only a small area around the sprinkler heads. The same losses occur when the valve closes.

This water loss can be prevented by installing antidrain check valves. These valves should be installed close to the lateral lines where possible. Many manufacturers today incorporate check valves in some of their sprinkler heads.

Overthrow—A properly designed irrigation system places the correct amount of water in the right location. Water reaching areas not intended for irrigation is lost. The geometry and size of irrigated areas necessitates the use of various types of sprinkler heads. By using part-circle heads and sprinklers with adjustable radius of throw, and by checking the irrigation system at least once a week, these losses can be greatly reduced.

Runoff—Runoff will occur whenever the precipitation rate of the irrigation system exceeds the infiltration rate of the soil. Infiltration is the entry of water into the soil surface. Slopes, grades and soil texture can reduce infiltration rates. Infiltration rate data can be obtained by sending soil samples to a testing laboratory.

To prevent runoff, the system should be designed with sprinklers that do not have a precipitation rate higher than the infiltration rate of the soil. The precipitation rate of sprinklers on slopes should be less than those on relatively flat terrain. By matching the two rates, the soil can be brought up to its water-holding capacity with minimal runoff.

Watering Below the Root Zone—The depth of the root zone actually defines the important area for moisture content. Moisture below this depth cannot be reached by the plant and is lost. It is possible by properly scheduling irrigation to place water only where it is useful to the turf and not deeper.

Poor Uniformity—Faulty irrigation design (high pressure, wrong spacing, wrong volume, etc.) and irrigating during windy days reduces the uniformity of water application. When a system has low uniformity, it is necessary to apply more water than is really needed to assure that an adequate amount has been deposited to the entire turf area.

To obtain higher uniformity, the irrigation designer should space the sprinkler heads at 55 percent of their diameter of throw or less. He should also specify a pressure-regulating valve whenever the available static pressure exceeds the system-design pressure by more than 15 psi. System-design pressure is the total of all hydraulic losses plus sprinkler operating pressure. Finally, irrigation should be done during low wind conditions, if possible (at night).

Evaporation Spray Losses—The highest evaporation spray losses will occur during daytime irrigation due to a combination of heat and wind. To prevent this loss, the irrigation manager should schedule cycles to be completed during the night or early morning. This will save both water and money.

By controlling these losses the amount of water applied will be more in line with the amount of water the turf actually needs. A water meter allows us to keep track of the water delivered to the field.

For example, if our irrigation controller operates three valves for 30 minutes each, the total amount of water passing through the water meter should be roughly 60,000 gallons. If one of the valves did not open, then the meter would show a deficit of 20,000 gallons delivered to the field. During the summer, in some regions of the country, turf will experience stress—or even death—if a valve misfunction goes undetected for more than two or three days.

Let's assume, hypothetically, that we have a 40-acre park with an irrigation system that has been designed to minimize losses by utilizing antidrain valves, part-circle heads, etc. However, it is still operated during the day, when water evaporation due to heat and wind is at a maximum.

Let's also assume the uniformity of application is 85 percent. The total system efficiency (TSE) will then be 85 percent multiplied by the remaining efficiency of the system after losses caused by evaporation and windy conditions. It has been determined that turf requires 1.5 inches per acre per week of moisture during the peak season without natural rainfall.

By using data from an American Society of Agricultural Engineers report by K. R. Frost and H. C. Schwalen and figures available from the California Irrigation Management Information System (CIMIS), we find an eight percent water loss due to wind and evaporation during sprinkling or a 92 percent efficiency (100%-8%). Consequently, the total system efficiency is 78 percent, obtained by multiplying 85 percent by 92 percent. In other words, to provide the turf with 1.5 inches of water per acre per week, 1.92 inches have to be applied (1.5 divided by .78) during the day. By irrigating at night the total system efficiency is increased to 84 percent and only 1.78 inches of water need to be applied per acre per week to provide the turf with the same 1.5 inches of water.

The total amount of water saved by night irrigation is 145,855.8 gallons per week.

These savings in water and money, when added to other advantages of nighttime irrigation should provide an array of evidence that anyone in charge of sports turf cannot afford to ignore. Not only do costs drop, but the daytime use of the turf area is extended, vandalism is often reduced, and the risk of liability due to falls or water damage is cut. These savings can be passed on to other turf management items that need improvement.

Editor's Note: The author is an irrigation consultant in San Bernardino, CA, and is a member of the American Society of Irrigation Consultants.