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Water *from page 29*

directing will be able to see the reflection possibilities from any location he decides upon. The bright ribbons will easily be seen in the water.

It is important to use such a technique. Reflections are affected by changing elevations of the land at both sides of the body of water. If the land is very level, just a few inches or feet above water surface, it will give one image. If the land rises quickly on the far side of the pond, it will create a different reflection potential. And still another version will result if the observer is standing on higher land as he looks across the water where the land also rises with a steep incline.

Where the land is very level, objects that are great distances away from the water will be reflected. Under these conditions you would not have to place the trees close to the water's edge in order to see the reflection. This might be a big help when it comes to interference with an airborne golf ball.

The ideal land contours would seem to be wherein the observer is standing higher than the body of water and the land on the far side of the pond would be only a gently rising slope. Under such conditions, it is easy to get reflections of both plants and the sky.

However, as we said, the surest system is to have a partner to work with. He can pretend to be the trees you have in mind and you can move him to the preferred spots. At those points, stakes or some other marking system should be used to identify the precise location of each new plant to be added.

Where the point or lake does not cross the entire fairway, you then can plan for reflections to be seen from the passing side of the water. As an example, if you walk to the right of the water on the way to the green then you might want to plant reflections to be seen as you look to your left as you move around the right side. (See picture 4)

Some waterholes are such that a footbridge or even a cart bridge is required to cross over them on your way to the green. The reflections of the bridge itself become very important. That fact is reason enough to consider the aesthetic design of the bridge as well as its basic function. As a simple example, a slightly arched bridge makes a very attractive reflection as compared to just a plain flat functional structure, or worse, a slanted, or tilted out of line bridge which then becomes a detraction from the appearance of the hole. If natural beauty on the course is an important consideration, you must take such refinements into consideration even though the cost may be a little higher.

It is no secret to many golf course superintendents that Canadian geese can really create a serious problem when their numbers grow into the hundreds and sometimes thousands. It is almost impossible to keep them away if your course has ponds or lakes on or near it. A *few* waterfowl on a body of water adds a dimension to the feeling of really being "out in the country". This would be a welcome sight on any course. We will, therefore, go out on a limb and suggest that on those courses having water ponds or small lakes, perhaps a pair of swans might be considered permanent guests. The wings are trimmed at a key time during each year to assure their permanent presence. If you have never witnessed the air of dignity that surrounds a swan, then you have a pleasant surprise in store.

A new practical device has been added to relatively still bodies of water such as irrigation reserve ponds. A device that creates a circular fountain-like effect is used to add more oxygen to the water in an effort to hold down the rampant growth of aquatic weeds. Like the swans, mentioned above, it adds "life" to an otherwise still body of water. They are large enough to be heard from a good distance away. On a very hot day, just the *sound* of moving water has a psychological cooling effect on us.

In situations where ponds are built to hold irrigation water in reserve through pumping it full from wells, we run into the problem of unsightly pumping equipment, mainly the pump house and structural work going from the shore out into the pond quite some distance. These structures are rarely attractive. They stand out like sore thumbs in the midst of a possible beauty spot.

Perhaps with only a small percentage of additional costs when a pump house is built, it could be camouflaged to appear to be an attractive building. The same holds true for the bridge work reaching out into the pond. Why not give it a false veneer to make it look like a summerhouse or a gazebo out over the water?

Streams that form water hazards on the golf course are not suited for the reflection factor. But they are very important from the close-up view. And if we could only do one thing about beautifying such water hazards, we would be very practical and ask for one thing above all else. Keep them neat and clean! Clean them of unwanted debris of any sort at all times — otherwise they can take on the appearance of a dirty, neglected open ditch instead of an exciting and interesting flowing stream of water. If frequent flooding overruns its banks, there isn't much to be done but to quickly pick up the debris left scattered around your fairways and roughs after the high water subsides. If, on the other hand, such flooding is rare, or indeed nver a problem, then you could encourage wild flowers and even some introduced varieties to grow along the flat areas that are inside the banks of the stream but still above the water level. Mints, water cress, mountain pink, Japanese iris, pickerel weed and the day lilies are but a few of the dozens of plants that could add touches of color and fragrance to such streams. Also grasses and sedges will prevent the sides of the stream from having an eroded look.

