Nothing on the course is more valuable – and regulated – than water, and superintendents don't want it trickling through their fingers

Precious to the Last Drop



f only irrigating a golf course was as simple as spelling H-2-O. Instead, superintendents often find themselves torn between babying their bentgrass and obligating their enablers.

There's the electric company, handing out penalties to anyone caught hogging all the juice during

the a.m. crunch.

There's the waterman, demanding that a minimum amount of effluent be used each week.

There's the conservationist, measuring overuse of the good stuff by the thimble.

And there are the ever-present golfers, ready to hit the links, sans live sprinklers, at daybreak.

"The modern superintendent serves many masters," says Jeff Kiewel, the national sales and marketing manager for Rain Bird's golf division.

In the meantime, near perfection is expected of the superintendent in the quest for flawless playing conditions. Accomplishing that in the northeast United States is difficult enough; doing so in the more arid parts of the country represents survival of the wettest.

"Irrigation management is the most crucial

part of our operation. It's probably 80 percent to 90 percent of what makes a good golf course a good golf course in Arizona," says Ernie Pock, the superintendent at Grayhawk Golf Club in Scottsdale, Ariz. "If we can manage our water, we can produce a very good playing surface."

Are clubs succeeding? In terms of irrigation uniformity, a primary determinant of waste, they are not, according to the American Society of Irrigation Consultants (ASIC). Independent consultant Jim Barrett, citing ASIC data, says the majority of U.S. courses have uniformity figures in the 50s and 60s rather than the acceptable level of 80 out of 100.

"(Scores of) 50 and 60 are terrible; a terrible waste of water, a terrible waste of power," says Barrett, the president of James Barrett Associates Inc., based in Roseland, N.J. "You need as uniform coverage as you can have and as efficient a system as you can have. The good superintendents are very concerned with precision of irrigation."

Checking the list

The first step toward improving water management is to have an irrigation system evaluated about every five years by a third party, such as a certified golf irrigation auditor (CGIA). An audit can do one of two things: 1) reveal simple changes that may lead to upgrades in the system's performance and efficiency; or 2) produce a cost-justification analysis for the superintendent wishing to replace or upgrade the irrigation system.

Differentiating between complete system renovation and upgrading is vital to the bottom line, considering a new system ranges between \$700,000 and \$2 million, while replacing sprinkler heads and their controllers can be a third of that cost.

"Audit costs are very reasonable, especially in light of the fact that they usually easily pay for themselves through system operating cost savings, not to mention improved course playability," says Rich Dunn, the golf rotor product manager for Hunter Industries.

CGIAs set their own rates, and costs are usually based on the number of valves or controller stations covered in the audit. A standard audit lasts one or two days and averages about \$2,500. A more detailed audit can include a return on investment analysis that can be valuable when presenting a proposal to club management.

"For capital improvement, I think (audits) are a very important tool," Pock says. "They're more for when you have to go to your owners and have to say, 'Hey, our irrigation system is wasting water,' or, 'Our irrigation systems aren't as good as they could be. Here are things we can do, and this is the audit that's telling us to do this.' "

"Irrigation management is the most crucial part of our operation."

ERNIE POCK, SUPERINTENDENT,

GRAYHAWK GOLF CLUB

Some of the common conclusions of an audit pertain to:

■ Sprinkler nozzles — After about 10 years, the efficiency of a nozzle deteriorates to the point where replacement should be considered. "It's not an insignificant expense," Kiewel says. "Depending on the number of heads, it could cost thousands of dollars to do a full nozzle replacement, but that's a lot cheaper than replacing your whole [irrigation] system."

Less expensive still, a system can be replaced one section of the course per year. *Continued on page 26*

Look in the Mirror

uniformity, such as this one, are few and far between.

Golfdom columnist Joel Jackson says all water woes will continue until individual homeowners and municipalities abide by the same standards they push upon smallniche users such as golf courses. See page 20.

Last Drop





"Audit costs . . . usually pay for themselves through system operating cost savings."

RICH DUNN,

GOLF ROTOR PRODUCT MANAGER, HUNTER INDUSTRIES

Continued from page 25

Some courses replace the heads around their greens and use the old sprinklers on the roughs. "Every single golf course in the United States has areas that can benefit from a new sprinkler that has adjustable trajectory and arc along with an optional back nozzle," says Toro Irrigation Sales Manager Bill Thornton.

■ Nozzle location — Closer spacing is a good thing as well, says Thornton. He recommends a separation of 60 feet to 65 feet in areas where water is tight. "This allows more even coverage and better control of water. It is very misunderstood in the industry: More sprinklers equals less water used."

