

## **Know Your Irrigation System**

***When irrigation systems are poorly maintained and operated, energy costs may be two to three times more than a system that is well maintained. One very good way to reduce irrigation costs is to optimize the use of water and energy.***

With all the other demands of managing residential, commercial or municipal property, it is difficult to be proactive in managing the irrigation system.

Many property owners and managers are faced with managing older irrigation systems. It is a fact that irrigation system components become more inefficient and costly to operate as the system ages.

It is a complicated process to choose irrigation system replacement components when they need to be replaced to achieve the best efficiency. An energy-efficient system requires a properly matched pump and power unit, correct pipe sizes, and the proper pressure and water distribution uniformities. Maximized efficiency is achieved by selecting a water- and energy-efficient system and then properly operating and maintaining it.

Thorough attention to the maintenance of the pump system and irrigation components is good insurance against the expense of replacing unsightly and dying landscaping or making major irrigation or pump system repairs.

As energy costs increase and water use is restricted, optimizing the effectiveness of the irrigation system is vital. The huge investment in the landscape is then protected from deterioration and the owner will enjoy an improved bottom line.

### **Water Management**

In striving for efficient use of water and energy, the greatest efficiency is achieved when the just right amount of water is applied at just the right time.

The amount of water to apply and when to irrigate are daily management decisions that are influenced by the type of system selected, soil and plant properties, and prevailing climatic conditions, including both temperature and rainfall.

Irrigation scheduling is the process of evaluating these factors and determining when to irrigate and exactly how much water to apply to each area.

### **Water Conservation**

Management practices that conserve water usually conserve energy as well. Accurate irrigation scheduling is an excellent way to save water.

### **Electric Power Management**

Electrically driven irrigation systems consume a large amount of electrical power during the hot summer months. Monthly electric bills consist of charges for the amount of electricity used, a

charge for maintenance of the generating facility and transmission lines, and a peak demand charge. The peak demand charge for the month is based on the highest power consumption (demand) during any single unit of time.

There are a number ways of to minimize peak electrical demands.

- Irrigators can schedule irrigation at night during nonpeak periods, reducing power consumption during the peak demand period. Restricting daytime running for service reasons to a single zone at a time may also avoid peak demand charges.
- Improving pumping plant efficiency will also reduce power usage.
- Optimizing the operation of a pump system to run at the best efficiency flow for each pump results in the lowest electricity use to run each motor.
- Procedures for testing pumping plant performance are complicated but scheduling run times for off peak demand hours can be a simple way to reduce energy consumed.

To take advantage of off-peak rates, you need to know the capacity of your irrigation system and the time it takes to deliver the amount of water needed during periods of high moisture stress. To provide adequate amounts of water during off-peak times, it may be necessary to purchase additional equipment to pump greater quantities of water during the off-peak hours.

Water- and energy-use efficiency for irrigation are not identical. Energy is consumed for every gallon of water pumped. For a given system, an increase in water use results in a proportional increase in energy consumption. Any water not actually needed to support the landscape reduces the water-use efficiency and consequently the energy-use efficiency. The first step to reducing energy use is to apply just enough water to satisfy the landscape's needs.

### **Electric Motors**

Electric motors should be protected from rain and direct sunlight. Many factors can affect motor service life and operation:

- Buildup of dirt or oil, obstruction of cooling vents, worn or dragging motor bearings, and voltage surges caused by lightning can cause electric motors to overheat.
- Overheating often leads to shorted wires in the winding and is the most common cause of low motor efficiency and failure.
- Voltage surges can also cause damage to or misalignment of phases in three-phase motors, resulting in low motor efficiency and failure.
- Misaligned shafts between motor and pump and over-tightened packing glands or seals can also reduce efficiency.
- Extended use and wear reduces efficiency as the motor ages. The condition can sometimes be improved in large motors over 25 horsepower by replacing the commutator (brushes) or having the motor rewound. In the case of smaller motors of 25 horsepower or less, it is usually more cost effective and practical to replace the motor.

### **Matching System Components**

Over time, most irrigation systems are altered from their original design, resulting in mismatching of components.

- Alterations such as adding or deleting sprinklers or laterals are often made without making corresponding adjustments to the pump system.

- A change in the depth to water, particularly in some deep wells where the static head has declined, can alter the pumping conditions enough that the pump no longer operates in the recommended efficiency range.

### **Minimizing Pressure Losses**

A common reason why excess pressure losses occur is running too many zones simultaneously. The demand for water then exceeds the capacity of the pumps and the irrigation system itself.

- Incorrect controller setup, overlapping of controllers, and incorrect nozzle sizes are common causes of this problem.
- Reduced irrigation efficiency can also result from poor maintenance and from wear of system components, leading to excessive pressure losses. With surface-water sources, intake hoses should be checked routinely for clogging and for air leaks or partial collapses of the suction hose.
- Couplers should be checked for leaks and adjusted or replaced when necessary. Sprinkler nozzle wear is a common cause of poor water use efficiency. Worn nozzles apply more water at lower pressure, leading to excessive water use and poor application uniformity. With most sprinklers it is easy to replace nozzles and other mechanical parts.

### **Using Correct Pipe Sizes**

Using undersized pipe, especially for mainlines, can significantly reduce energy efficiency. This problem is common when the pump system has been adjusted or modified to increase irrigation capacity. For a given flow rate, friction loss and thus pumping cost decrease as pipe size increases.

### **Using Correct Sprinkler Nozzles.**

Sprinkler nozzles are designed to operate within a narrow range of pressures. Correct nozzle pressure is necessary to ensure uniform water application. Converting to low-pressure nozzles also requires adjusting the pump pressure. Pump replacement may be necessary in some cases.

Reducing operating pressure may lead to one or more of the following problems:

- sprinklers may not throw water as far (reduced wetted diameter)
- droplet size may increase
- pattern shapes of individual sprinklers may change

These changes may cause:

- application rates on moving sprinklers to be higher
- the uniformity on fixed-spacing sprinklers to decrease
- surface runoff to increase
- Soil surface compaction due to increased droplet size (larger drops have greater impact energy)