



SCHEDULING IRRIGATION SYSTEMS

One of the most frequently misunderstood aspects of proper irrigation maintenance is scheduling. Many irrigation managers, contractors and homeowners rely on the "spray zone 20 minutes, rotary zone 45 minutes—every other day" rule-of-thumb when setting up and maintaining irrigation controller scheduling. Relying upon rule-of-thumb irrigation scheduling can ultimately lead to wasted water due to overwatering, soil saturation and run-off. With increasing awareness in the Western states regarding water conservation and management, it is only a matter of time before proper irrigation scheduling and water conservation will become mandated in this part of the country. Educating yourself now to meet the increasing demands for water conservation will help you to put more money into your customer's pocket—possibly saving commercial customers thousands of dollars in wasted water.

Calculating scheduling times and run-times for efficient irrigation system operation is relatively straightforward once you realize that it is all based upon several key factors:

1. Evapotranspiration rate (E_t)
2. Crop coefficient (K_c)
3. Precipitation rate (P_r)
4. System application efficiency (E_a)

Evapotranspiration – ET: One of the main causes of water depletion in turf is solar evaporation—water moves by capillary action to the surface of the soil where it is evaporated by wind and sun. Additionally, water absorbed through the plant roots passes nutrients through the plant and helps to keep the plant cool—the process is called transpiration. The relation of these two depletion processes is called evapotranspiration. Evapotranspiration is a measurement of water loss.

Evapotranspiration is variable by month, season and climate, and is available from the National Weather Service.

Crop coefficient: A crop coefficient is a value that is assigned to plants indicating the rate at which they lose water. The coefficient allows the irrigation manager to adjust the watering

requirements of different types of plant materials when making scheduling decisions by simply using the plants 'crop coefficient' as a percentage of need. As an example, consider a plant such as a leafy crop, which will lose water at a faster rate than a plant such as a warm season turfgrass. The leafy crop may have a coefficient of 85%, whereas the warm season turf may have a crop coefficient of 70%.

The crop coefficients of various plant materials are available from Rutgers University Horticulture Department.

Precipitation rate: The precipitation rate of the zone can be calculated using the following formula:

$$Pr = 96.25 \times \frac{\text{Total GPM of zone}}{\text{Total area of zone}}$$

Total area of zone

Where: Pr = Precipitation Rate in inches per hour

Total GPM = Total flow of all sprinklers in a given area

Total area = The total square footage of irrigated area

96.25 = Constant used to convert area and flow into common units

System efficiency: System efficiency is defined as the ratio of the quantity of water actually metered through the system to the amount of water actually used by the crop (turf). Many factors can affect the efficiency—evaporation, run-off, losses through deep percolation through the root zone and wind drift are a few examples. The actual application efficiency of any irrigation system can be accurately measured by using the "catch can" method placing catch cans around within the zone, catching the water applied within the zone and measuring the difference between the amount of water metered and the amount of water that actually reaches the plant. Typically, an efficiency of 70%-75% can be assumed for a well-designed and maintained irrigation system.

Once the information has been gathered, the following formula from the Hunter Industries "Handbook of Technical Irrigation Information" can be used to determine zone run-time:

$$T = 60 \times \frac{Eto \times Kc}{Pr \times Ea}$$

Pr x Ea

Where: T = Sprinkler run time in minutes

60 = Constant for conversion of area, flow, inches per hour and inches per day, into common units

Eto = Evapotranspiration rate in inches

Kc = Crop coefficient, percent

Pr = Precipitation rate of zone, in inches per hour

Ea = System application efficiency, percent

EXAMPLE:

Determine the monthly irrigation run-time for Mrs. Smith's front lawn. Assuming no rainfall, the E_t for the month of July is 6.98", the K_c is 70% (cool season turf), the P_r of the zone is .43 inches per hour and the system application efficiency is 70%.

$$T = 60 \times 4.98 \times 0.70$$

$$.43 \times 0.70$$

$$T = 209.16$$

$$0.30$$

$$T = 697.20 \text{ minutes per month or approximately 23 minutes per day}$$

Always take the following into consideration when scheduling an irrigation controller:

- Amount of supplemental rainfall
- Soil type and infiltration rate
- Slope
- Depth of root zone
- Allowable "watering window"
- Township watering restrictions (if any)

Positioning yourself as a water manager is another of the "value added" services that could potentially help you sell more jobs and save your existing customer base money through efficient water usage.