A vintage, sepia-toned photograph showing a person from behind, carrying several large, white, cylindrical pipes on their shoulder. The person is walking through a field with a long, narrow trench or furrow in the foreground. The background shows a line of trees under a clear sky. In the upper right corner, there is a graphic overlay consisting of two overlapping circles: a solid orange one on the left and a white one on the right with an orange border. The text "irrigation '74" is printed in a black, serif font within the white circle.

irrigation '74

FERTIGATION: Double Duty

“... an excellent complement to our regular fertilizing methods”

By LARRY A. WEBER*

One of the more serious problems facing a golf course superintendent is finding the time to fertilize during the season. A little over a year ago, after the pro shop and I failed to reach a common shut-down time for fertilizing, I decided it was time to look into other methods of fertilization.

The method that showed the most promise was fertigation. Fertigation is the practice of applying fertilizer through an irrigation system.

Inverrary Country Club is a 54 hole golf complex within a 1000 acre development in Ft. Lauderdale, Florida. It includes two — eighteen hole championship courses and one — eighteen hole executive course. The Jackie Gleason Inverrary Classic golf tournament is played here each February.

I chose the executive course as a trial area for fertigation. The course covers 65 acres and has a perfect wall to wall Toro Varitime irrigation

system. The greens are planted in Tifton-328 Bermudagrass, fairways and tees are planted in Tifton-419 Bermudagrass and the roughs are seeded in common Bermudagrass.

The fertigation system consists of a few basic components. These include:

1. 1200 gallon storage tank with 6 ton capacity.
2. In line filter.
3. High pressure injector pump.
4. Check valve to prevent water pressure from going back into fertilizer tank.
5. Electric pump start and isolation switches.

My vertical shaft turbine pump station requires a high pressure injector pump. With a centrifugal pump station, the high pressure injector pump can be replaced with a metering valve. The isolation switches allow the flexibility of fertilizing greens only, fairways only or roughs only or any combination of the three.

The fertilizer used was of two analysis. During the summer months I used 12-0-6 with magnesium, manganese, and iron. In the cooler months I used 11-0-5



with same minors to prevent salting out at the lower temperatures. Phosphorous was not applied throughout the year due to an adequate amount in the soil as indicated by soil tests.

The rate of application of fertilizer is based on the number of days irrigation is needed. Our average rate is 20 days per month. We used 13 gallons of fertilizer per hour for 11 hours per night or a total of 143 gallons of fertilizer per night. I used this low rate to compensate for changing wind conditions, to keep the soluble salt level down and to keep the growth rate of the grass at a constant level.

The total amount of fertilizer used throughout the year was far less than I expected. I use a total of 63 tons of the liquid blend, 2 tons of granular 7-3-7 greens mix and 10 tons of Milorganite on slopes and trap fingers. The dry material was used during periods of heavy rainfall when I did not need to irrigate.

The actual amount of fertilizer elements used over the year proved very interesting. The total amount of Nitrogen applied was 250

(continued on page 28)

*The author is the golf course superintendent of Inverrary Country Club where the Jackie Gleason Inverrary Classic is played in February.

For Your Irrigation System



By MAX A. BROWN*

Turf managers for years have felt that applying fertilizers lightly and frequently had many advantages over heavy, infrequent fertilizing. So called "spoon feeding" of turf areas eliminates cycling between heavy flushes of growth soon after fertilizing and hungry, weak turf when the next application is due. "Spoon feeding" also minimizes the risk of heavy losses of fertilizers from surface erosion or leaching when heavy rains occur.

But applying fertilizer costs money. The labor and equipment required to apply dry fertilizers is calculated to be between \$5 and \$10 per ton for bulk handled materials and over \$10 per ton for bagged fertilizers. On an area basis it costs between \$1 and \$3 per acre each time you apply fertilizer. Therefore, most fertilizer programs become a compromise between the frequency we would like to use for best results and what we can practically afford in time and money.

A reasonably designed automatic irrigation system provides the

ideal tool for applying fertilizers lightly and frequently without labor costs. The automatic irrigation system is by far the most expensive piece of mechanical equipment on the golf course. In fact it usually costs more than all other pieces of mechanical equipment combined. This system can apply fertilizer to all irrigated areas as well as water them.

Fertigation, the coined word for the practice of applying fertilizer through an irrigation system, involves a "technological marriage" between the solutions fertilizer industry and the irrigation design and equipment industries.

Liquid fertilizers are not new. They have been a major factor in the fertilizer industry for many years and today account for about 30% of all forms of fertilizers. Irrigation equipment and design have evolved considerably in the past ten years. Quite acceptable uniformity and dependability can now be expected from these systems. The "technological marriage" of these two industries is consummated by the technology necessary to precisely introduce the liquid fertilizers into the irrigation system.