It may seem too obvious to mention but it has happened so often it seems right to discuss it at this time. When a stream crosses an entire hole from rough to rough, the bridge or bridges to allow players to cross over it should be placed in the roughs — not out in the area of the cut fairway. One in each rough is ideal to spread the foot and cart traffic over two areas instead of leading it all into one small spot. If the bridge is in the fairway, then the turf will be worn away on each end of the bridge creating a permanent eyesore on that particular hole.

We have not discussed the building, maintenance of, ecological and legal aspects of ponds, dams, bridges, etc., since this article deals with how to landscape the water areas. For help, or at least initial direction for help on such matters, the best place to start would be your local Soil Conservation District headquarters or your Cooperative Extension Agent's office. **GB**

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- 21 ☐ Purchase
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3 What is your estimated annual expenditure for each of the following:

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- 32 ☐ $1,000 to $5,000
- 33 ☐ $5,000 to $15,000
- 36 ☐ $15,000 to $30,000
- 37 ☐ $30,000 to $50,000
- 38 Other_____

3B/ Fertilizers (All Formulations)
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- 58 Other_____

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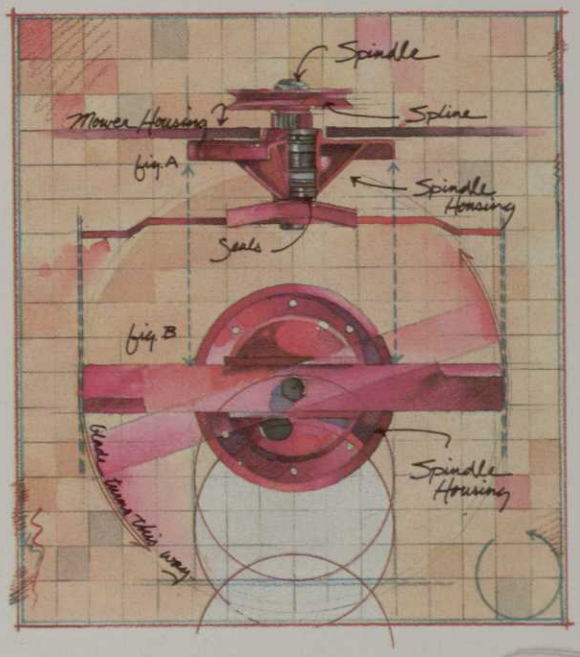

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To reduce the rate of consumption, nonessential loads must be off when demand is highest. . .

Computerized energy management can cut costs and optimize comfort

By **Charles Stein,** Director of Operations, Brookhaven CC, Dallas, Texas

Energy management is a new dimension added to country club management in recent years because of a sharp rise in energy costs. A corresponding drop in microprocessor costs has put energy management technology with reach of organizations such as Brookhaven Country Club. Our goal is to reduce the total cost of energy while optimizing the services to our club members.

Brookhaven, like many small commercial businesses, is charged for electrical energy in two ways. One charge is for actual energy consumed as measured in kilowatt-hours (KWH). An additional charge is made for the rate of consumption or demand, and is measured in kilowatts (KW). Demand charges are based on a peak value occurring in any 15 minute period and "set" a "rachet" value that determines the demand charge for a period of several months.

The system

The energy management system at Brookhaven consists of a central computer, remote sensors and controllers, and a communications system. The function of this system is to sense the state of the energy system, make decisions according to predetermined guidelines, and to control energy consuming loads.

The state of the energy system is ascertained remotely by sensors at specific locations throughout the club. Energy consumed and demand are sensed at the power meter and transmitted on a pair of wires to the computer as pulses. Each pulse represents some quantity of energy (KWH), while the pulse rate is proportional to demand (KW). Temperatures are sensed in individual rooms or areas and transmitted to the computer as current signals on individual pairs of wires. Humidity is treated in the same way as temperatures.

