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# Monitoring irrigation systems

**By recording the pressure profile within an irrigation system, a pressure recorder can help locate extreme pressure variations that can interfere with the system's performance.**

By Larry Workman

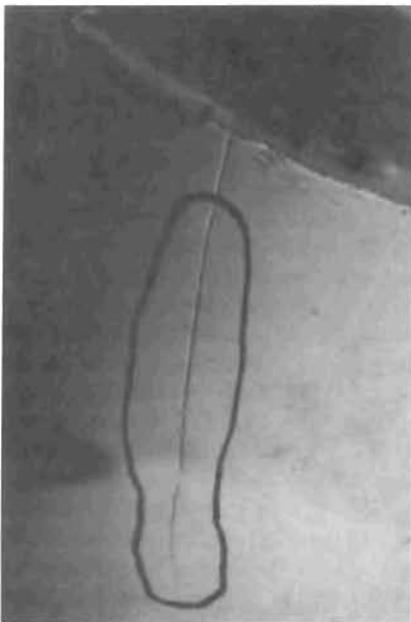
Plastic fittings in irrigation systems can become weak due to changes in system pressure. For example, under the pressure of rushing water, a simple directional fitting with a 90° elbow will try to straighten out. Turn off the water, and it resumes its 90° stance. Repeating the pressure/relaxation cycle over many days, months and years may result in plastic fitting fatigue.

At times, leaks in an irrigation system can be traced to one or more fittings that have small cracks in the crotch—the inside corner of the fitting's directional change. These

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**FITTING WEAKNESS**—Cracks like the one circled on this plastic fitting are caused by pressure changes and can lead to leaks in an irrigation system.

cracks are caused by the pressure/relaxation cycle just described. Replacing the fittings will solve the leak problem for the moment, but chances are, additional steps will be required to solve the underlying problem, which may lead to further failures in a few weeks or months.

## Extreme pressure changes

Sudden, repeated, major changes in system pressure can produce the stresses and strains that lead to fitting weakness and failure. For example, if there is a leak in a pressurized section and the pump station is repeatedly coming on line to maintain pressure, the system will be flexed each time by the hydraulic pressure change. If the controller is operating too many valves at one time, the velocity within the system piping will cause surges or the possibility of water hammers.

Most solenoid-controlled diaphragm valves close or open more rapidly when the upstream and downstream pressures are greatly varied. This means that most of the flow rate (gallons per minute) is closed off in the last half-second of valve operation. The bulk of the flow comes on during the first half-second of valve operation time. These sudden changes in system pressures can destroy an irrigation system.

Pressure fluctuations within a system should not exceed 1½ times that of the lowest pressure rating of any component in the system. In addition, if there is a pressure increase or decrease of approximately 50 percent (for example, ± 40 psi in an 80 psi system) in a short period of time and it is repeated often enough, fittings will fail. Although all systems have some degree of pressure fluctuation and all variations cannot be

removed, make an effort to stabilize the pressures.

## Pressure recorders

The first step to reducing severe pressure fluctuations is to find out what is happening inside your system. This calls for installing pressure recorders at various locations within a system, including the extremities. Depending on the system's complexity and size, recorders may be installed for a short-term check or for permanent monitoring. Pressure recorders vary in cost, from units with small, hand-wound clock motors, which cost about \$100, to solid-state, computerized models costing thousands of dollars. Pressure recorders may be available for short-term rentals in some areas.

By recording the pressure profile within a system and comparing it to the irrigation schedule, you can analyze what you must do to reduce the quantity or magnitude of the surges. Many times, surges or pressure variations are worse during night hours, when no one is there to observe the recorder's readings.

Once you locate the source of the surges, the solution may be as simple as adjusting the high/low pressure limits of the pump station, revising some valve grouping or lowering the overall system pressure. Although these steps may remedy the cause of failures, they will not necessarily eliminate future breaks. Once a component has been weakened, it may only be a matter of time until a fracture appears. However, making pressure corrections may significantly extend the system's operating life.



Photo credit: Philips Industries Inc., Lasco Division.