"... significant labor and money saving advantages"

Injection Methods

Fertilizer can be injected into the irrigation water flow at any point. However, the most successful systems have been those in which the fertilizer is injected into the main irrigation line. Those systems with independent injection into each sprinkler or group of sprinklers have been troublesome.

A requirement for uniform fertigation is that there be a uniform concentration of fertilizer in the irrigation water. This can be achieved in two ways, with one being more versatile and expensive than the other.

The ultimate system of choice involves a flow sensing device in the main irrigation line. This device precisely measures the flow rate of water. It then causes fertilizer to be injected into the water in a precise, preselected concentration regardless of whether one sprinkler or many are operating. As the main-line flow rate decreases at the end of a watering cycle it automatically shuts off. Once the main-line flow

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Liquid fertilizer is stored in a corrosion-resistant tank and injected directly into the irrigation water. All nutrients normally applied to turf in dry fertilizers can be applied through the irrigation system.

resumes, the fertilizer injector will automatically start up. A monitoring device can be installed downstream in the main-line which will shut the system off if the fertilizer concentration varies from the pre-selected level. Several systems of this type are presently on the market.

The less versatile and less expensive alternative is to use a constant volume injection device and try to maintain a constant main-line flow of irrigation water. This can be done

by manipulating the irrigation controls so there are the same number of sprinklers of one type operating any time the injection device is operating. This system can also be installed so that it is automatically started and stopped.

The above described systems are necessary when injecting into a pressurized water line, such as the discharge side of a turbine pump. However, when centrifugal pumps are used the fertilizer can be simply and

inexpensively metered into the suction side of the pump. This system can also be valved to operate automatically.

Most failures of fertigation systems result from a) poor injection methods and b) fertilizer problems. Once a thorough study is made of injection methods, a good understanding of available fertilizers and their limitations can be achieved.

Fertilizers

The fertilizer must be stored in a corrosion resistant tank near the injection device. Most success has been achieved using clear solution fertilizers, rather than suspensions. These materials must stand prolonged stationary storage without agitation.

Some superintendents dissolve dry fertilizers in water to produce their own liquid fertilizers. This procedure is very time consuming and troublesome. It eliminates much of the labor saving advantage of fertigation. Prescription mixed liquid fertilizers eliminate handling labor and are comparable in cost to dry fertilizers.

All nutrients normally applied to turf in dry fertilizers can be applied through the irrigation system. One occasional exception is phosphorus. This nutrient reacts with certain waters high in calcium forming a cloudy, white precipitate which can coat pipes and sprinkler nozzles. Phosphorus cannot be included in liquid fertilizer mixtures containing magnesium.

Those nutrients which are readily leached in sandy soils such as nitrogen, potassium, magnesium, and sulfur can be easily applied. The complete spectrum of minor elements can also be included with no problems.

Advantages

Fertigation is a significant labor saving technique. Fertilization is done automatically and rates are adjusted by turning a dial. There are no bags to lift and no dust. Fertilizer is usually delivered directly to your tanks by the supplier and moved by pumps and hoses. The need for large fertilizer storage space is eliminated.


There is no danger of burn to turfgrasses since liquid fertilizers are greatly diluted with irrigation water. Wheel tracks and speckling of turf burned by fertilizer granules is eliminated.

Fertigation does not conflict

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with golf play. Golf courses, closing a portion of the course to golfers when fertilizing, can significantly affect revenue at busy times of the year.

There is strong evidence that less fertilizer is needed to maintain healthy turf under fertigation. Certain golf courses on very sandy soils have experienced up to 50% less fertilizer required under fertigation when compared to their normal dry fertilizer program.

Disadvantages

Clear solution liquid fertilizers are limited in the total amount of plant food they can contain. Solutions containing large quantities of potassium, for instance, may "salt out" at low temperatures. Users must be aware of the "salt out" temperature of each fertilizer grade they use.

