



Super Science

// TRAFFIC TRAUMA

DEFICIT IRRIGATION AND TRAFFIC IMPACTS BERMUDAGRASS FAIRWAY PERFORMANCE

Reagan Hejl and Ben Wherley, Ph.D.

Golf course water use in Texas has become increasingly regulated in the past decade due to persistent drought conditions, diminishing water supplies and rapidly growing population. Many golf courses have been faced with considerable cutbacks to irrigation allocations, but information is limited regarding critical levels needed for maintaining adequate turf quality, persistence and recovery from divots and traffic.

A field study was conducted over two years in College Station, Texas, to determine the effects of continuous reference evapotranspiration (ET^o)-based deficit irrigation levels on quality of Tifway bermudagrass (*Cynodon dactylon* x *C. traansvalensis* Burt. Davy) fairway plots. Turf quality evaluations from both seasons demonstrated that in the absence of traffic, irrigation levels of 30% x ET^o (supplied 3x/week on a fine sandy loam soil) were sufficient to maintain acceptable turfgrass quality during summer months. Canopy temperatures noticeably increased with deficit irrigation practices, with up to a 30°F temperature increase observed between irrigated and unirrigated plots.



Simulated traffic being applied to deficit irrigation research plots at the Texas A&M Turfgrass Field Laboratory.

Upon resumption of full irrigation levels in October of both years, deficit and unirrigated plots quickly recovered to ~90 percent green cover by late November 2012, but these same plots were much slower to recover after the 2013 season, indicating cumulative drought stress effects, especially in unirrigated plots. In both years, traffic delayed fall recovery of turf at all irrigation levels. This research was supported by the GCSAA's Environmental Institute for Golf and the Lone Star Chapter of Golf Course Superintendents.

Reagan Hejl and Ben Wherley, Ph.D., Texas A&M University, College Station, Texas. Ben Wherley can be contacted at b-wherley@tamu.edu for more information.

NEWS UPDATES

BAYER CROPSOURCE RECEIVES AGROW AWARD FOR INDAZIFLAM

Environmental Science, a division of Bayer CropScience LP announced indaziflam, the herbicidal active ingredient in Specticle, received an Agrow Award in the category "Best New Crop Protection Product."

Specticle is a pre-emergent herbicide that provides turfgrass professionals superior control of more than 90 grasses, broadleaf weeds and annual sedges at up to 40 times



lower use rates than current standards. "The need for new herbicides with alternative modes of action and resistance-breaking capabilities is more urgent than ever," said Dr. Hermann Stübler, Head of Weed Control Research

at Bayer CropScience. "In a team effort we created and developed indaziflam, employing our leading expertise in herbicide research and our deep knowledge of weed control."

“WITH INTRINSIC FUNGICIDES, THE TURF IS ABLE TO RECOVER FROM STRESSES MORE QUICKLY DUE TO INTERNAL PHYSIOLOGICAL CHANGES AND A STRONGER ROOT SYSTEM.”

Renee Keese, Ph.D.
(see full story on page 42)

//NEW ACTIVE INGREDIENT

BASF unveils Xzemplar and Lexicon Intrinsic

By Renee J. Keese, Ph.D., BASF

BASF research and development is the process of carrying out investigations to create a product to bring to market. This is a time consuming and expensive part of our industry, but necessary for the launch of new products.

For the past six years BASF has been developing a new active ingredient for use in turf markets, as well as agricultural crops. Fluxapyroxad is a SDHI (succinate dehydrogenase inhibitor) and blocks the process of plant respiration at Complex II. Growth of fungal cells is stopped when the biosynthesis of building blocks is interrupted. Fluxapyroxad quickly penetrates to the interior leaf tissue; where it is bound to wax layers within the leaf, and this contributes to making it rainfast as

“Lexicon Intrinsic is a next generation Intrinsic product that delivers both superior disease control and advanced plant health...”

