Troubleshooting Irrigation Valves

Valves are Vital to Your Irrigation System...
Knowing How They Work Provides You With Fast Solutions to Problems

By LAURIE BERRY
Rain Bird Sales Inc.

"An ounce of prevention is worth a pound of cure."

Nowhere is this truer than with irrigation valves. They are highly reliable and will last for years if you properly care for them. But valves can be difficult to troubleshoot because many of the parts that could be causing the problems are hidden. By learning how irrigation valves work, you can troubleshoot almost any problem.

Proper valve troubleshooting starts with a few basic questions:

* Is the irrigation controller plugged in and properly programmed?
* Is the master water supply turned on?
* Is water present to the valve?
* Is the flow-control handle open?
* Is sufficient water pressure and flow available?
* Is the pump working?

Valves 101

Before troubleshooting begins, you must understand how irrigation valves work. Valves control the flow of water to sprinklers and can be mechanical, hydraulic, electric or a hybrid-know what kind you're dealing with.

A valve stays closed because the surface area above the diaphragm is about two-and-half times larger than the pressurized surface area below the diaphragm. The difference causes a greater force above the diaphragm than below it. The valve traps the water, which fills the upper chamber. The valve will open only when the force above the diaphragm has been relieved. This will happen electrically when the controller energizes the solenoid or manually when you use the manual bleed.

The solenoid is a coil of electrical wire that, when charged with an electrical current from the controller, creates a magnetic force and pulls up a small, metal plunger inside the valve. As the plunger rises, it dumps water from the chamber above the diaphragm to a lower (downstream) pressure area. This reduces the force above the diaphragm and the valve opens.

To close a valve, the irrigation controller stops sending an electrical current to the solenoid. As the current terminates, the solenoid drops the plunger and stops the flow of water from above the diaphragm. The pressure above the diaphragm builds to a force greater than the pressure below the diaphragm, and the valve closes.

This also occurs when you operate the valve manually. When you open the manual bleed screw, you relieve the force above the diaphragm either to the atmosphere or to the downstream side of the valve.

Electricity and Water

A variety of conditions can cause an irrigation valve to malfunction. But don't overlook the obvious. If the valve will not open, make sure you have turned on the water supply. You can check to make sure you have a water supply by manually opening or "bleeding" the valve.

There are two types of manual-bleed devices. The most common is an external manual bleed. It usually consists of a small knob on top of the valve bonnet that bleeds-or relieves-the water above the diaphragm. The second type of manual-bleed device is an internal manual bleed. It is usually a lever on the solenoid or the solenoid itself. When you turn on the lever or activate the solenoid, water pressure above the diaphragm bleeds to the downstream side of the

(Continued on Page 24)

Irrigation Valves--

(Continued from Page 22)

valve. Turn the external manual-bleed screw or operate the internal manual bleed and check for water flow. Be aware that some valves incorporate both external and internal manual-bleed systems. If there is still no water flow to the valve, check the PVC line for breaks.

Another common problem is lack of electrical signal (voltage) to the valve. To determine if the valve is receiving power, use a volt-ohm meter. From the irrigation controller, manually turn on the station you are troubleshooting. With the volt-ohm meter, check the voltage between the ground and the controller-station terminal. Your reading should be 24 volts AC (VAC). If it is not 24 VAC, you need to determine the cause-which is usually a blown fuse in the controller or in the controller's transformer.

While you are at the controller, check the entire irrigation program. In many cases, a valve will not operate properly because of faulty controller programming.

If your meter reads 24 VAC at the controller station wires, check the zone in question to make sure it's operating. Make sure that the controller has a programmed start time and run time and that the "days-to-run" setting is programmed. Though this may seem elementary, an improperly programmed controller is one of the most common causes of valve malfunction-and usually the largest source of customer complaints.

If the controller is working properly, check the voltage to the solenoid. With the controller turned off, skin the insulation off the two wires running from the valve solenoid to the splice. Make these cuts as close to the splice as possible. Attach a voltmeter to the wire running from the splice-the voltage should read zero.

Manually operate the irrigation controller, and check that you are receiving 24 VAC. It is normal to experience some voltage loss at the valve, but if the volt-ohm meter reads less than 20 VAC, the field wires have a problem. You need to find the source of this problem or replace the wires.

After completing this test, cut out the original splice, and reconnect the wires. It's important to leave enough wire to make the splice.

Contamination

Because of its direct connection to piping from the main water line, a valve is susceptible to contamination from dirt and debris, especially if you use non-potable or effluent water. To reduce the risk of contamination, most irrigation valves have a filter or screen to keep dirt out of the area above the diaphragm and the solenoid area.

Dirt and debris trapped in the valve may cause it to "weep." The telltale sign of a weeping valve is excessive puddling at the lowest sprinkler after the valves have shut off.

(Continued on Page 25)

Irrigation Valves--

(Continued from Page 24)

To check for excessive dirt, debris or algae buildup, turn the water off, remove the valve bonnet, and check the screens for contamination. Some valves have filter screens directly below the solenoid, which can be removed with a small screwdriver or coin. Flush the screens with water to remove any debris.

This is also a good time to check the diaphragm and valve seat for debris, wear or deterioration (note that some valves have these two components molded into one piece). The diaphragm, which is a large, rubber-like, flexible disc, is subject to deterioration. It can be nicked or torn by a trapped pebble or a build-up of grit.

The valve seat is the lower sealing surface in the valve body. Inspect it for nicks by running your finger over the lip of the valve seat. Replace the valve body if the valve seat is damaged. Check the diaphragm and the valve seat for cracks and wear. Replace them if they show signs of wear or deterioration. Reassemble the valve, turn on the water, and manually operate the irrigation controller to make sure everything is working properly.

Solenoids

If you have checked the water supply, the power supply and the diaphragm and valve seat, and the valve is still malfunctioning, usually the only possibility left is a faulty solenoid.

With the water turned off, unscrew the solenoid from the bonnet of the valve. Be careful not to lose the plunger or the small spring, which helps force the solenoid plunger downward.

Inspect the solenoid plunger. The plunger is the small, metal piston with a rubber base inside the solenoid housing. The plunger must be clean and free of any debris.

To check the operation of the solenoid, manually turn on the valve or zone from the irrigation controller. If it's working, the solenoid plunger will be pulled into the solenoid body.

Some irrigation-equipment manufacturers have designed "captive" solenoid plungers. A small piece of plastic holds these types of plungers in the solenoid housing. If the valve has a captured solenoid, you will hear a sharp clicking sound when the solenoid energizes. If the solenoid is not working properly or if the solenoid plunger does not move freely in the solenoid housing, clean and retest it. If it is still not working, replace the solenoid.

Also, with the solenoid removed, check the small hole in the bonnet that allows water to pass from above the diaphragm to the downstream side of the valve. Check the opening with a paper clip or small piece of wire. It is important not to enlarge this hole because it controls the opening and closing speed of the valve.

By following these suggestions, you'll be able to save time and quickly get to the root of the problem when valve troubles occur.