

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.