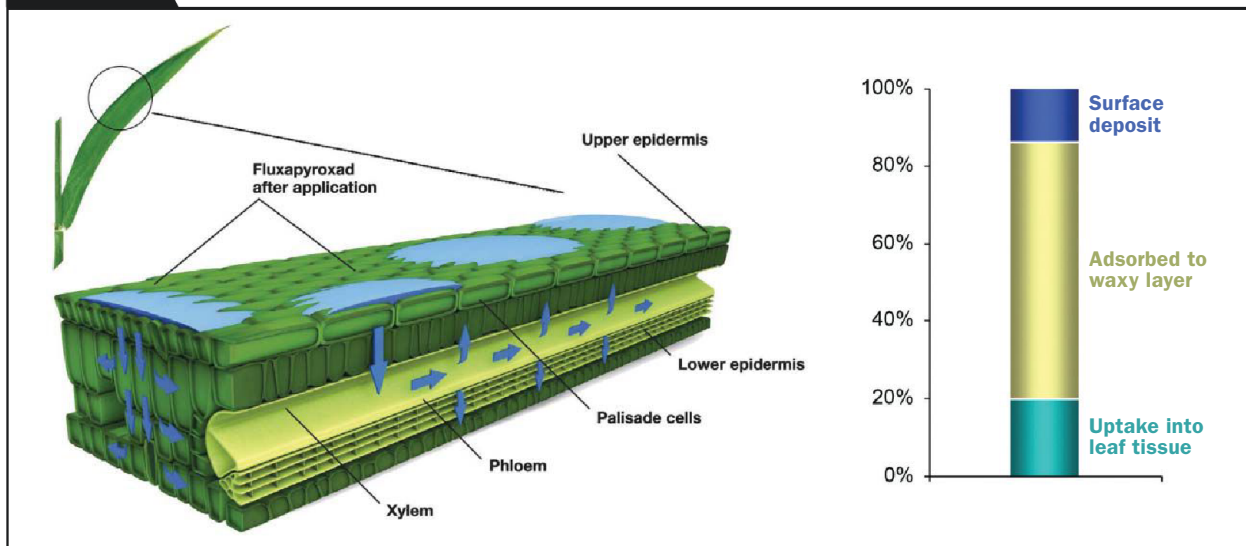
soon as the spray is dry (Figure 1). It moves upward in the plant through the xylem and protects parts of turf blades that did not receive spray application. This new active ingredient has been shown in field trials to be effective at very low rates due to its high level of biological activity in fungi.

SDHI chemistries belong to FRAC Group 7. Emerald fungicide, which contains boscalid, is also a carboxamide belonging to this same mode of action. But fluxapyroxad has lower use rates than boscalid-containing products. Early testing compared this

new chemistry to boscalid, and determining the use rate and application interval took a few years of study. Once the formulation and load of the active ingredient in the product are determined, the use rate and application intervals can be evaluated. Xzemplar, the product containing fluxapyroxad, is a 300 g/L SC (suspension concentrate) formulation.

The process of bringing new products to market takes multiple years and requires many tests. Since 2008, over 200 field trials have been conducted with university or private contract turfgrass

