



Water quality is one of the most misunderstood parts of any golf course management program. Agronomist Carmen Magro keeps you from getting lost in the numbers and outlines the simple science behind water quality reports.

drop

effective or not right out of the tank and with regard to residual effect on the turf and soil

- The relationship of elements and components in a water sample is much more important than the individual elements themselves. For example: A salt is a salt...the measurement of electro conductivity (EC) which measures salt conductivity in water is oblivious to what salt is causing the reaction. Therefore, EC alone cannot be

used to determine water quality although it often is the case that it is.

- Water quality is dynamic, meaning that it changes often throughout the year. Therefore there is no standard water testing protocol. If your water is fairly consistent, annual or even biennial or triennial tests are fine. If you use wells or have water pumped in and that quality changes during various times of the season, you should test

whenever a significant change takes place so you can make informed decisions on what practical changes to make to your program.

To develop or implement any cultural practice or management program on the course, we need to understand what the water quality test is telling us. Water quality is defined as the ability of a water source to meet its beneficial uses. In this case, the beneficial use is to supplement rain for the quality growth and performance of the golf course turfgrass and ornamental landscape. The following are the most important things to look for on a water test and what they mean:

TOTAL SALT CONTENT (TDS). This is a measurement of all dissolved salts but does not tell us which salts. This is also known as a measurement of salinity but this does not necessarily mean sodium (Na⁺). TDS is roughly 640 times the EC of the water measured in mmhos/cm or dS/m. TDS is typically reported in parts per million (ppm). A TDS level below 480 indicates there is likely not a problem with salts in the water. Between 480 and 1950, potential salt problems exist and this will vary with turf tolerances. Above 1950 we generally see salt related problems and it is imperative that good drainage is in place to be able to move the water through the soil profile to prevent salt buildups in the soil.

ELECTRO-CONDUCTIVITY (EC). This is a measurement of the conductivity of salt reactions in water. As salts dissolve, ions disassociate from each other and carry a charge. That charge gives off energy measured as EC. For example, table salt, sodium chloride (NaCl) dissolves to a Na+

ion and a Cl⁻ ion. These ions give off energy measured as EC. All salts dissolve and give off charges. EC is reported in mmhos/cm or its equivalent dS/m. Therefore 1 mmhos/cm = 1 dS/m.

While EC alone cannot tell us what salts are present, it is another indicator of a potential salt problem as it is another measurement of salinity. Remember that turfgrasses, even of the same variety vary in their tolerances of salt, but if salt indicators show that salts are present, again, it is important to insure that we have the ability to move them through the soil profile and away from active roots so that there is no negative impact on turf growth and performance.

General tolerance levels include:

- <0.25 dS/m = Low Salinity Hazard
- 0.25 – 0.75 = Tolerable with moderate leaching and permeability in place
- 0.75 – 2.25 = Not tolerable on soils with restricted drainage or with salt sensitive plants
- >2.25 dS/m = generally not an acceptable irrigation water source

If you have an 'unacceptable' source of water but are forced to use it, it is imperative that bad salts are replaced with good salts at the irrigation pumping source and through amendments on the course. In addition, quality drainage characteristics must be in place throughout the irrigated property to prevent salt buildup in the soil.

HARDNESS AND ALKALINITY. These are oftentimes considered the same thing, but specifically they are not. Hardness refers to the level of Calcium carbonate and Magnesium carbonate in the water. However, other metals add to the hardness of the water.



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ALUMNI UPDATE

“While I believe that most superintendents realize that our profession has grown more business-oriented over recent times, I don’t think I really understood the level of business acuity I needed to have or could have to continue to grow in my profession. The topics covered at SBI were all relevant to our profession. From accounting principles and negotiating tactics to leadership and management training: all of the subject matter was made relevant to today’s superintendent. I’ve come to realize that while I have made efforts in my personal growth endeavors to participate in business and management educational opportunities, the SBI experience has taught me that I have still much to learn.”



