Fertigation:
Getting the Most Out Of Your Budget And Irrigation System

During the past few years many sports turf managers and golf course superintendents have wisely improved and upgraded their irrigation systems. By retrofitting their systems with better controllers, sprinkler heads, pump stations, and water conservation devices, they have improved the quality of their turf and gained control over water and energy costs. There is however, one more step they can take to get the most from their irrigation systems, adding fertigation.

Stadium at the University of Tampa is used by the Tampa Bay Buccaneers as a training center. The field is fertigated year-round.

Fertigation is the process of injecting minute quantities of nitrogen and other nutrients to the water during irrigation. Whether used as the only means of fertilization or as a supplement to granular or liquid fertilizer applications, fertigation helps eliminate the peaks and valleys in turf nutrition while easing labor, equipment, chemical, and storage costs.

Unlike some aspects of irrigation improvement, fertigation is not an expensive proposition. In fact, many turf managers have found it useful in stretching tight budgets to meet greater amounts of play and higher turf standards. The initial investment in injection equipment, storage tanks, and installation can be less than the cost of one seasonal employee, yet it provides a return for years.

As Lesco's Dr. Bruce Augustin points out, the advantages of fertigation for turf are widely recognized in certain parts of the country and almost a secret in others. One reason for the acceptance of fertigation in Florida, Arizona, and Southern California is the service provided by distributors in these areas. Formulators supplying liquid fertilizers to farms and nurseries have successfully branched into turf. They can custom blend fertilizers to match nutrient needs of turf just as easily as they do for agriculture. Since delivering liquid fertilizers is like shipping water, it is limited to a reasonable distance from the supplier. Some dry, water-soluble fertilizers can be dissolved in water if premixed solutions are not available.

The second roadblock to this useful tool is the illusion that nutrients applied by fertigation are easily lost by leaching and that irrigation coverage has to be perfect to avoid green rings of turf. Neither are true, cites Augustin, a former extension turf specialist in Florida. "Fertigation is the least likely of all nitrogen sources to leach and the best to prevent groundwater contamination," he comments. "A good turf manager may use less nitrogen during the season and have better control over growth with fertigation." That is why he estimates that three quarters of all superintendents south of Orlando have added fertigation systems.

Dr. George Snyder, professor of soil science at the University of Florida Agricultural Research Center in Belle Glade, has evaluated fertigation for more than a decade. He has revealed that fertigation helps stabilize the amount of nitrogen available to turfgrass. It may also have important applications for iron, potassium, manganese and magnesium.

"For best turf quality, nitrogen should be present in the soil in adequate, but not excessive, amounts," Snyder advises. "It is difficult, however, to maintain an ideal level of nitrogen in the soil because of the many changes nitrogen undergoes and because of the speed at which these changes occur. In order to ensure that as much as possible of the applied fertilizer is taken up and used by the turf, it is best to make frequent applications of nitrogen in amounts small enough to be used by the turf in a few days.

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In this way, a minimum amount of nitrogen will undergo unwanted transformations, and excessively lush growth will be prevented."

As Snyder reveals, several methods can be used to achieve this type of regulated nitrogen supply. Slow-release (water-insoluble) fertilizers have been developed so large amounts of nitrogen can be applied to the soil at one time, yet only a small portion enters the soil solution each day. However, once the fertilizer has been applied, the release rate is largely out of the hands of the turf manager.

A second way to regulate nitrogen supply is to make frequent light applications of water-soluble fertilizers. "These forms of nitrogen are less expensive than slow-release forms, but the labor required to make frequent applications by conventional means adds considerably to the total fertilization cost," he adds.

The cost of light, frequent fertilization can be reduced by applying nutrients through the irrigation system. Turf managers can take advantage of low-priced, water-soluble nitrogen sources without the associated costs of conventional sprayers, spreaders, or labor. Furthermore, fertilizer can be applied without disrupting use of the turf. It doesn't have to be watered in and is not subject to skips or overlapping.

Snyder stresses that fertigation is not foliar fertilization. Very little of the applied water remains on the foliage. He also has found that considerably less nitrogen is leached out of the rootzone with fertigation as compared to bimonthly applications of dry ammonium sulphate applied to Tifgreen bermudagrass. During one study, an average of 44 percent of nitrogen from dry ammonium sulphate leached beyond the rootzone while only eight percent of the nitrogen from fertigation with ammonium nitrate leached.