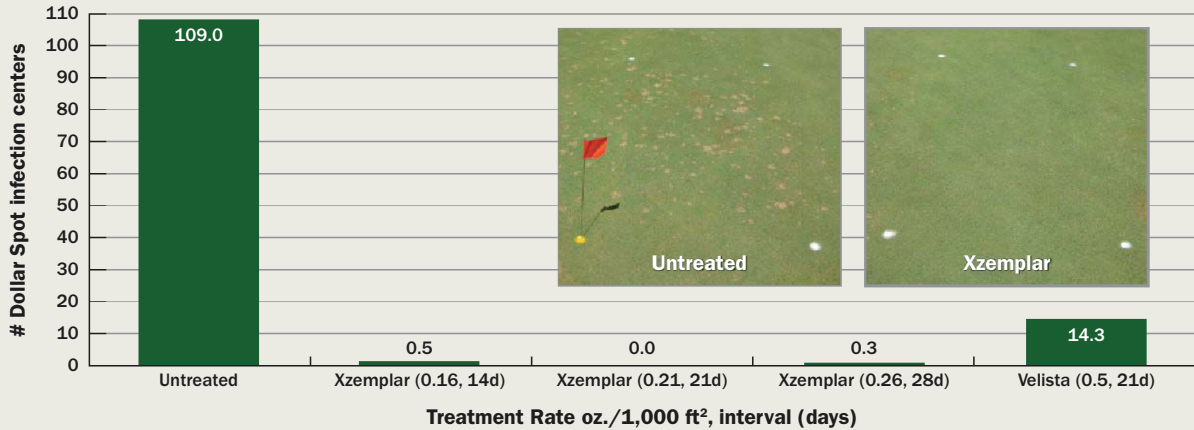
FIGURE 1



Fluxapyroxad delivery into leaves drives good systemicity. The fungicide coats the leaf surface then penetrates internally where it moves upward in leaf tissue, with the flow of water in xylem. Seven days after application the bulk of fluxapyroxad is found adsorbed to the wax layer in leaves. (Courtesy of BASF)

FIGURE 2

Preventive dollar spot control (*Sclerotinia homoeocarpa*) at varying rates and intervals.



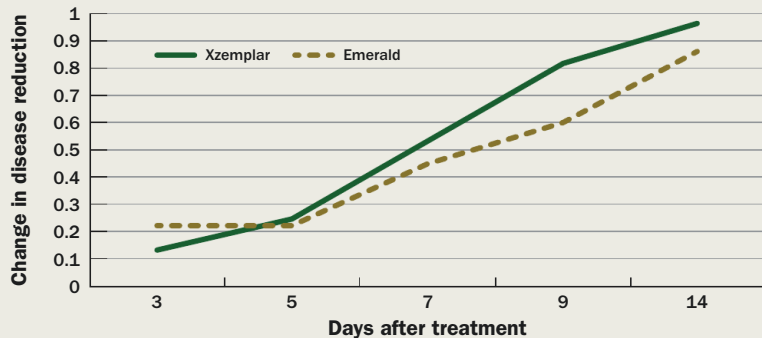
Data from John Inguagiato, Ph.D., University of Connecticut, 2012 trial. Evaluation 40-days after initial treatment and 14-days after the last treatment. Three applications made on 14-day interval, two applications on 21- and 28-day intervals. LSD=17.42 at P=.05. Photos from Florence, S.C., courtesy of BASF.

researchers. Use rates of Xzemplar are lower than Emerald and under moderate disease pressure, the interval can be extended. Many superintendents will be familiar with the product Emerald, which historically has provided strong dollar spot control; Xzemplar controls dollar spot (*Sclerotinia homoeocarpa*, soon to be known as *Clariireedia homoeocarpa*) and brown patch (*Rhizoctonia solani*), the two most important and prevalent turf diseases, as well as several other patch diseases. Continued testing demonstrated this new product has broader disease spectrum than Emerald fungicide. Dollar spot efficacy from fluxapyroxad is both preventive and curative (Figure 2). Whether disease has actively begun to infect, or conditions are right for growth, fluxapyroxad will stop further growth when it contacts the fungi. Activity across four trials in the US in 2012 demonstrated efficacy faster than Emerald (Figure 3).

The Xzemplar label provides flexibility in application rates, with rates as low as 0.16 fl. oz./ 1000 sq. ft., or a mid-rate of 0.21 fl. oz. and up to 0.26 fl. oz. /1000 sq. ft. This allows superintendents to vary their application intervals based on the fungicide program they use or disease pressure on the golf course.

FIGURE 3

Curative dollar spot control from Xzemplar and Emerald applications, 14 days after one application.



