Irrigation Scheduling

Tim Cleary
Water Management Division Manager
Turf Equipment and Supply Company, Inc.

How Much is Enough?

Does anyone really know how much water they are applying or should be applying to their sports fields? Is the controller program set once in the spring when the irrigation system is turned on? Do you have wet corners, dry middles or mushy infields?

Irrigation scheduling is key to providing the right amount of water, in the right place at the right time. Improper scheduling of an irrigation system can waste as much as 50% of the water applied. For example, irrigating during windy conditions or during the heat of the day can cause water losses of 30%! That's 30 % of the water your applying never even reaches the plants.

We should all be good stewards of one of our most precious resources. Since most of us have facilities that are highly visible to many, we can help set the example of proper watering. The water restrictions in our region during the last few years underscore the importance of conserving water.

There are many factors to consider when scheduling your irrigation. Local climactic conditions such as temperature, solar radiation, wind and humidity all play a role. Other factors such as soil type, plant type, slope and vegetative cover are also important components. In the irrigation industry, we focus on Evapotranspiration, which is a combination of many of the above mentioned factors.

Evapotranspiration, or ET as it is commonly called, is a measurement of the amount of water loss. ET is a combination of two principles: evaporation and transpiration. The primary cause of water loss is evaporation. Water evaporates into the atmosphere from the surface of soils thereby pulling more water from the soil below. As you might expect, on hot, sunny days there is more loss than on cloudy, overcast days. Windy days cause more evaporation. High humidity, a condition that typically exists in the Mid-Atlantic region, lessens evaporation losses when compared to the dry air of places such as the arid Southwest.

Transpiration is the other factor in the ET equation. Water is absorbed by the roots of plants, is passed upward through its tissue and evaporates from the stomata (pores) of the stems and leaves. This process is critical to plant health as it both transports nutrients and cools the plant. Think of how humans perspire to keep cool. The hotter it is the more we perspire. It's the same with plants. The hotter it is the more they transpire.

It is important to understand the role of the soil- or as it is more affectionately known- dirt. The soil is the reservoir where the water is stored as it evaporates or is taken by the plants. Our irrigation is aimed at replacing what's lost from this reservoir. That's the whole point to irrigation right there, irrigating to replace the water lost from the soil to ET!

Water adheres to the soil particles. If you can envision layers of water around a particle, the closer you get to the actual grain of sand or clay, the more tightly the water is held. The outer layers are lost to ET first. As the layers get closer to the soil particle, it becomes a fight between the plant and the soils adhesion forces-this is where you start to see the plant wilt or turf turn purple. The plant is stressed!

Soils are composed of three basic particles: clay, silt and sand. Clay is a smaller particle, there are more of them and they sit closer together. Sand is the opposite extreme: larger particles and more loosely held together due to their size. Clay dominated soils can hold a lot of water as all those particles are adhering water. Due to the small size of the particles, they are closer together and therefore don't let water into the soil or through as well as other soils. Think of your clay fields and the puddles that can form during rain storms or how wet they can stay for long periods of time. Sand fields drain well but give up their water readily. The lesson- clay soil fields are going to be irrigated in shorter times per cycle to let the water infiltrate, for multiple cycles to fill the large reservoir, but with longer intervals between watering. If you have sandy fields, you can irrigate heavily. Do it carefully as water can drain right on through the rooting zone and be lost. Most importantly, irrigate frequently as sand will not hold much water to be used for ET.

So what role does rainfall play in our irrigation scheduling? Well…it depends (you know I couldn't give you a simple answer). Usually only 30% of rainfall is considered effective. That is, the rain that actually infiltrates the soil and is held for ET. The rest is lost to surface runoff or drains through the soil. Think about the month of July. July is typically our hottest month and also has the highest ET. We do get an average rainfall of 4 to 5 inches during the month, which sounds great. Most of this water is the result of thunderstorms, and very little of it can infiltrate the soil because it comes too fast. It runs off to puddles, swales and drains or it drains through the rooting zone due to sheer volume.

That's a lot of information, and we still have not discussed how many minutes to put on each station or how many days per week to water or at what time we should actually water. OK, since you now have some background, here are the 'cliff' notes.

1. Controllers should be reprogrammed at least three times per year. Spring, summer and fall. More is better, less is not an option. Remember all the factors that affect ET. ET is definitely different in May than in August. We must adjust our controllers to account for this. The historical average peak ET that we focus on replacing with irrigation is usually around 1.25" to 1.75" per week in July. Set your controller to replace this much water and then use your percentage adjust switch or day intervals to change it for the rest of the year. Your going to need to know your sprinkler head precipitation rate and efficiencies, so see point 2.
2. Since conditions differ on every site, it is worth having a system audit done or consult with an irrigation professional. There are many certified irrigation auditors (CLIA certification) who have been trained and tested by the international Irrigation Association. System efficiencies, turf grass type, and sprinkler precipitation rates are other important factors that we have not discussed that these individuals will consider when auditing your system.
3. Don't count on rain. It may not provide much benefit. Rain sensors, a minimal investment, should be part of every system to suspend irrigation when it rains.
4. There are many recent technological advancements in the irrigation industry. Consider changing your controller if it is more than 5 years old to a newer model that can react to ET automatically. These controllers are affordable, save you time, save water and make your turf healthier.

Proper irrigation scheduling conserves water and promotes healthy, safe surfaces.

Small weather stations are affordable and can communicate directly with irrigation controllers to adjust programs automatically in response to Evapotranspiration..