

TRENDS IN GOLF COURSE IRRIGATION DESIGN

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One of the more interesting aspects of being involved in the irrigation industry is watching the dynamic evolution of the irrigation industry over time. Obviously, there has been quantum leaps in the equipment available but there has also been just as strong a momentum in improvements in system design.

It was once remarked that “the closer we get to perfection, the more our imperfections show”. As turf quality on a well-maintained golf course approaches perfection, limitations and shortcomings in the irrigation system become more and more apparent. With each generation of irrigation systems, we try to assess the flaws and then offer solutions that are consistent with prevailing technology and willingness and ability of a golf course Owner to pay the price for “perfection”. Each year, irrigation systems become more and more sophisticated, and demand an ever increasing dollar allocation both in initial construction cost and in on going maintenance cost.

Because expectations for the irrigation is always changing, any irrigation improvement should assess current needs as well as anticipated future needs over the next twenty to fifty years. If we look back at systems twenty years ago compared to today, we see the magnitude of the changes. History tells us we need to be visionaries and try to image what might be expected in the future, and build in the flexibilities with any system we do today. To just look at and solve the immediate irrigation needs is short sighted -- and the system you buy today will be out of date tomorrow. In other words, we need to become more proactive to potential problems rather than reactive to problems that are immediate.

Cost effective ways to anticipate and allow for future system improvements include:

- I. Generous sizing of mainline piping to allow for system expansion
- II. Some excess capacity in the pump station to allow for wear and for future system expansion
- III. A surfeit of isolation valves
- IV. Oversized 120 volt wire to allow for additional control timers and/or additional stations
- V. Spare 24 volt wires and controller stations where expansion likely will occur in the future
- Keeping current on latest trends in irrigation design and equipment and assuming many of today's trends occurring at the “high end” projects will eventually be standard practice sometime in the future. Make plans and provisions accordingly.

IMPROVED IRRIGATION TECHNOLOGY

As expected, golf courses are taking advantage of the vastly improved technology and materials available. What we are seeing is expanded scope of irrigation coupled with use of better technology and increased awareness of system efficiencies.

Radio control is a popular choice for many courses, where the inherent convenience of radio control maximizes the user's efficiency in system operation, maintenance and trouble shooting. For new construction, the

preferred system still has stand alone field satellites, communication wire, and central programmer equipped with radio option. Very often, the installation of the central programmer is delayed until after initial grow in. Weather stations still are not "standard" equipment but we see increased use at the country club level.

Pump stations are primarily prefabricated units, with vertical turbines the preferred choice. VFD control is difficult to justify from a cost standpoint alone due to limited hours of operation per season and relatively low energy cost. However, variable frequency drive (VFD) is gaining acceptance for the benefit of eliminating the pressure regulation valve and increasing the life of the piping system.

Although not yet widely accepted in our area, the cost benefits of a fertigation system are being evaluated. The few new courses that have instituted the fertigation system are extremely satisfied and preliminary results indicate it to be a cost effective solution for both grow in and long term use.

ENVIRONMENTAL

There is increased use of native grasses and vegetation on a golf course. This is in response to the environmental issue of reducing the mowed and maintained areas, reducing the amount of water required to irrigate, aesthetics and the resurrection of "links style" course. In areas where water conservation is mandatory, "target golf" is prevalent.

While the increased use of native vegetation may reduce the amount of area under irrigation, and will also reduce the amount of water required for irrigation, it generally increases the irrigation budget. These unmowed native grasses should not be covered under irrigation at all, or covered under a system separate from the maintained turf areas. Since the maintained turf will require comprehensive irrigation, and overspray to the natural areas must be severely limited, this requires the use of smaller radius sprinklers to better conform to the meandering free form line created with the native turfs. It also calls for greatly increased use of part circle sprinklers bordering the "natural" areas. The same would be true where restrictions do not allow overspray into wetlands.

In our area of the country, water is generally readily available and virtually free of cost. In spite of this, there is an increased sensitivity to water conservation. There is a realization that although water use is not currently limited, there may be a time in the future when it will be. Paying more up front for increased system efficiency without any immediate paybacks is a difficult sell in water rich areas, but it is more universally acknowledged as a necessary expense. More easy to "sell" is the idea that increased system efficiency will result in improved turf and playing conditions with the added benefit of reduced water usage.

GREENS

Greens on new course construction as well as rebuilt greens on existing courses are getting larger, have increased slope severity and continue to be USGA type construction. And of course, there is the continued pressure to maintain a hard, firm, putting surface and fast green speed. Good coverage to the putting surface remains as top priority, maintaining the highest water application uniformity possible. However, maintaining the putting surface at the correct moisture levels often means there is inadequate moisture to the perimeter of the green, particularly on west and south facing slopes.