Data from four 2012 trials in Mo., N.C., Pa. and S.C. Disease pressure at initiation of trial averaged 15%. Average disease pressure between eight-10 days was 31 percent dollar spot incidence. The change in disease is compared to the previous rating within the identical plot. The steeper slope of line indicates faster control.

For light disease pressure the lower or mid-rates are sufficient and the interval can be increased to 21- or 28-days. The Xzemplar label includes diseases such as brown patch, dollar spot, large patch, snow molds and summer patch, along with reduction of algae. Use sites include golf courses, residential and commercial lawns, parks, athletic fields, cemeteries and sod farms.

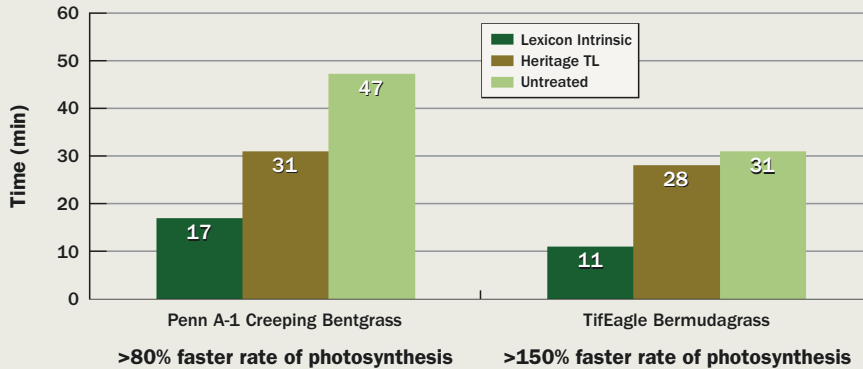
A combination product was also developed containing fluxapyroxad and the active ingredient (pyraclostrobin) in Insignia SC Intrinsic brand fungicide.

This combination is very broad spectrum and provides excellent dollar spot control. The flexibility of two modes of action (SDHI and QoI - Quinone Outside Inhibitor) is an excellent tool for resistance management. The combination product, Lexicon Intrinsic brand fungicide, is also a suspension concentrate (SC) formulation like Xzemplar, and can be used on the same turf use sites. This 500 g a.i. /L formulation contains 167 g of fluxapyroxad and 333 g of pyraclostrobin. Excellent

Continued on page 44

FIGURE 4

Float time of 50 percent of Penn A-1 creeping bentgrass and TifEagle dwarf bermudagrass leaf segments treated with Lexicon Intrinsic or Heritage TL fungicides.



Continued from page 43
control of diseases like anthracnose (*Colletotrichum graminicola*), brown ring patch, caused by *Waitea circinata* pv *circinata*, and leaf spots like *Bipolaris* and *Dreschlera* spp. was achieved with Lexicon Intrinsic at both labeled rates (0.34 and 0.47 fl. oz. /1000 sq. ft.). Lexicon Intrinsic is a next generation Intrinsic product that delivers both superior disease control and advanced plant health, including the ability to withstand stresses such as extreme temperatures, drought, mechanical processes such as aeration, etc.

To demonstrate the impact on rate of photosynthesis, fungicide-treated leaf disks or segments were put into a sodium bicarbonate solution with detergent. This solution provides a carbon source for photosynthesis and breaks the surface tension on the leaf surface. After drawing a vacuum to remove the cellular interstitial space, the leaves sink to the bottom and are placed in the dark for five minutes. The leaf segments were then placed into cuvettes under light, and as oxygen was released and bubbles formed on the leaf surface, the leaf segments floated. The quicker float

time indicates a faster rate of photosynthesis and healthier turf plants; Lexicon Intrinsic treated turf (0.47 fl. oz. /1000 sq. ft.) had the fastest photosynthetic rate compared to Heritage TL (2 fl. oz. /1000 sq. ft.) or untreated leaves (Figure 4).