The computer

The central computer consists of a microprocessor and its associated memory. To aid the computer operator, there is a group of ancilliary equipment designed to interface between the operator and the computer. The CRT (cathode-ray tube) terminal consists of a video screen and keyboard. A printer logs the status of the system and changes in status as they occur. Manual switches allow the operator to control each load individually by selecting ON, OFF, or AUTO. Lamps associated with each switch indicate the status of that load. Alarm lamps indicate when an alarm condition exists.

The system consists of a computer, remote sensors and communication

Individual loads are controlled by the computer via a pilot relay. The computer causes the relay to open or close by its command. The relay contacts are in series with the control circuit or power circuit for each load. The relay is wired in such a way that if the computer fails or loses power, the local control circuit will assume normal operation.

Communications between the sensors and the computer or between the computer and the pilot relays is normally done on a twisted pair of wires that is shielded against outside noise. In some cases, when the sensor or pilot relay is a large distance from the computer, or a large number of wires would be required to one location, a telephone circuit is used with some type of interface equipment. The remote water well pumps are controlled via a telephone circuit. The golf cart garage and the tennis facilities communicate with the computer via a multiplexer and four-wire voice grade telephone lines with modems.

Facilities

The Brookhaven system includes two centrally located buildings, two separate tennis/raquetball facilities, a golf cart garage, and two remote water well pumps. Each group consists of distinct combinations of location and types of loads.

The two main buildings consist entirely of heating, ventilating, and air conditioning (HVAC) units and their associated temperature sensors. The sensors and pilot relays are linked to the computer by shielded, twisted pairs of wires.

The two tennis/raquetball facilities have HVAC units, air handling units (AHU), and light to be controlled. In addition, the lights at the old tennis facility are controlled remotely from the Pro Shop in the new tennis/raquetball facility. All of these tasks are accomplished via multiplex (MUX) units on four-wire, voice grade telephone circuits.

The golf cart garage contains 16 groups of battery chargers and is linked via the multiplexer unit and telephone lines. The two remote water well pumps are started/stopped via a special telephone control circuit.

Management techniques

To achieve energy savings, both the consumption of electricity and the rate of consumption must be reduced. Typically, the amount of energy consumed can be most effectively reduced by turning off loads when they are not being used. This function is called scheduled start-/stop. Using the computer to control this function, the HVAC's and AHU's are turned off during periods when their respective rooms and areas are unoccupied and unused. Additionally, tennis and raquetball court lighting can be turned off after their

Rate of consumption must be reduced

usage is complete.

To effectively reduce the rate of consumption, or demand for electricity, nonessential loads must be turned off when the demand is highest. At Brookhaven, the golf cart battery chargers are shed first, then the water well pumps, and later the HVAC's and AHU's are shed. Typically, this will keep the power demand below a predetermined limit during the peak demand period. After the peak, typically less than one hour, the loads are turned on again in reverse order.

This will keep the power demand below a predetermined limit . . .

A third technique used to reduce demand and to a lesser degree, consumption, is load cycling. By this means, loads are cycled off for some part of a cycle. For example, a HVAC unit may be cycled off for five minutes out of every hour. That is a 1/12 savings in consumption. If other HVAC units are cycled also, but at different times throughout the same hour, then demand is reduced likewise.

Other computer techniques can further reduce consumption and demand by optimizing use of particular loads.

Using the computer, there are other techniques available that further reduce consumption and demand by optimizing the use of the particular loads. For instance, a HVAC unit may be started at an optimum time before occupancy to assure that the occupants will be comfortable, yet no unnecessary energy is used. This is done by sensing indoor and outdoor temperature as well as humidity and predicting the optimum start time. Another technique is to modify the cycle time for a HVAC unit to regulate the temperature with the area it serves.