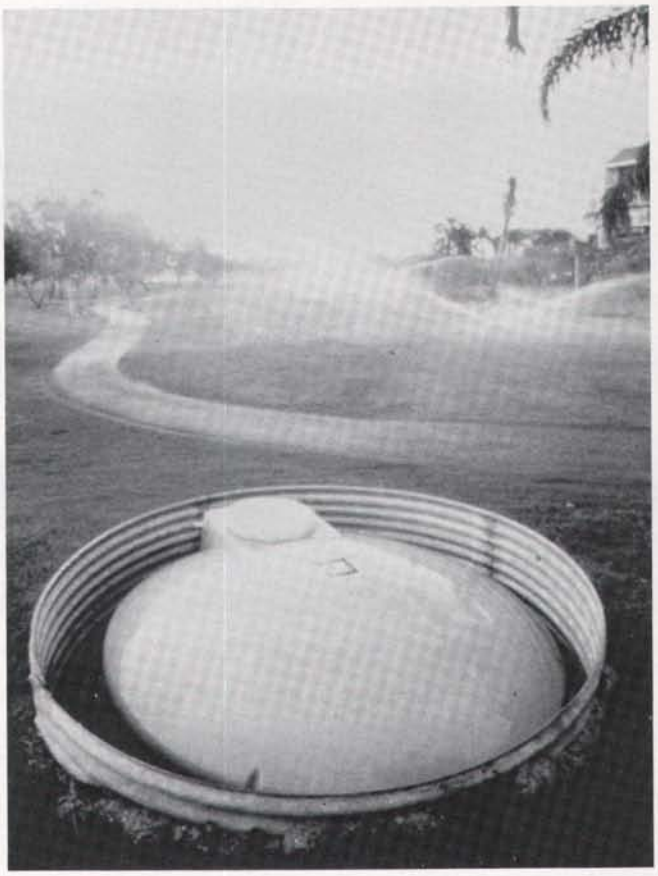
In the same study, Snyder found that the amount of nitrogen in the rootzone from fertigation remained relatively constant while the nitrogen level from bimonthly dry treatments dropped rapidly within ten days. Nitrogen levels in the bermudagrass tissue and the amount of clippings removed during mowing were constant for fertigated plots and dropped over an eight-week period for the dry fertilizer.

Snyder concludes that fertigation helps stabilize nitrogen nutrition within the rootzone and reduces leaching under heavy rainfall or frequent irrigation cycles. More controlled growth of turfgrass results, as well as a reduction in the potential for groundwater contamination. Secondary benefits may include a more manageable amount of clippings, reduced thatch accumulation, and hardier, more disease-resistant turf.

This type of technical evidence provides a strong case for fertigation, yet most superintendents and groundskeepers utilize the technique for economy and convenience. Every night, while the maintenance crew is asleep, your irrigation system can apply a few hundreths of a pound of nitrogen per 1,000 square feet. Over a month, this will spoon feed the turf with more than one pound of nitrogen per 1,000 square feet. Furthermore, a greater portion of the applied nitrogen is utilized by the plant.

By adjusting the amount of nutrients injected, fertigation systems can also be set to apply nitrogen, iron, or potassium every seven to ten days. This light, frequent feeding is helpful to turf growing in sand rootzones or in soils that have a poor pH or low cation exchange capacity.

Fertigation is also useful when a course or field is scheduled for a special event. Small amounts of nutrients can be applied to prepare the turf for the event or help it recover afterwards. These rates avoid lush growing conditions, give the turf greater stress tolerance, and do not disrupt the use of the facility during the day. They also greatly reduce the potential to burn the turf during the summer and enable you to restore nutrient levels following heavy rain storms.



Fertilizer tank at Isla Del Sol.

Various types of injection techniques have been utilized over the past 20 years. It's important to recognize that any chemical injection system must follow a backflow prevention device to avoid contamination of the water source. For further control, fertigation devices are installed on a bypass with valves to separate the injection equipment when not in use. All types of fertigation installations should be designed by a trained expert.