Eric Foerster, CGCS, MG
Ironbridge Golf Club
Glenwood Springs, Colo.



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IRRIGATION

“To develop or implement any cultural practice or management program on the course, we need to understand what the water quality test is telling us.”

Sometimes you can taste iron in well water for instance. This iron (Fe³⁺) increases the hardness level of the water, but typically Calcium and Magnesium are the main drivers. Alkalinity refers to the ability of a water source to neutralize acids. As you can see, hardness and alkalinity go hand in hand. Just as if we have an acid water source we need compounds like Calcium and Magnesium carbonates to neutralize the acid, if we have high levels of Calcium and Magnesium (Hardness), we need to break those down (dissolve them) by using an acid. Remember that it is not the Ca and Mg that do the neutralizing of acid. It is the Carbonate (CO₃²⁻) as it associates with H⁺ ions...the ions that are causing the acid reaction. On the flip side, using acids in the presence of carbonates allows a disassociation of the carbonate compounds to take place. This happens most easily at the pumping source...particularly with using acids. To an extent, we can also address some related hardness issues using appropriate amendments on the course from routine applications of soluble products.

General hardness tolerance levels, reported as parts per million (ppm):

- 0 – 125: Satisfactory
- 126 – 245: Possible problem with calcium and magnesium buildup
- >245: Likely problem with calcium and magnesium buildup

CARBONATES (CO₃²⁻) AND BICARBONATES (HCO₃⁻) THESE LEVELS ARE THE FIRST INDICATORS OF MULTIPLE SALT ISSUES. As carbonates and bicarbonates rise, the sodium absorp-

tion ratio (SAR) and exchangeable sodium percentage (ESP) also tend to rise. Without the later indicators, carbonates or bicarbonates alone will not indicate the total problem present but will indicate the likelihood that calcium and magnesium are going to precipitate out of the water solution. That means they turn to solids and are not easily taken up by plants. Calcium and Magnesium carbonate compounds are strong ‘marriages’ in soil chemistry and are broken with acids. If carbonate and bicarbonate levels are high, there are no free Ca⁺⁺ or Mg⁺⁺ ions for easy uptake by the plants.

The following are general tolerance levels of CO₃²⁻ and HCO₃⁻. But note that the true hazards associated with carbonates and bicarbonates must be assessed using the Residual Sodium Carbonate (RSC) along with SAR and ESP.

Carbonate tolerance levels:

- 0 – 12 ppm: Satisfactory
- 13 – 62 ppm: Possible problem developing
- >62 ppm: Likely problem with key nutrient precipitation

Bicarbonate tolerance levels:

- 0 – 111 ppm: Satisfactory
- 112 – 525 ppm: Possible problem developing
- >525 ppm: Likely problem with key nutrient precipitation

RESIDUAL SODIUM CARBONATE (RSC). RSC is equal to the sum of the carbonate and bicarbonate ion concentrations minus the sum of the calcium and magnesium ion concentrations. This is figured out using the meq/l values, not parts per million. The conversion is done by