One of the major additional benefits of an energy management computer such as the one at Brookhaven is the awareness of the various energy loads and their characteristics. With the monitoring capability of the system, we are able to modify our program to optimize the energy savings and comfort of the club members. We expect the system to improve our savings over several years to come. **GB**

Forecast *from page 8*

LP-200	100%
Manhattan	75%
NK-200	100%
Omega	80%
Pennant	80%
Pennfine	75%
Premier	80%
Regal	100%
Yorktown	75%
Yorktown II	100%

Bentgrass

Astoria	20%
Bardot colonial	100%
Emerald	100%
Exeter colonial	100%
Carmen	Ltd.
Highlight colonial	100%
Kingstown velvet	100%
Penncross	100%
Penneagle	78%
Seaside	100%

Others

'Fults' *Puccinellia distans*	60%
Redtop *Poa alba*	100%
Reubens Canada bluegrass	100%
Sabre *Poa trivialis*	100%

Renovation *from page 25*

increased.

Less Than Half The Average

"We only applied 3.2 inches of water this year, less than half of what we used to apply to our course under normal conditions," reports Portz. "Neighboring courses began watering in June. We didn't even consider irrigating until July, and actually didn't make the first watering until July 15. Given these same conditions two years ago, I'd estimate I would have had to apply close to nine inches of water."

Having cut his irrigation needs in half, Portz made only eight waterings between July and mid-September, one of which was to wash in an application of Pre-San. "Looking back on the situation, I feel we could have watered even less," he contends. "That would have brought the poa infestation down even lower. But, not having dealt with this situation before, I was somewhat hesitant as to how far I could stress the new turf. Next year, if we have the same conditions, I hope to cut back even further."

Fewer waterings also helped save labor, conserve water, and reduce wear-and-tear on the pumps, says Portz. "It's impossible to figure how much we saved on electricity. But, water and labor costs were cut by 50 percent, and we spent no money on overtime because extensive irrigation wasn't needed and we didn't syringe one green or fairway."

The greatest cost efficiencies, however, were achieved in the area of water conservation, Dave points out. "With a low water table due to the drought and not knowing if the soil mositure would be replaced before the ground froze, we might have been faced with a critical situation if a similar drought were to occur next year. Since conservation is foremost in every superintendent's mind, and our new turf requires a minimum of water, we were able to conserve enough water so that we can hopefully irrigate all the greens and trees next year, irregardless of the amount of rainfall."

Less Fungicide

In addition to cutting irrigation, the taming of poa has also helped Portz cut fungicide treatments to one application versus 12 just two years ago. "The dry conditions reduced the potential for outbreaks of pithium and brown patch which thrive under high, humid temperatures," he points out. "But, if I was dealing with a poa course, that would have had to be water constantly under this year's conditions, we probably would have had severe disease problems."

Many courses in southeastern Pennsylvania made 12 or more fungicide applications plus several spot applications throughout the season. "We saved close to $5,000 on fungicide alone," claims Portz, "not to mention the aesthetic benefits of no brown patches."

In weighing all the benefits of the renovation, Portz is quick to note that improved playing conditions are the bottom line. Mowers can now be benchset at one-inch all season long, while the poa-infested course required cutting the fairways higher during the stressful summer months. As a result, the new turf provides the membership with a uniform playing surface all season long.

Another new advantage is that golf carts are now permitted on the fairways year-round, a great improvement over the days when they were restricted to prevent additional turf loss over the summer. "We lost less than one percent of our turf this year, if that much," Portz contends. "In a season such as we had, with a poa-infested course, we could lose as much as 10 percent. And we've never had a summer this dry."

Although he is modest about the beauty of the course, a post-renovation increase of 30 percent of in-cart revenues and 10 percent of guest fees confirms that it is not simply in the eye of the beholder.

"The most satisfying aspect of all," concludes Dave Portz, "is that we're now able to provide a uniform turf cover all year long. There are no soggy wet spots or patches of dead turf and the membership is very, very happy. That's the bottom line: keeping the membership happy with a turf management program that is cost effective so we can devote our energies and money to other course improvements. **GB**

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Controlling The Invasion Of Bermudagrass Into Bentgrass Putting Greens

By Dr. Bill Knoop, Texas Agricultural Extension Service, Dallas

Every once in a while a golf course superintendent is faced with a serious problem on the course such as a disease outbreak, an insect invasion or a period of severe weather. Fortunately, these occurrences are usually fairly remote. There is one nagging problem that is continuously present on golf courses in the south, especially those that have bentgrass greens. The problem is the slow, but inevitable, spread of bermudagrass from the collars or fairways into the greens.