With Intrinsic fungicides, the turf is able to recover

from stresses more quickly due to internal physiological changes and a stronger root system. Research indicates that Lexicon Intrinsic Brand Fungicide is effective on over 30 disease organisms, and is a fast acting fungicide, which provides additional plant health benefits. Both Lexicon Intrinsic and Xzemplar received US EPA registration December 17, 2013. Always read and follow label directions.

Renee Keese, Ph.D., is a biology project leader for turf and ornamentals for BASF.

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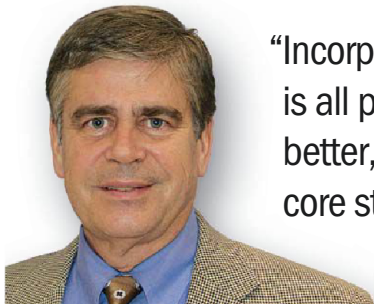


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“Incorporating new ideas and plans is all part of making something better, as long as you know your core strengths and uniqueness.”

KARL DANNEBERGER, PH.D., *Science Editor*

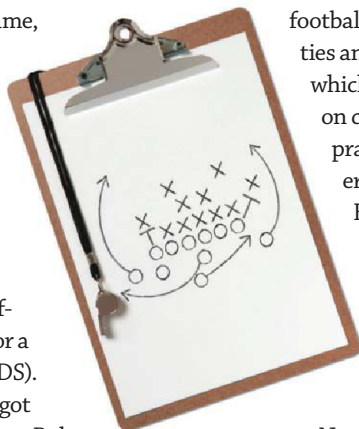
Leadership isn't something you clone

At the beginning of 1969, the University of Michigan hired Bo Schembechler as football coach. Previous to his hiring, Michigan was at best a mediocre team through the 1960s. Attendance at the football games averaged between 30,000 and 60,000 in a stadium that seated over 100,000 fans.

Schembechler came to the university during a time of unrest and radicalism for students. In this environment it was not uncommon for students to go to a home football game, at least those who went, then head to central campus to protest the Vietnam War. Around the same time of Schembechler's arrival, a group of student radicals formed the Weathermen, an offshoot to the Students for a Democratic America (SDS). The Weathermen, who got their name from a line in a Bob Dylan song, “You don't need a weatherman to tell you which way the wind is blowing,” bombed government buildings and banks in protest.

During spring football in 1969,

Schembechler came into the radical student and university setting and changed the culture of the football team. He required the football players to wear coats, ties and letter jackets, for which they faced ridicule on campus. During spring practices, one to two players were quitting daily. However Schembechler said, “Those who stay will be champions.” Whatever he did, he transformed an average team into one that beat the



No. 1 ranked Ohio State University in the fall of 1969. I bring this story up, because years later some of his assistant coaches got head coaching jobs at other university football programs. One university hired an assistant with the intention of

getting a clone of Schembechler. This coach failed miserably. Whatever traits made Schembechler a leader were not easily copied.

Acting like someone does not make a leader or a successful person. If you are trying to be someone you are not, people will see you as a fake. We have all seen that in a new superintendent who acts like someone he is not. The staff and crew see right through the charade.

I know you can learn to be a better leader by working for, or observing others you admire through leadership classes, conferences and by reading. A key is recognizing who you are, your strengths and weaknesses, then incorporating what you admire and learn into your “self.”

My comments are not earthshaking and serve only as a reminder, but we can use these same ideas to make for a better golf course and golf course operation. A golf course is designed in a location that has unique characteristics, and might be referred to with a, “This is how golf was meant to be played” only to be copied somewhere else and fail.

Why? Because each site has a unique quality to itself, perhaps land form, location or market. Whether it is a golf course or a golf course management program, incorporating new ideas and plans is all part of making something better, as long as you know your core strengths and uniqueness.

Bo Schembechler was a leader of men. He is in the company of other leaders like Dwight D. Eisenhower, Martin Luther King, Jr., Ronald Reagan, Nelson Mandela and John F. Kennedy to name a few. Each shared similar qualities, but each was unique.