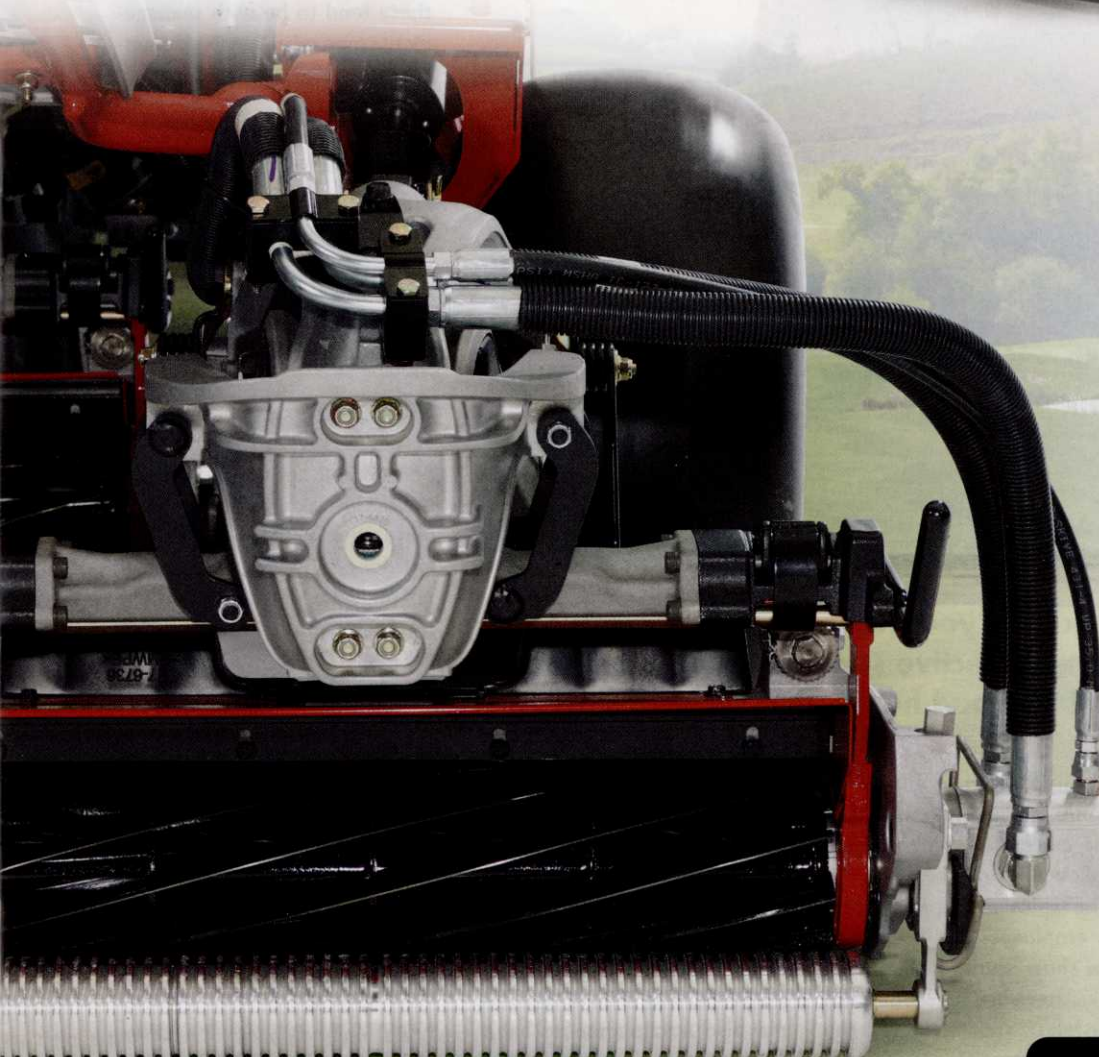
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BASIC TRAINING



It is hard to imagine what iconic businesses like McDonald's, or highly effective groups like the U.S. military, would have become without the development and investment in proper training programs. In golf I am aware of a number of company-wide training programs, however these tend to be with management companies, high-end country clubs and government-run facilities.

The development of an effective and successful formal training program will take time and money. However, it's an investment that will have an immediate return on investment and will actually make your job easier as a manager of a well-trained staff.

BASICS. Golf courses have a variety of repetitive tasks that need to be accomplished daily to provide desired levels of conditioning and playability. Most of these tasks are done by workers who may not understand what the finished product should look like and whether the job was completed successfully.

Golf courses are living entities and they grow and change daily. However, many of the maintenance practices don't evolve at the same rate and often do not require substantial judgment decisions for the average worker.

For example, mowing greens, nearly 100 percent of the time, is a routine performed the same way over and over and over again. Yes, there are instances when we may have to use different approaches, such as with new seedlings, first mowing of the year, or after aeration. The

Is your training regimen killing your maintenance department? Bruce Williams outlines an effective strategy to pass on best practices and eliminate bad habits and shortcuts.

