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A pHinal solution?

Lowering the pH level in irrigation water can be the first step toward improving performance.

Eric McMullen

The first question Pete Lieponis often hears is, "Does it work?"

"But that's not the question to ask," he says. "The question to ask is, 'Will it work in my situation?' There's a big difference."

Lieponis, president of Prime Turf Inc., says there's no question that lowering the pH of your irrigation water can solve a number of turfgrass problems, including standing water after irrigating, localized dry spots and poor color response to fertilizer applications.

"There's no mystery to it," says Lieponis. "Those problems are all the result of poor water infiltration and/or distribution, and are frequently the result of high soil or water pH and high levels of bicarbonate in the water. Acidifying your irrigation water lowers the pH of the water and reduces the level of bicarbonate.

"It's basic chemistry," he says.

However, there are rare occasions when soil impermeability is not caused by high water pH or high bicarbonate loads. Therefore, Lieponis recommends that superintendents who are considering acidification get their water tested at a reputable lab and determine three things:

• Whether total bicarbonate and carbonate levels exceed free calcium and magnesium totals

• Whether residual sodium carbonate exceeds 1.25

• Whether adjusted Sodium Adsorption Ratio (SAR) exceeds 6 millequivalents per litre

If your water exhibits any of these characteristics, it is a prime candidate for acidification, says Lieponis. Your water lab should be willing to explain any aspects of the testing you are unfamiliar with.

On-course results

"It's not that difficult," says Scott Clark, general manager at PGA National Resort and Spa in Palm Beach Gardens, Fla., and a 13-year GCSAA member. "Acidification is a time-tested practice that any water scientist will recommend if the conditions are right. And if they are, you'll be amazed at the difference it makes."

The first step in adjusting water pH is in the irrigation line.

Clark, who has been watching the pH of the water on all five of his courses for several years, says it's like the difference between night and day — or, more appropriately, between green and brown.

Jim Evans, superintendent at Turnberry Country Club in Crystal Lake, Ill., agrees.

"Our main problem was that the pH of our water was around 8.3," says Evans. "We had localized dry spots and standing water, and we weren't getting a good response from our fertilizers, especially our iron and sulfur."

So Evans had a pH-sensing injector installed into his irrigation system and began using a water amendment (pHairway, a patented, highly acidic chemical reaction of urea and sulfuric acid) to lower the pH of his water.

And the results?

"(It's) the best thing we've done since I've been here, and I've been here 24 years," says Evans, who has also been a GCSAA member for 24 years. "As far as turf quality goes, I can say it's the most significant change we've made in 24 years."

He says his turf is greener and healthier, the dry spots have been eliminated, and he's seeing better infiltration of water, especially on the greens.

"The golfers have noticed," he says. "I've had several come up to me and ask if we've been doing anything different. They say the greens hold their shots better and they love that. And it gives me a chance to give them a little lesson on turf care, which I love."

Clark had much the same experience. Upon being named general manager at PGA National in 1999, he immediately went to work on his water. He had been studying water quality issues for several years and knew that his water was high in pH and bicarbonates, but he wasn't prepared for just what a difference lowering the water pH made.

"We tried it on just one of our five courses because we weren't sure what we would see," says Clark. "But within a year, we had expanded to all five courses. The difference was night and day. You just can't believe how quickly it clears up your problems. The turf is greener and lusher within a matter of days because the lower pH frees up iron, zinc and magnesium in the soil. Infiltration is better, so you don't have any standing water. And you don't need to hand-water your dry spots anymore because you don't have any."

A top-of-the-line system

Chuck Odierno, operations manager for Prime Turf, says his company has about 200 systems in place around the country.

"Each superintendent's situation is different, but it all starts with a water test," Odierno says. "Then, we look at the irrigation system. Most superintendents like to keep their storage tanks inside for cosmetic reasons, so we need to make sure there's room for that. Plus, our system has a pH sensor downstream from the injection pump, and its placement becomes a consideration."

Clark says that the system he had installed is virtually maintenance-free and that the payback comes in lower fertilizer bills, lower water costs, lower labor costs due to less hand watering, and a healthier and greener turf.

A few years down the line, says Odierno, "a guy might get used to seeing that green color every day and wonder if he still needs to control his water's pH. We tell him to turn the system off. Within a week, those old problems will start showing up, and he'll start up the system again. It's a pretty vivid lesson."

Back to basics

The first step in adjusting water pH is in the irrigation line. Clark and Evans both set their systems for a water pH of 6.5, which cut the level of bicarbonate in their water in half.

Lieponis explains that bicarbonate is a negatively charged ion that will bond with free calcium or magnesium to form calcium carbonate (lime) or magnesium carbonate. That, says Lieponis, prevents turf from getting those nutrients, and those particulates will plug sprinkler heads. In addition, he says, bicarbonate can break down pesticides and can cause liquid fertilizers to form precipitates and drop out of the water.

When the pH-amended water hits the soil, Lieponis continues, infiltration improves as the sulfuric acid in the amendment reacts with a soil's free lime,

resulting in a release of soluble calcium, which can then displace sodium on a soil particle's exchange site. Calcium is a divalent ion, which means it has two positive charges. In the soil, calcium causes soil particles to aggregate, leading to improved soil structure. That increases infiltration by helping keep the soil open, Lieponis says.

With improved water infiltration, Lieponis says, nutrients that travel through the soil in front of the water line are more quickly available to the roots. In addition to the soluble calcium, these nutrients include iron, zinc, managanese and phosphorous, which are notorious for getting tied up in soils with a pH above 8.0, according to Lieponis.

"We've definitely lowered our fertilizer costs," says Evans. "And we used to use two 55-gallon drums of wetting agents each year, and now just use one. Plus, the turf is healthier. We still see a little dollar spot and treat for it, but definitely the overall health is better."

Better water quality has even helped with the course's ornamentals, says Evans. "We had some trees that were chlorotic, but the lower pH made iron and manganese available to them and cleared that right up," he says. "And we just put out 300 flower plants and saw a big response on them, too."

Eric McMullen is a free-lance writer in Emeryville, Calif.

Golf Course Superintendents Association of America
1421 Research Park Drive
Lawrence, KS 66049-3859
Tel. (800) 472-7878 or (785) 841-2240
infobox@gcsaa.org