Mark Satterfield, UC Davis irrigation technician, trouble-shoots a wiring problem with an irrigation control wire analyzer. Photos courtesy: Bob Milano. (Inset) Close-up of an irrigation control wire analyzer.

Take a Systematic Approach to Irrigation Trouble-Shooting

By Bob Milano

An outstanding sports turf irrigation system is like an outstanding umpire — the best of them work unnoticed. For field playability and aesthetic reasons, a sports turf irrigation system must be invisible at game time — all sprinkler heads must retract flush with the field, all valves buried beneath the soil, all controller neatly hidden from view. Like a great umpire, an irrigation system is meant to enhance the game, without intruding upon it.

Out of sight, however, doesn't mean out of mind, particularly for sports turf managers. For them, an irrigation system will always remain a complex network of underground pipes, valves, wires, sensors and sprinklers, the prime objective of which is to apply water to the turf as uniformly as possible. Even with today's sophisticated irrigation technology, that's easier said than done.

Systematic Analysis

The "perfect" irrigation system has yet to be installed, nor it is likely to be. Varying site conditions, soils, use, compaction, wind and construction tech-

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niques will all influence the effectiveness of any irrigation system. As a result of these and numerous other factors, ongoing field adjustments and repair will always be required to attain the most beneficial water distribution.

To address the site variables and the numerous components of an irrigation system, only one strategy will work: a system analysis approach. A fully functional sports turf irrigation system is not a collection of unrelated parts and components. It is a fully interrelated composition of valves, screens, piping, pumps, nozzles, wires, sensors and control working in unison to evenly distribute water over the turf surface.

With all of these components and their various functions playing a role in the overall success of the system, the conclusion is only logical: When repairing, maintaining or trouble-shooting turf irrigation, the entire system must be considered.

Fielding Problems

Imagine a softball field that has several extremely dry hard spots. Dry spots are one of the most common, nagging problems in turf maintenance. Too often, the "solution" is simply to increase irrigation run times on the controller. Sometimes it works, sometimes it doesn't. However, this problem can almost always be solved by taking a step-by-step systematic approach, which enables you to pinpoint the problem and make informed decisions on potential solutions. Such an approach might include these steps:

- Inspect the area visually. Is there an obvious problem? Are the water requirements of the turf being met?
- Probe the "dry" areas. Are they actually dry?
- Test-operate the system from the controller. Does the system appear to be operating properly and as scheduled?
- Pressure-check the system at the sprinkler nozzle. Do any of the screens, filters of wye-strainers need cleaning?
- Measure and record the sprinkler head spacing distances. Do any of the spacings seem too close or too far apart?
- Perform a catch can test or a complete water audit if possible. Is the distribution obviously poor?

This systematic approach will yield quick identification of obvious problems, while simultaneously assuring that the other components of the system are operating properly. Most importantly, data is gathered to evaluate possible system adjustments or modifications.

Landscape irrigation systems, particularly those for athletic fields, must operate at peak efficiency for field safety, turf health and maximum aesthetic benefit.

Assuming that no blatant problems were discovered, the process can continue by utilizing gathered data (head spacing, operating pressures and distribution uniformity) to make adjustments to the equipment. These adjustments may include nozzles, flow controls or head spacing.

Lastly, these changes cannot be *assumed* correct. They must be re-evaluated and contrasted with the original data to verify that improvements to the water distribution were made.

Consider a soccer field, where the entire midfield area is dying. Entire portions of turf wilting and beginning to die, as if no matter has been applied, is another common sports turf problem. A systematic approach to this problem might include these steps:

- Visually inspect and probe the area. Is there an obvious problem?
- Test-operate the system from the controller. Do any or all of the stations operate?

Let's say you find that one valve will not operate. Continue the systematic process:

- Check the remote control valve flow. Is there a water supply to this valve?
- Operate the valve using the bleed screw. Does everything work normally?
- Use an irrigation control wire analyzer to determine the extent of the problem. Is the analyzer conclusive?

To continue resolving this problem, let's assume the remote control valve and the controller are in good working order. We had deduced through our investigation a single control wire to this valve is not functioning properly. Now we can continue with the scenario.

- Check wiring at the controller. Is it in good contact with the correct points?
- Visually check the wire splices at the control valve. Could simply resplicing solve the poor circuit connection?
- Visually inspect the site for any recent disturbances or activities that could have severed the control wire. Were there any recent excavations or paving repairs?
- Using a wire tracer or fault locator, identify the underground wire location or possible broken site or both. Is this information conclusive or simply a guess?

More often than not, an approach such as this will quickly and efficiently identify the problem so proper repairs can begin. In this case, we identified the broken wire in the trench line of a new underground street lighting circuit and spliced in a repair connection.

Because of our successful systematic trouble-shooting efforts, we were able to avoid "trying" other potential solutions to the problem. These alternatives included: placing a new underground control wire, installing a valve-double piece of equipment, wiring two valves together to operate simultaneously, or installing a battery-operated unit. None of these solutions were correct for this hypothetical situation.

Landscape irrigation systems, particularly those for athletic fields, must operate at peak efficiency for field safety, turf health and maximum aesthetic benefit. To achieve this objective, maintenance, repair and adjustments will be necessary, and the methodology used during these processes must involve a systematic approach.

Jack Miller, University of California at Davis landscape technician, simplifies this philosophy when he says, "Digging is the last thing you want to do!"

The step-by-step systematic approach to irrigation system maintenance, trouble-shooting and repair is not a "work avoidance" strategy — it's a reminder to carefully analyze and evaluate the problem using a total system approach before beginning repairs. By following this methodology you can eliminate unnecessary steps and false solutions, minimize work that provides no net benefit to the system as a whole, and provide a safe, playable and pleasing natural athletic surface by resolving the true problems of the system. ❑

Editor's note: Bob Milano is grounds operation manager, University of California at Davis Physical Plant, and a board member of the national Sports Turf Managers Association.