I often tell the story about training that is fitting for golf courses. The story is based on my observations over the years and defines the challenges that all facilities face with being run and managed like a business.

The primary question is how many people would send their children to a school that had no teachers and where the students are only taught or trained by their fellow students? The answer is simple, that nobody in their

right mind would do this. Yet, it is commonplace in golf course management for superintendents to follow this practice.

The typical scenario is to hire new employees and then have them show up the next day for work. After a brief welcome with their fellow staff members, the employee is sent to work alongside a co-worker who shows them the ropes on tasks such as bunker raking, weed eating or another job. Therein lies the problem.

Under this scenario, the new employee begins to develop their own idea of what management wants and what defines the facility's maintenance standards. While the new employee may learn some good techniques and the proper way to do things, they may also pick up some bad habits and shortcuts that management would not find acceptable.

There is only one way to prevent this and that is to have a formal training program.

TRAINING



first approach would be to train people to handle the task and then deal with the isolated incidents later in the training cycle and reinforce those practices that are used on a seldom basis.

When staff goes out to mow the greens you want to be sure they understand what scalping is, what straight lines are about, which direction you should be mowing that day. They need to look for isolated dry spots, fix ball marks and be cognoscente of dew removal, overlapping, proper turning and clipping disposal. If all of your operators are doing this daily, then you will have uniformity on your greens and similar putting quality including speed, trueness and look.

TRAINING TRAINERS. Training should be conducted by management and not fellow workers with longevity. To assure standardization of procedures, it is best that training comes from one person on the staff – the superintendent, an assistant superintendent or a foreman. There are a variety of methods that can be utilized. For a training program to be formal in nature, the program should be in writing and reviewed on an annual basis and adjusted when necessary.

It could take a few months to develop an outline and training program, but it is time and money well spent. Other components include video training. I particularly like the Superintendent Video Workshop from EPIC Creative. These videos teach a generic version of various tasks on the golf course and pictures are worth a thousand words. Each individual golf course then must customize

their own training program to fit their specific needs.

Training should begin at the point of hire and then be continuous throughout the period of employment. New technologies, new practices and occasional tweaks in programs should be addressed with refresher courses for long-term employees.

Without a formal training program the staff tends to do things in the manner that is quickest, easiest and not in sync with the rest of the team. Without proper training it is very difficult to manage a team that makes up its own rules and where the members call their own plays. So the time invested in the training will result in less time spent managing and teaching on the fly after the mistakes are made.

TRAINING MODULES. Training modules are an efficient and effective way to conduct not only training, but continuing education, as well. Here's a cross section of training modules and what they should include:

- Orientation
- Hazard communication
- Safety
- Standard Operating Procedures (SOP)
- Equipment operation
- Equipment maintenance
- Cultural practices
- Standard tasks

The law requires several of these training modules. While others are not required for employment, they will increase quality and efficiency and also possibly keep your club and department out of some potential law suits.

(TRAINING continues on page 50)

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Tim Moraghan, principal, ASPIRE Golf [tmoraghan@aspire-golf.com]. Follow Tim's blog, Golf Course Confidential at <http://www.aspire-golf.com/buzz.html> or on Twitter @TimMoraghan

NOT-SO DIRTY DOZEN

Many of us were lucky to grow up in the industry with researchers and scientists who have become legends, among them James Beard, Joe Duich, Joe Vargas, and Paul Rieke. We owe these gentlemen and their legions of research assistants a huge debt of gratitude for what they've done to advance turf over the past three decades.

So who are the next grass gurus? Is there a new generation of scientific wunderkind getting ready to set the standards? Indeed there is.

As I've attended turf conferences, regional meetings and research field days, I've met and listened to a new crop of talented young agronomists who soon will be changing our world. Some of them might not yet be known to you, but they—and their research—won't stay under covers for long.