What is it that makes you unique and how can you build on that to become a better leader or a leading golf course facility?

Karl Danneberger, Ph.D., *Golfdom's* science editor and a professor at The Ohio State University, can be reached at danneberger.1@osu.edu.

ISTOCKPHOTO

Thatch collapse disease

John Kaminski, Ph.D., is an associate professor of turfgrass science at Penn State University. Thatch collapse is one of many turfgrass diseases he and his students study. Kaminski can be reached at kaminski@psu.edu.

Q Talk a little bit about the fungal pathogen that causes thatch collapse disease.

The fungal pathogen we have isolated from numerous samples with thatch collapse disease is *Sphaerobolus stellatus*, a basidiomycete.

Q What are the symptoms associated with the disease?

We see the symptoms most often on putting greens due to the low mowing heights. On greens, the most common symptoms are a slightly depressed area of green turfgrass, anywhere from several inches to up to two feet in diameter, with longer, wider leaves in the depressed area. Since the turf in the depressed area is mowed at a higher height than the surrounding turf, it is noticeably greener and easier to see.

The crowns in the depressed area are white and healthy. The organism does not kill or thin the turfgrass plants. In some cases it is possible to see the mycelium in the soil just below the soil surface of the depressed areas.

Q Where on the golf course do you find thatch collapse disease?

We find thatch collapse disease most often on putting greens because of the low mowing heights of the green contrasts with the slightly higher mowing height of the depressed area. The disease can be found on collars, approaches, tees and fairways.

Usually the disease is found on a few

greens on a golf course and there appears to be no pattern within a single green.

We have received thatch collapse disease samples from velvet bentgrass, creeping bentgrass and annual bluegrass greens. In Australia and New Zealand thatch collapse also occurs on bermudagrass greens.

“THE ONE COMMON ELEMENT AMONG ALL THE SAMPLES IN WHICH WE HAVE POSITIVELY IDENTIFIED THATCH COLLAPSE DISEASE, IS A HIGH LEVEL OF ORGANIC MATTER.”

The one common element among all the samples in which we have positively identified thatch collapse disease, is a high level of organic matter.

Q What are your thoughts on why this disease is becoming a problem now?

I think thatch collapse has probably been around for several years, but it was mistaken for other diseases, such as fairy ring. With increased awareness of the disease, superintendents have submitted more samples for identification.

Q What steps can be taken to minimize damage from the disease?

We are still learning how to manage the disease and at this point we suggest that a superintendent undertake an aggressive thatch management program that would include aggressive cultivation and frequent topdressing to reduce the severity of the disease.

There are only limited data on fungicide control strategies. If a superintendent wanted to try a fungicide, we suggest using a fungicide that is effective at controlling fairy rings since the causal agent of thatch collapse disease is a basidiomycete, like the causal agent of many fairy rings. The challenge is to get the fungicide into the soil where the mycelium is located. Since the organism does not kill the plant, getting the fungicide into the plant isn't as important.

Q Anything else you would like to add?

In only about 30 percent of the samples we receive are we able to identify thatch collapse disease. If you suspect that you have thatch collapse disease, remove a small plug of turfgrass with two or three inches of soil attached and place the plug in a clear container. Place the container in a window where it will receive ample sunlight. In a week or two, look for the fruiting bodies of the fungus growing out of the plug. There are a number of places on the internet where you can find pictures of the fruiting bodies.

In a couple of days it is likely that you will see the mycelium growing in the soil below the plug. The depth of the mycelium tells you how deep you have to get a fungicide in the soil to provide some control of the disease.

Editor's Note

If you would like to submit a sample to determine if the turf has thatch collapse disease, contact John Kaminski at kaminski@psu.edu.



Clark Throssell, Ph.D., loves to talk turf. Contact him at clarkthrossell@bresnan.net.