The first modern fertigation device was a venturi system. In this method, a small tube leading from a nutrient supply tank is inserted into the water line. The flow of the water in the pipe sucks fertilizer into the irrigation water for distribution by the sprinkler heads. If the flow changes, the amount of suction changes. A small valve is used to adjust the amount of solution injected. By keeping track of the level of fertilizer in the supply tank, the turf manager can determine the amount applied during a given irrigation cycle.

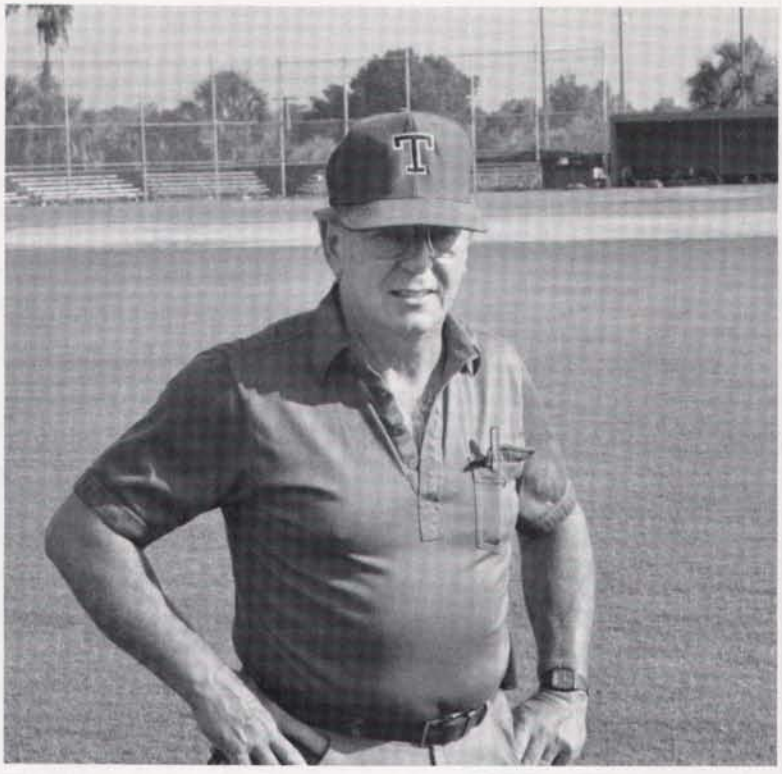
In an effort to gain greater control over injection amounts, engineers incorporated small proportioner pumps which deliver precise quantities of solution into irrigation lines. These pumps can be adjusted to inject parts per million of a chemical if necessary. Since one irrigation station may require a different flow rate than the next, and therefore a different quantity of fertilizer, flow sensors were added to change the injection rate of the pumps. Then, as the controller switches from one station to the next, the level of fertilizer remains the same.

In some cases, the turf manager may not want to fertigate all stations on his control-

ler. One option is to run individual stations with the fertigation system on. A second is to install injection devices only for the lines leading to the fertigated zones. A third, more advanced option is to utilize the irrigation controller to instruct the bypass valve on the fertigation system to open and close.

The one limitation of electric pumps is they require a power source to operate. Some manufacturers offer water-driven piston pumps that compensate for water pressure and flow. These can be used for remote turf areas. Like all pumps, they must be selected to fit the flow rate of the irrigation system.

In all cases, storage tanks must be protected from vandals and located in areas accessible to delivery trucks. All applicable state and local laws regarding storage facilities must be followed.



Bill Andrews, head groundskeeper at the University of Tampa.

Whether the facility is a single baseball field or an entire island resort, fertigation is being utilized for turf fertilization. Every square foot of Isla Del Sol, a small island across the bay from St. Petersburg, FL, receives fertigation during the winter. Superintendent Marvin Russell turns to spoon feeding to keep the 18-hole golf course and resort grounds green and thriving during the busy season when the island is filled to capacity with retirees and their guests.

From May to November, Russell has plenty of time to get on the course with spreaders to establish a base of slow-release fertilizers. But when the winter residents arrive on the island, he must squeeze maintenance into the first few minutes of daylight. For the past eight years, Russell has solved this problem with fertigation.

Two nights a week, Russell turns on the fertigation system to apply ammonium sulphate through his Rain Bird

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impact rotors. His seven-ton tank is refilled every six weeks by Koos-Shore, a fertilizer supplier. Dave Bouck, president of Golf Course Services, Inc., helps Russell put together a fertilization program based on soil tests.