Here is a list of 12 up-and-comers to keep your eye on, men and women working in soils, turf, weeds and other disciplines critical to our profession. Apologies to the many others not on this list, and thanks to you all for working hard to make our lives, and work, better in so many ways.

Dr. Aaron Patton – Purdue University,
Department of Agronomy
ajpatton@Purdue.edu
765/ 494-9737

Research Interest: Weed Biology and Control Turfgrass Extension. Current projects include warm season turf grass germplasm evaluation and product evaluation of biopesticides.

Comment: New-wave pesticide research will result in a wider variety of safe products, which besides improving turf will reduce the pressure on superintendents.

Dr. Dara Park – Clemson University,
Horticulture Department
darep@Clemson.edu
843/ 319-4957

Research Interest: Turf grass, Soil & Water Quality and Quality in Turf grass Systems

Comment: The use and dispersal of effluent water on golf course and landscape turf grass can only grow. Work like this will keep us better informed on how to use effluents wisely and effectively.

Dr. Doug Soldat – Wisconsin University,
Department of Soil Science
djsoldat@wisc.edu
608/ 263-3631

Research Interest: Evaluation of use of biosolids for improving the economics and environmental sustainability of sod production. Identify water and nutrient management strategies to promote healthy turf grass and minimize the loss of water and nutrients from the root zone.

Comment: It all starts with a properly functioning rooting zone.

Dr. Michelle DeCosta – University of Massachusetts, Stockbridge School of Agriculture
mdacosta@psis.umass.edu
413/ 545-2547

Research Interest: Drought Stress and Low Temperature Stress physiology of Cool Season Turf grass. Irrigation management and water use.

Comment: With winter golf on the rise—for which we can thank or curse “global warming”—preventing winter turf decline will lead to more golf and more golfers.

Dr. Gerald Henry – University of Georgia, College of Agriculture and Environmental Sciences
gmhenry@uga.edu
706/ 542-2461

Research Interest: Crop and Soil Sciences. Monitored MSMA leaching po-

tential in Bermudagrass. Performance testing of sports fields for assessment of player safety and field playability.

Comment: Golf isn't the only area of turf grass research. Other types of playing fields need better study. And sports field management could offer other career opportunities for us.

Dr. Stacey Bonos – Rutgers University, Department of Plant Biology and Pathology
bonos@aesop.rutgers.edu
848/ 932-6367

Research Interest: Developing improved pest resistance and stress tolerant turf grasses for conservation and environmental enhancement in the Northeast. Turf grass breeding for disease resistance and salt tolerance in various turf grasses species.

Comment: The more we can make turf resistant to wear and tear, the more golf—and other games—we can play.

Dr. Jim Kearns – North Carolina State University, Department of Turf Grass Science

jkerns0@gmail.com
608/ 516-8917

Research Interest: Turf grass pathology. In four years at University of Wisconsin the focus was based on disease of cool season turf grasses, in particular dollar spot and snow molds. There will be a shift in research focus once settled into the NC State University system.

Comment: Jim brings a wealth of cool-season turf grass disease experience to the Carolinas, where there remains a large percentage of creeping bent grass.

Dr. Kelly Kopp – Utah State University, Plants, Soils and Climate
Kelly.kopp@usu.edu

(MORGHAN continues on page 50)

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TIER IV has officially kicked in, and as a result prices will increase for diesel-powered turf maintenance equipment greater than 25 horsepower. Are you prepared?

By now, most golf course superintendents should have heard of the EPA's Tier IV diesel engine emission reduction mandate and how it will impact their budgets. The mandate took effect on Jan. 1, 2013, and impacts all diesel-powered turf maintenance equipment greater than 25 horsepower. The good news? All Tier IV-compliant turf equipment manufactured after Jan. 1, will be better for the environment and healthier for everyone. The bad news? The equipment will cost more.

But there's more good news. According to Grant Young, director of marketing of the Commercial Division at The Toro Co., turf maintenance is one of the last categories of diesel-powered products to go through the major stage of Tier-IV compliance.