Irrigation consultants are responding by proposing a dual system around the greens -- one system to water the bentgrass/poa putting surface and another system to water the bluegrass perimeter. The differing turf types and maintenance practices on the putting surface and green perimeter plus the perched water table created by the choker layer on the green demand separate watering regimes for these two areas. We have found it most effective to use 360° sprinklers around the green perimeter to water the bentgrass putting surface plus the perimeter area, and part circle sprinklers to provide additional water to the bluegrass perimeter only. In some cases where the topography and or vegetation dictate, a second row of small radius sprinklers is added to ensure good coverage to the landforms surrounding the green for visual impact to the entire greens complex. There is no one correct way to water the greens perimeter, but rather topography, exposure and vegetation will dictate the best solution.

The increased size of the greens can present special problems for irrigation. It is not the increased square footage of the green that creates the problem, but the width of the green. Greatest system uniformity coverage can be obtained by using a fairly small radius sprinkler -- about 60' to 65' radius. Many greens are constructed with a width too large to accommodate this smaller sprinkler, necessitating the use of a sprinkler that is larger than desirable, both in radius and gallons per minute. Irrigation consultants across the country bemoan this dilemma, and threaten to start putting sprinklers in the center of the green to accommodate the large width.

A common misconception is that the larger the green, the more number of sprinklers it will take to irrigate it. The number of sprinklers to be used on the greens is dictated by the shape of the green, with the width of the green being the controlling factor. Assuming a round shape green with a diameter of seventy feet would require use of four sprinklers, each with a sixty five to seventy foot radius. On the other hand, a long narrow green with a width of only fifty five feet across, may require six sprinklers, but with a sprinkler radius of fifty to fifty five feet.

TEES

Golf course tees are increasing both in size and in physical number. This is in response to increased play, and a greater accommodation for different levels of golfer ability. These tees are more often than not “scattered” rather than the elongated single tee with different markers.

It is desirable to keep all sprinklers off the tee surface so as to not conflict with usable teeing area or conflict with maintenance operations. The larger tees very often require two rows of sprinklers on either side of the tee rather than the single row that historically was used. This provides many other benefits including improved coverage to these intensely used spaces, plus improved coverage to the high visibility and high traffic areas around the tees.

There is a trend to use a 1” i.p.s. 40’ to 50’ radius sprinklers zoned in groups of two to four sprinklers on select tees rather than using a valve in head sprinkler. The smaller size sprinkler is often more appropriate for the given tee space, as well as compatible with a concept sometimes favored by golf architects to have unmowed native grasses surrounding the tee box area.

FAIRWAYS

Bentgrass is being used on almost all the new midrange to high end daily fee golf courses and fairway widths are increasing. It is not unusual to have fairway widths greater than 160’ up to more than 200’ wide, especially in the landing areas.

The bentgrass fairways with its limited root system in the late summer will demand a more uniform water distribution than will bluegrass fairways. As 110’ to 120’ is considered to be the maximum practical for a two row irrigation system, these wider bentgrass fairways are now dictating three and even four rows of sprinklers to provide the appropriate coverage.

Courses may be built on land that may lack natural topographic or vegetative interest or on reclaimed land. More architectural landforms must be built into the golf course design to create movement in the fairways and roughs and around the greens complex. These forms include designed or built in depressions, undulations, grass bunkers and swales. For irrigation, this also translates into using multiple rows of smaller radius sprinklers (60’ to 70’ radius) and more need for individual head control in the fairways.

There is increased use of three and more rows of sprinklers, with sprinkler radius of sixty five to seventy feet, and individual sprinkler gallonage of twenty to thirty gallons per minute. Use of these sprinklers will provide the highest water application uniformity, with less runoff, wet and dry spots.

ROUGHS

Watering roughs, especially in areas where native turf is used, was historically never irrigated in our region. Natural rainfall is adequate to sustain these turfs. However, we find more of an interest in providing a system for some of the roughs, at least in key areas, to promote establishment of the turf as well as maintain the turf in drought periods, particularly in high traffic and high visibility areas. This is probably one of the most difficult areas to assess whether there is an economic payback. In a drought year, it would be a good investment. In a normal to wet year, the system would be rarely used except on courses with very coarse soil textures. At a minimum, systems are being designed to allow for expansion to these areas as revenues or circumstances change.

BUNKERS

Bunker forms are frequently more dramatic with severe slopes, capes and moundwork. They dry out quickly, are difficult to water due to runoff, and are labor intensive to maintain.

On the higher budget courses, zones of low gallonage, short radius sprinklers are used to spot water these unique areas. Generally, a 35' to 40' radius sprinkler is used, grouped in zones of four to eight sprinklers. This zone of "mistlers" is used to maintain the area around the bunker, the bunker edge, and to maintain the moisture level in the bunker sand to make it a more consistent golfing hazard.

CONCLUSION

Budget estimates for a midrange daily fee golf course in the Great Lakes area is now about \$500,000 to \$600,00 with an upscale daily fee golf course budget approaching \$750,000. As recent as five years ago, we considered a budget of \$450,00 to be quite generous.

We are frequently asked why the cost of systems have gone up so dramatically in the last few years. The answer is, the quality of the average golf course built today is much better than that of a few years ago and correspondingly, its cost has also dramatically risen. Irrigation must keep pace and remain appropriate to the level of golf courses being built and to meet the growing expectations of the golfing public.