■ Sprinkler differentiation — Water requirements for the green differ from the area around the green, Thornton says, so back-up sprinklers should be utilized around the greens. Separate systems for rough watering should also be considered. "If water shortages arise, this offers choices on where to cut back use and still maintain some playability," he says.

Command central

As drought conditions become more prevalent and as the price and quality of water move in reverse directions, new and improved versions of computerized central control systems, which originated about 15 years ago, are becoming a necessity, Kiewel says.

"Irrigation management is becoming more and more complicated every year," he says. "So, the real ball game on upgrades is control. Do you have enough control to put the amount of water where you need it and when you need it?"

With effluent water being pushed on courses, water placement becomes increasingly critical. One misplaced sprinkler, and the dissolved solids in effluent can ruin a green's complexion. In turn, the fertilizer or fungicide that will be needed to remedy the situation burns a hole in the course's budget.

"You need to have enough control of the system," Kiewel says, "to make sure that a) you don't have any overspray on the

green from some other place, and b) you can measure the use of the system so you can essentially pump out all the effluent water from the system before you start irrigating the greens."

With myriad groups dictating a watering schedule, a control system offers clock-like precision along with documented records.

"As there becomes more layers, the superintendent needs a better brain to help him optimize his systems," Kiewel says. "Let's say there are a dozen programs that run overnight to irrigate a golf course. Well, the central control will go out and find out which heads are available to be turned on, and it turns them on and runs them. The pump station runs most efficiently wide open, so you wind up using the least amount of electricity. And it's constantly doing the math and keeping a record of all of this, so if someone wants to come in and say, 'Did you use effluent last night?' I'm going to have a report that says, 'Yeah, here it is. These programs ran the effluent. They ran at this time. This is the amount of water I put down.""

Central control systems consist of a central control unit and controllers, or satellites, which cost about \$5,000 to \$6,000 apiece. The more sprinkler heads a course features, the more controllers it will need.

"Controls are all above ground, so your primary cost is the cost of equipment," Kiewel says. "We're seeing more and more people *Continued on page 28*





"We're seeing more and more people . . . doing control upgrades . . . so over a five-year period, they have a new system."

JEFF KIEWEL, NATIONAL SALES AND MARKETING MANAGER, RAIN BIRD GOLF DIVISION

Continued from page 26

who are satisfied with their (current) irrigation designs. So they're doing control upgrades. Or they're doing all of their satellite controllers this year, and next year they're going to do centrals. And then they're going to start doing rotors — the greens, the tees and then the fairways. So over a five-year period they have a new system."

Keen observations

Even without an audit, superintendents can easily spot indications of wasted water on their own, according to Dunn. A similar course might be using dramatically less water or pump station electricity. And wet areas or excessive run-off might be present at the same time adjacent areas are too dry.

Useful tips to prevent waste include the use of:

• Hand-held radio controls — "With the new palm pilots they're coming out with, you're actually able to take that central computer and take it right out onto the golf course," Pock says. "That's where you really start finetuning your irrigation system. We can get it to the point where we know exactly when the golf course is going to get hot the next day. It can be that precise."

• Accurate records of costs and weather — "Tracking weather during the year can let you compare year-to-year weather, with costs," Thornton says. "These figures can be valuable to begin justification discussions."

A quality camera with a date stamp on the image — "This can help ID the problem areas and measure progress over time," Thornton says. "Photos of playing conditions, repairs and condition of system components can be valuable."

Experimental plots — "If you have cultural practices or watering schedules you want to test, pick a part of the golf course you can experiment with and test your theories," Thornton says. "Perhaps the practice range has similar conditions to your fairways. You could try cutting back watering until you notice conditions are diminished. Dial in the schedule, then roll it to other parts of the course."

Soil probes — "Moisture beyond the rootzone is not available to the plant," Thornton says.

Technology aside, a superintendent's experience and intuition are invaluable, according to Pock.

"You can't rely on proper water management just by sitting in front of the computer," he says. "You have to physically still go look at the golf course, and that's how you'll make your adjustments on the central. We're more or less high-tech farmers, but you still have to look at your golf course and make your decisions there." Learning how to deal with effluent and poor-quality water is taking on an increased priority in the golf industry — and for good reason

In Deep Wastewater?



urf scientist Ronnie Duncan knows well the increasing problem of superintendents dealing with effluent water. He just had to look at the class he taught on the topic with fellow scientist Robert Carrow at the Golf Industry Show in February.