"The liquid fertilizer is a good supplement for cool weather," says Russell. "The ryegrass stays healthy without growing too fast. It's easier and cheaper for us to apply with all the winter traffic we get. The sandy soil here also doesn't hold nutrients well. We can add potassium to improve traffic tolerance if necessary."

In nearby Tampa, Bill Andrews has a busy winter and summer schedule for the athletic facilities at the University of Tampa. Fertigation was a big switch for Andrews after 40 years as a college groundskeeper. "The people at Mantek/Opti-Gro had to twist my arm to get me to try fertigation the first time," he admits. "Now, I call them regularly for advice."

In addition to fielding strong baseball, softball, track, and soccer teams, the university is the site of the Tampa Bay Buccaneers training facility. The Tifway 419 has to be perfect for the Buccaneers when camp starts in July. Andrews overseeds the athletic fields in November to withstand the winter practice and game schedule on campus. He can't allow either the ryegrass or the bermuda to lose its aggressiveness.

"Not only do we have to keep the turf growing year-round," says Andrews, "we face a constant battle with fire ants and mole crickets. Every moment of staff time we save by fertigation is needed to perform other types of turf maintenance. Our ten-person crew must stay on top of 100 acres of campus grounds without a break.

Marvin Russell, superintendent of Isla Del Sol.

"We can green up the baseball stadium for a major tournament in 12 hours by using the fertigation system to apply nitrogen and iron," he adds. "It's tough to predetermine our needs. We may only get a few day's notice for a special event. I can also adjust the fertigation to fit rainy or dry weather. You really need to manage stress well in this climate."

Across the country in drought-stressed Southern California, Phil Baker has adapted monthly fertigation to the campus at Westmont College. Located on 135 acres in the Montecito Hills above Santa Barbara, Westmont's campus and athletic facilities are a stark contrast to the chaparral of the surrounding mountains.

Baker, like other groundskeepers in the region, has been forced to save every drop of water possible without sacrificing his valuable landscape. Westmont is fortunate because it has an excellent well and a former swimming pool in which to store 210,000 gallons of water. Most campus plants and trees are on drip.

Cut into the mountains are the athletic

fields for the college's 1,200 students. Carr Field serves as a baseball and soccer field. Lovik Field was added in 1988 as a multi-purpose field. Carr Field is kikuyugrass in the summer and overseeded ryegrass in the fall. Lovik is turf-type tall fescue. Nine gardeners do all the work on campus.

Carr Field had a venturi-type fertigation system for 10 years before Baker joined the staff. "Fertigation is not new here," he states. "But when Lovik Field was built we had a chance to reevaluate different types of injection systems. The Dosatron unit was a good fit due to the hillside location of the fields and the way our controllers are set up. Since they don't require electricity, we could have one system for each field. With the old system someone has to be there to adjust the injection rate when the controller switched to the next station. The new unit adjusts automatically."

Since the school only fertigates once a month, Baker is using approximately a half pound of nitrogen each application. "We just set the dial on the unit and go home," Baker adds. "The next morning the teams are out practicing without any limitation on field use. It saves us a lot of time over spreading fertilizer, we don't have to water it in, and we've never had a problem with fertilizer burn."

Baker has been upgrading heads and controllers and checking soil moisture levels frequently the past five years. "In some areas we found we could get by with half the amount of water we were using. By using the water budgeting feature on the Irri-Trol controllers we have reduced campus irrigation by 25 percent."

The school plans to expand fertigation to the dormitory areas of the campus and add moisture sensors in the coming year. Baker has been adding wetting agents and soil penetrants to heavy wear areas through the fertigation system. Minor elements are added to the solution based upon yearly soil tests. For the hard-to-reach fields, Baker transports the solution in a 50-gallon tank on the back of a Cushman truckster. He then tranfers the mix into a 150-gallon storage tank on site.

Baker, Russell, and Andrews have their special reasons for fertigation, but those reasons are not unlike those of thousands of other professional turf managers. Getting the most out of an irrigation system and limited maintenance budget is the important thing. By doing this in an environmentally responsible way, they have insured the use and reputation of their facilities for the future.