Figure 1.

The battle against the invading bermudagrass has been mostly mechanical but some superintendents choose to use chemicals. The profile of the battle zone is detailed in Figure 1. On some courses, the collars are bentgrass and the efforts to control the bermudagrass invasion take place at the collar-fairway line (B). Around greens that have bermudagrass collars, the control efforts take place at the green-collar boundary (A).

The most common of the mechanical devices used to sever the invading bermudagrass stolons is some type of a vertical knife. It may be a gasoline powered edger or a non-powered single disc blade.

The severed invading bermudagrass runners are removed from among the bentgrass plants by hand. If the invading bermudagrass is common, this job is much easier than if it is one of the bermudagrass hybrids such as 328 or 419. Common bermudagrass leaves and stolons are much larger than those of bentgrass or those of the bermudagrass

Continues on page 40

Figure 2.

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hybrids. The employee assigned this task may need more training or experience to tell the difference between 328 and bentgrass than he or she would need to tell bentgrass from common bermudagrass.

Another mechanical technique involves the use of a sod cutter (Figure 2). When it becomes necessary, depending on the speed of the bermudagrass encroachment, the outer area of green, if the collar is bermudagrass, is removed with a sod cutter. If the collar is bentgrass, a strip is removed next to the bermudagrass fairway. As anyone who has ever had any experience will testify, cutting and laying sod is not an easy job and many times a great deal of top-dressing is required before the surface is truly smooth again. Of course, for this method of work, a source of clean bentgrass sod must be at hand. This usually means that the golf course would have to have its own nursery.

Common bermudagrass is a prolific seed producer and it is not too hard for seed to be moved from the fairways onto the greens via foot and/or vehicular traffic. The end result is that not only does the bermudagrass invade the sides of the green by runners but may "pop up" anywhere on the green from seed, especially if the green has a weak bermudagrass cover. Many superintendents have their bentgrass greens checked regularly for young bermudagrass plants, but others take another approach.

Checking and removing bermudagrass from bentgrass can be a very expensive item of the labor budget and, of course, some clubs may not be able to afford the labor necessary for the task. On some courses in late summer or early fall, the old contaminated sod is completely removed, the soil mixture is sterilized in place with a material such as methyl bromide and seeded to bentgrass. With good weather the greens may be back in play in two or three months.

There may be a reasonable alternative to all these methods to keep bermudagrass out of bentgrass greens. This method involves establishing another variety of turfgrass between the bermudagrass and the bentgrass. This turfgrass must have several characteristics — it must not be an aggressive spreader; it must be able to be mowed at collar or fairway height; and it must be environmentally adapted to the area.

One of the turfgrasses that best fits these requirements is Emerald Zoysia. The finer leaved Emerald seems to be more desirable than the wider bladed Meyer. Zoysia is very capable of forming and maintaining a dense sod that is fairly resistant to the invasion of bermudagrass. Another strong point in the favor of Zoysia is the fact that its favorable growth period is much the same as bermudagrass. During the hot periods of the year when bermudagrass is at its highest growth rate, bentgrass growth is nearly at its lowest rate and it is difficult to maintain a high enough density in a bentgrass green to resist bermudagrass invasion.

As indicated in Figure 3, the whole collar may be established in Zoysia or a strip or two of Zoysia sod may be placed just at the outside of the collar (Figure 4). In either event, the battle line against the invasion of bermudagrass has been moved away from the bentgrass and is now separated by a fairly non-aggressive turfgrass, Zoysia.

Zoysia is a turfgrass that has not found a popular use in many parts of the country, but in the south it just may make life a little easier for golf course superintendents that have bentgrass greens. **GB**

Figure 3.