There were supposed to be 60 registrants, but the demand was so overwhelming that the Golf Course Superintendents Association of America (GCSAA) let 75 people squeeze their way into the room.

From California to Colorado to Arizona to Florida and beyond, learning how to deal with water that is either effluent or poor quality is taking on an increased priority in the golf industry. And in many states where the problem does not exist for now, the switch to treated water is on the near horizon. In fact, 10 superintendents in the class Duncan and Carrow taught had been notified recently that their courses will be switching to treated water.

The problems created by poor water,

especially when high in salts, are not just a concern to golf courses. They go well beyond closely mown turf, as municipalities and the private sector also irrigate with it.

"My greatest fear is that we create another Salton Sea, and everything we do impacts the environment," says Duncan, president of Turfgrass Ecosystems, a water quality consulting firm in San Antonio, Texas. Located in Southern California, the Salton Sea — the largest freshwater body of water in the state — has a salt content that's higher than the Pacific Ocean and rising. Years of runoff from agricultural farms and polluted leaching from local irrigation districts have caused the problem, resulting in massive bird and fish kills. Some predict the lake could become uninhabitable to aquatic life in the next few years.

Duncan, Carrow and others are concerned that the buildup of Total Dissolved Salts (TDS) in effluent water used for irrigation could have a disastrous effect on the environment. As Duncan points out, government regulations *Continued on page 32*

Wastewater



"The key is people don't realize that not all water is good water for turf."

SHAWN EMERSON,

DIRECTORY OF AGRONOMY DESERT MOUNTAIN PROPERTIES

Continued from page 30

are focused on human exposure and not the eventual deposition of the minerals and salts. Duncan says the latter problem should be a concern of the turf industry.

"If (salt) gets in the soil, then where is it going to go?" Duncan asks. "[But] this [problem] is much bigger than golf turf."

The use of effluent water and the problems it causes is a complex issue. There are no simple guidelines to follow or quick-fix chemicals to alleviate the difficulties.

Carrow, who co-authored with Duncan the book, "Salt-Affected Turfgrass Sites: Assessment and Management," says there are a few hard and fast rules when it comes to dealing with reused water. First, superintendents must have accurate water testing so they understand the specific problems. Second, constant monitoring of water to detect quality changes is imperative. There is also one very important rule to consider even before a course switches to effluent.

"Do not enter into a contract where you

have to accept a quantity of water constantly," Carrow says.

That scenario leads to problems when superintendents are forced to irrigate merely to make room for more water. With the subsequent overwatering, contaminants build up quicker and turf also suffers from being too wet.

Carrow breaks water problems into three categories: high total soluble salts, nutrient imbalance and high sodium content. But the issue is more in-depth. There can be 10 or 12 variables that come into play. "You have to understand, it's complex when you get poor water quality. It is site specific," Carrow notes.

Some of the factors affecting water include quality of the original supply, method of purification used by the supplying municipality, soil type, weather patterns, and drainage and irrigation systems.

To illustrate how complex the issues are, Duncan points out that bicarbonates and calcium are found in high levels in areas of the West even before entering the municipal water supply.



1. Insignia (0.50 oz) and Heritage (0.20 oz)/1000 sq. ft. Gray leaf spot control at 14-day application intervals. Average disease severity in controls was 50.5%. Source: Summary of university trials from 8 locations 2. Insignia (0.90 oz) and Heritage (0.40 oz)/1000 sq. ft. Dollar spot suppression at 14-day application intervals. Source: Virginia Tech University, 1996.

In another common scenario, over time a prolonged drought can turn good water bad or bad water worse. Duncan says he always knows when a dry spell has affected water quality in a specific part of the country. "That's when my phone starts ringing off the hook," he says.

Maybe no other location in the country has as many waterrelated issues as greater Scottsdale. First, Scottsdale is arid, receiving about 6 inches of rain a year. Second, the crushed granite soil drains poorly. Third, what was poor water is getting worse as sodium levels have increased dramatically.

The reason for the drop-off in quality is directly related to humans. According to Shawn Emerson, director of agronomy at the six-course Desert Mountain Properties, nearly 40 percent of the sodium in his irrigation water is from home use of water softeners.

Once in the ground, the sodium ions pull water away from the plants. Sodium that makes its way into the plant structure restricts the flow of other nutrients, causing the plant to starve itself.

Desert Mountain switched to effluent in October of 1998 and Emerson says problems with the turf developed shortly after. He estimates the cost of balancing the effects of the water is more than \$100,000 a year per course.