"Because of this, many of our customers have already seen the pricing (and technology) implications of achieving compliance, keeping in mind that the technology drives the cost," says Young.

Young cites over-the-road trucks,

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By Jason Stahl

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certain power ranges of tractors, tub grinders, construction equipment and forestry as examples of equipment that has already experienced the major “jump” in price associated with the stiffest tiers of compliance.

“So, comparatively, the price of compliance isn’t terribly surprising to anyone who has had experience in one of the other categories, OTR trucks probably being the closest to most,” Young says. “That said, it’s never easy delivering a message of price increase to customers. In the end, it’s a mandatory regulation that has a price associated with it.”

Young expects prices to go up 10 to 20 percent, a number that has been consistent with price increases in other power classifications that have gone through Tier IV.

Reaction from customers so far has been mixed, says Young, depending on their knowledge and awareness of Tier IV.

“Those who have already experienced something around Tier IV due to buying an OTR truck



The technology changes are nearly imperceptible, with most of the changes occurring under the hood.

for their fleet (or even personal use), for example, aren’t really phased by it,” he says. “Those who have little or no awareness are more surprised. I would say this is the main reason why we’ve been out trying to message the

issue and what it means. The worst thing for the industry is to have ‘surprised’ people as of Jan. 1, 2013.”

Toro has been spreading that message for the last 18 months through industry associations,

conferences, electronic and printed materials, distributors and individual customer visits.

“Because this is a major change to turf maintenance equipment, and because capital purchase schedules are usually planned years out, we feel creating awareness to the change and its implications is critical to being a good partner with our customers,” says Young.

Toro’s message has been in four parts: What is Tier IV? Why is it happening? When is it happening? And what does it mean to me (in terms of product performance, pricing, capital budget implications, the environment, etc.)?

Mark Ford, marketing manager of John Deere Golf, says his company has not released pricing for its Tier IV compliant products yet but is sensitive to the concerns in the marketplace that Tier IV could have on pricing.

“With that in mind, John Deere has been focused on bringing maximum value to our customers with new product features and benefits, while meeting all regulations,” says Ford.

Prepping your ownership

Like a lot of things in life, it comes down to knowledge, preparation and planning. That’s exactly the strategy superintendents should take when it comes to informing their bosses about the Tier-IV price increases.

“Capital planning should be a multi-year process,” says Grant Young, director of marketing of the Commercial Division at The Toro Co. “And knowing what’s coming and what your options are will help superintendents and all stakeholders make the best agronomic and financial decisions for their facilities.”

Proactive approaches are often recommended for managing turf diseases, but it’s also the way to go when handling situations your ownership might have issues with.

“Look ahead,” says Mark Ford, marketing manager of John Deere Golf. “Start talking with your ownership now about the long-term needs of your course and your equipment budget. This will help determine what changes, if any, are needed for your near-term product replacement life cycle.”

Jacobsen also emphasizes preparation as the key to superintendents avoiding giving course ownership sticker shock when Tier IV products are

released to the market.

“There will be a larger investment in service capabilities with the new engine and filtration technologies. The best way to overcome these obstacles is to prepare for them,” says Rachel Luken, product manager for Jacobsen. “Therefore, start educating all levels within the property about the upcoming federally-driven product change. All information needs to be reviewed in order to prepare an accurate equipment replacement plan.”

As capital equipment budgets are developed for new or replacement equipment needs, Luken says superintendents should consider the following options:

- Buy on regular routine. When a capital equipment plan calls for new equipment and/or existing equipment’s useful life ends, buy what is available and pay market price.
- Buy ahead. Prices are forecasted to rise when Tier-IV compliant equipment is released, so postpone the purchase of higher priced equipment and buy in advance of a regular replacement cycle.
- Buy environmentally friendly. Despite the expected higher prices, actively seek out and purchase the greenest Tier-IV product.
- Buy used. Since equipment is compliant based on the year of engine manufacture, buy equipment that is already in use.