Professional Grade

NEW PRODUCT HIGHLIGHTS // GIS SNEAK PREVIEW

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MORE PRODUCTS THAN YOU CAN SHAKE A SOIL MOISTURE METER AT.

BY SETH JONES // Editor-in-Chief

1. Hauler Pro

CUSHMAN is proud to introduce the next generation in golf utility vehicles, the fully electric Cushman Hauler Pro with a 72-volt AC drivetrain that provides the range and power once exclusive to gas-powered machines in a silent, zero-emissions vehicle. The Hauler Pro has up to a 50 mile range fully loaded on a single charge and is equipped with energy-efficient AC Drive technology and regenerative braking that recharges the batteries whenever the vehicle's brakes are applied. Additional features include: 72V AC powertrain that provides consistent speed up and down steep slopes; maximum load capacity of 1,000 pounds; 9.5-cubic-foot cargo bed or optional 14.9-cubic-foot aluminum cargo bed; wider front axle and larger turf friendly tires.

Visit cushman.com or **GIS booth 1353**

2. Triple Crown

A multiple action insecticide providing fast-acting, long-lasting broad-spectrum control of more than 30 above and below-ground turf pests, Triple Crown golf insecticide

is now available from **FMC CORPORATION**. Triple Crown is an innovative three-way combination of FMC bifenthrin, FMC zeta-cypermethrin and imidacloprid, offering multiple modes of action on key pests including armyworms, cutworms, sod webworms, grubs (masked chafer, European chafer and Japanese beetle), chinch bugs, annual bluegrass weevils, billbugs, mole crickets and more. Among the fastest liquid insecticides now available for superintendents, Triple Crown is labeled for broadcast golf course turf applications. Research among university specialists in various parts of the country has shown that Triple Crown delivers fast results against damaging annual bluegrass weevil and billbug adults, chinch bugs and mole crickets.

Visit fmcprosolutions.com or **GIS booth 2000**

3. Ready and Platinum

Designed with common sense in mind, **AIR-O-LATOR'S** fountain lines have always been engineered for easy installation, removal and equipment maintenance. At the request of customers, the new Ready and Platinum

ORLANDO JUST BRINGS THE BEST OUT of the Golf Industry Show. It's always the highest-attended GIS site, and this year the trade show makes a comeback in size (see the *Golfdom* Report on page 24.) We reached out to GIS exhibitors for products that we could sneak preview in the magazine, and got back more than we could fit. Look for the overflow on Golfdom.com, and in the next two months, look for the best in show to be written up right here in this space.

fountain rock float is an alternative to a decorative cover. Currently, the rock decorative cover is available as an accessory. Customers camouflage the polyethylene molded plastic with a cover styled to look like stone. The new rock float combines both the float and the rock cover into one piece. The flotation device is an integral part of the Font N'Aire fountain line. It is important in providing a stable and safe mounting platform. The rock float provides a decorative, single device that camouflages the installed fountain, lights and electrical connections providing a more aesthetic, top-of-the-water view.

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4. Integrated Sensor System

RAIN BIRD says its Integrated Sensor System is the industry's only soil sensing system that delivers real-time full central control integration. Its sensors transmit soil moisture, salinity and temperature data to the system's software, which works with the course's central control system to make real-time decisions about when and how long to irrigate. Because

of its full integration with Rain Bird central control software, the ISS can automatically set individual station run times based on changes in soil moisture. Because superintendents define all the parameters, they retain total, customized control of their irrigation systems at all times. The ISS is also easy to expand. Superintendents can start with one sensor and then add to their systems as demand and budgets permit.

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5. Country Club MD

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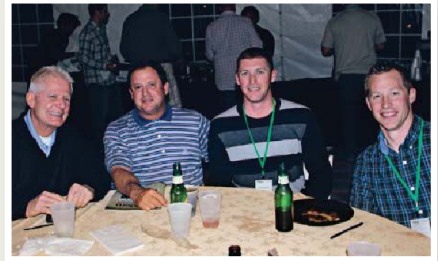
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