To combat the problem, he is paying more in labor, fer-



Learning how to deal with water that is either effluent or poor quality is taking on an increased priority across the country.

tilization and sod. Overseeding has become more expensive because ryegrass is not tolerant to salt, so his germination rate has been lower since converting to effluent. Some smallerbudget courses in the Scottsdale region have foregone overseeding because they don't have the means to maintain the rye with such poor water, Emerson says.

One way Emerson is combating sodium build-up in fairways — his USGA greens allow the sodium to leach away — is aerifying six to eight times a year at varying depths to increase leaching. Another way is to actually overwater at times in an effort to flush the salts out of the soil.

Continued on page 34

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"Our biggest problem is the smell of chlorine more than anything else."

JOE ONDO,

CERTIFIED SUPERINTENDENT WINTER PINES GOLF CLUB

Continued from page 33

Superintendents are often advised to add amendments to soils, which in turn affect fertilizer programs. For some, a switch from granular to liquid nutrients is needed to help the turf take up the fertilizer. For Emerson and others with larger maintenance budgets, the management practices are working to a small extent.

"We are holding off the sodium," Emerson says. "We're not alleviating the problem. You have to attack it from multiple directions."

For superintendents who find they have problems, Duncan says it may take three to five years before they can get the problems under control.

This year a respite for Scottsdale has come in the form of increased rainfall. From Dec. 1 to March 1, 12 inches of clean, low-sodium water fell, improving soil quality and plant health markedly. "The rain has removed about 30 percent to 40 percent of the sodium (in the soil)," Emerson says.

It's not just maintenance costs that have risen dramatically as the water quality has waned. Construction costs have also skyrocketed. Emerson estimates that an additional \$800,000 was needed to build each of the last two layouts at Desert Mountain. To improve leaching, the courses were plated with 8 inches of sand. Also, irrigation heads were moved from spacing of 60 feet down to 55 feet in an effort to improve coverage and 60,000 linear feet of drain tile was installed compared to the usual 20,000 to help move water.

To try to cut down on costs of dealing with wastewater, more than 20 courses in the north Scottsdale area have banded together and are working with the city to come up with a solution to a problem that is also facing ball fields, parks and any other facility using the wastewater.

Emerson says one possible answer is the construction of a reverse osmosis plant, which is extremely expensive, about two to three times the cost of a standard water purification facility. Another plan is to educate residents about the problem in hopes of getting homeowners to change from sodium chloride water softeners to potassium chloride-based products. Sodium levels in re-used water would drop by 20 percent if half the residents make the switch.

"The key is people don't realize that not all water is good water for turf," he adds.

Emerson notes that it's important for the

general public to understand that golf courses want to help in conserving water by using effluent and that improved water quality will actually reduce the amount of water needed. With the current situations, courses use large amounts of water — up to 150 million gallons a year — in efforts to flush the contaminants from the soil structure. Better water would not require as much irrigation.

Not every course dealing with effluent has it as bad as those in Scottsdale. Winter Pines Golf Club in Winter Park, Fla., has been using effluent since 1984, a year after it opened. Joe Ondo is the only superintendent the course has ever had, and his course's water comes directly from the Winter Park Estates Treatment Plant about two miles from the course. The course does not have retention ponds, and a contract with the treatment facility does not require the purchase of a predetermined amount of water.

According to Ondo, not only did the treatment plant start putting out good water but the quality has improved over the years. The course averages about 150,000 gallons a day.

"We have to use a little more gypsum," Ondo says. "Our biggest problem is the smell of chlorine more than anything else, and we can live with that."

Winter Park is built on a mud/peat base and the greens are pushup, the certified superintendent says. The course has some problems with drainage, but he says improvements in surfactants and aerifying equipment have helped him deal with that problem over the years. The heavy rains that accompanied the Florida hurricanes in 2004 helped to flush contaminants from his soil.

Because Winter Park hosts about 65,000 rounds a year, Ondo keeps the green and fairway heights of cut a little higher than most greens at 5/32 of an inch and fairways at 5/8 of an inch — which he says helps the turf deal with the stresses related to effluent. It's Ondo's response — raising mower heights — that Emerson says is one of the many answers to irrigating with effluent.

But for the issues to be dealt with in a way that also protects the environment, Emerson says there must be input from across the golfing spectrum. "It's going to have to be an industry solution," he adds.

In Duncan's mind, there never will be a solution. He also says the situation is getting worse. "It's as good as it's going to be," he adds.

34 Golfdom April 2005