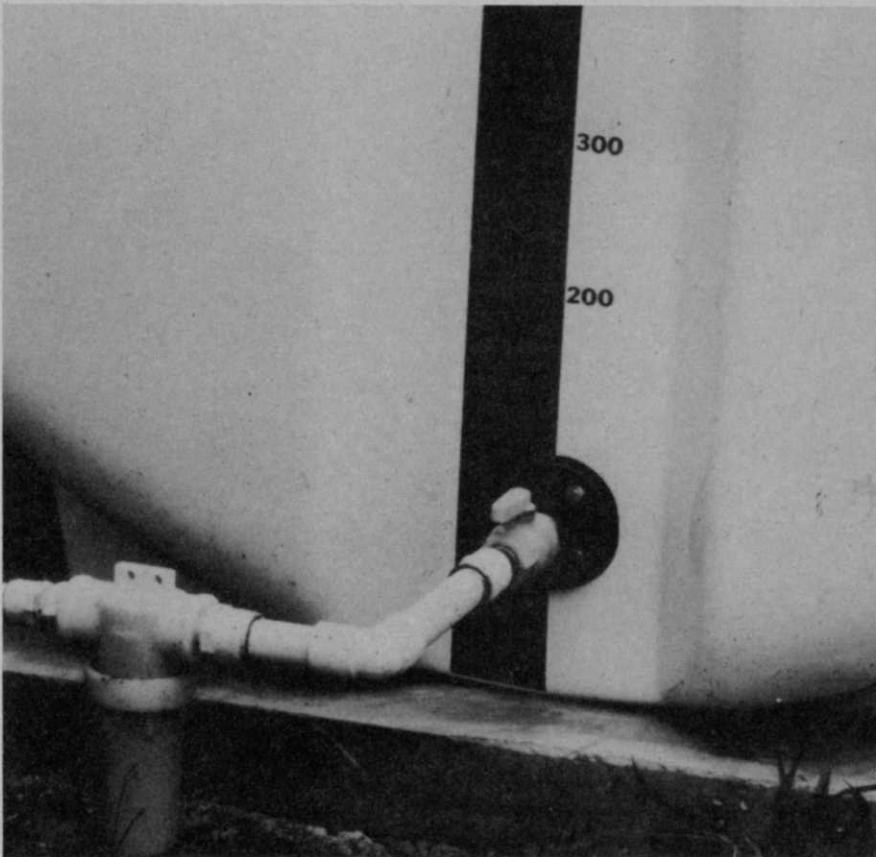
It is difficult to apply large amounts of fertilizer through an irrigation system during rainy weather. Care must be taken to apply phosphorus through fertigation only if it will not react with chemicals in the irrigation water and other fertilizer nutrients.

Distribution

Uniformity of fertilizer distribution through fertigation is only as good as the irrigation system. This can be good but is sometimes quite poor. However, we are not comparing with a perfect standard. Most dry fertilizers are bulk-blended granular materials applied with centrifugal-type spreaders. Uniformity with this type of equipment is normally quite poor especially on variable terrain like a golf course where no straight lines for uniform overlapping are possible.

Segregation of materials occurs in dry fertilizers because of differences in particle sizes, shapes and densities. Heavy particles are thrown farther and small light particles drop near the applicator. With liquid fertilizers each individual drop contains the same plant food content.

Fertigation will not fit every turf situation and will not match every turf manager's program. But the significant labor and money saving advantages, and the enthusiastic acceptance by most superintendents who have tried it, lead me to believe that a major portion of large-area turf fertilization will be done by fertigation in the near future.



Fertilizer, flowing directly from the tank to the irrigation system, can be injected in a precise, preselected concentration regardless if one sprinkler or many are operating.

FERTIGATION (Weber)

(from page 22)

lbs/acre or 5.74 lbs/1000 sq. ft. This is about one-half the amount recommended by our state for our area. Their recommendation is 9-12 lbs. N./1000 sq. ft./year. Likewise, the amount of potassium was greatly reduced. I applied 112 lbs of K₂O/acre or 2.57 lbs/1000 sq. ft.

The most pleasing results of fertigation were in the reduction of costs. The total amount spent for fertilizer figured out to \$80.37/acre/year. The average cost per ton of the material used was \$60.00 to \$80.00/ton. With the ever increasing cost of fertilizer materials, the liquid system looks much better all the time.

Some of the main advantages of fertigation are:

1. No labor costs for spreading fertilizer.
2. No disruption of golf play.
3. No storage area required as for dry fertilizer.
4. Grass can be maintained at an even growth rate.
5. Cost of liquid is less per ton than dry.

There are also a few disadvantages, too.

1. It may be necessary to irrigate just to fertilize.
2. Uneven distribution of sprinklers — some running longer than others, therefore putting out more fertilizer.

At Inverrary, our play is very heavy in the winter months. This is also the time of year when the Bermudagrass requires more fertilizer. This is why I chose fertigation.

To see if fertigation was the best method of fertilizing, I had to compare it to the conventional methods of fertilizing. I have gone on a complete Scotts program on the West course and on the East course I am on a granular dry fertilizer program. It will be several months before I have enough data to accurately compare the three methods.

I don't feel at this time that fertigation is the complete answer to all our fertilization problems. I do feel that it is an excellent complement to our regular fertilizing methods especially during the winter months in Florida.

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