

Irrigation Systems: Potential Workhorses

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Although problems still must be solved, the feasibility of applying fungicides, herbicides and pesticides through an irrigation system is not so far-fetched

An irrigation system is designed to function as a water dispensing system. Because of this, it should be capable also of distributing chemicals, including fertilizers. Potentially, it is capable.

Using an irrigation system for these purposes could represent a substantial cost saving: first, it reduces labor costs; secondly, it saves equipment purchasing and maintenance. In addition, there is evidence from related fields—greenhouse culture of potted plants and flowers—to indicate, in the case of fertilizers, that small amounts of nutrients, applied regularly through irrigation water, produce plants of superior quality.

Despite these apparent benefits, it is most significant that to date, except for fertilizer injection (see "Fertilizing While Irrigating: A Reality?" *GOLFDOM*, August, 1969, p. 43), irrigation systems are not used to apply chemicals on turfgrass areas. Why? Because of the necessity for uniform application of water and proper concentration of the chemical.

Uniform application is the key to effective use of the system as a distribution vehicle for fertilizer, pesticides, fungicides and herbicides. Strength of solution or dilution limits the use of many pesticides through an irrigation system. With the exception of soil drenches and the possible exception of sys-

temic compounds, the dilution rate of most pesticides would be too low to be effective. At the present time, therefore, these chemicals should not be considered for application through an existing irrigation system, unless the system was initially designed for that purpose. Before making any attempt to convert an existing system, superintendents should contact the manufacturer which would send a consultant to determine the feasibility of a conversion. Once it has been ascertained that conversion is feasible, a superintendent might work with a local engineer on possible designs.

Designing a system for use in applying chemicals must take into consideration the area to be covered; hours available for watering; amount of water to be applied; source of water; type of system; precipitation rate; head spacing; wind velocity and service life of the equipment.

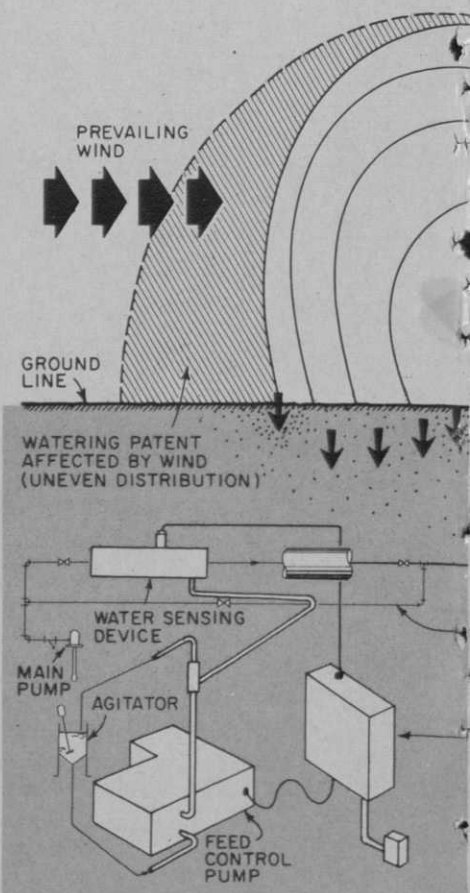
Soil and climatic variation

The physical properties of soil directly effect the uniformity of infiltration, percolation and drainage of water and chemicals. In addition, topography (especially degree of slope), the degree of soil compaction and wind velocity, influence the manner, amount and rates at which both water and chemicals

will reach the root zone, even though the water may have been applied uniformly to the turfgrass surface. These factors can be compensated for with design. It must be recognized that any system, new or old, irrespective of how well it has been installed, used and maintained, is no better than its basic design.

Wind condition is frequently overlooked in both design and performance. Unfortunately, many heads are spaced on a "no wind" basis. This is wrong. Note how spacing varies with wind velocity:

MPH wind	Maximum triangular spacing (% of diameter)
1-3	70
3-5	60
5-7	50
8-10	40



The number of heads required for effective watering goes up in inverse proportion to the square of spacing. Therefore, three times as many heads would be required in an eight to 10-mile-an-hour wind as are required in a zero to three-mile-an-hour wind. Substantial savings may be effected simply by the operator scheduling watering periods to coincide with periods of day or night when winds are low.

Irrigation equipment presently available permits the controlled application of precise amounts of water needed for chemical application. Further, such systems are capable of delivering the water in accordance with the needs of the grass plants and in conformance with the ability of a given soil to take in (infiltration capacity) and store water

(water-holding capacity). Today's systems are economical and function to assure water conservation and minimal operating cost.

The technological advances in controllers, valves and sprinkler heads that have occurred within the past few years have been substantial. The development of two-speed gear driven rotary sprinklers has been essential in ensuring uniform application because they eliminate the problems associated with overlapping and non-overlapping areas. The head rotates at half-speed where there is no overlap, at full speed through the overlap area. Thus, an equal amount of water is distributed to all areas. Valve-in-head sprinklers also increase the accuracy of chemical application through underground

sprinkler systems. They can be cycled by central programming for chemical injection, but can also be scheduled with satellite controllers in the field that can be operated manually for on-the-spot supervision of chemical application. The running time of each head can actually be timed to adjust to the turf conditions of the area it covers.

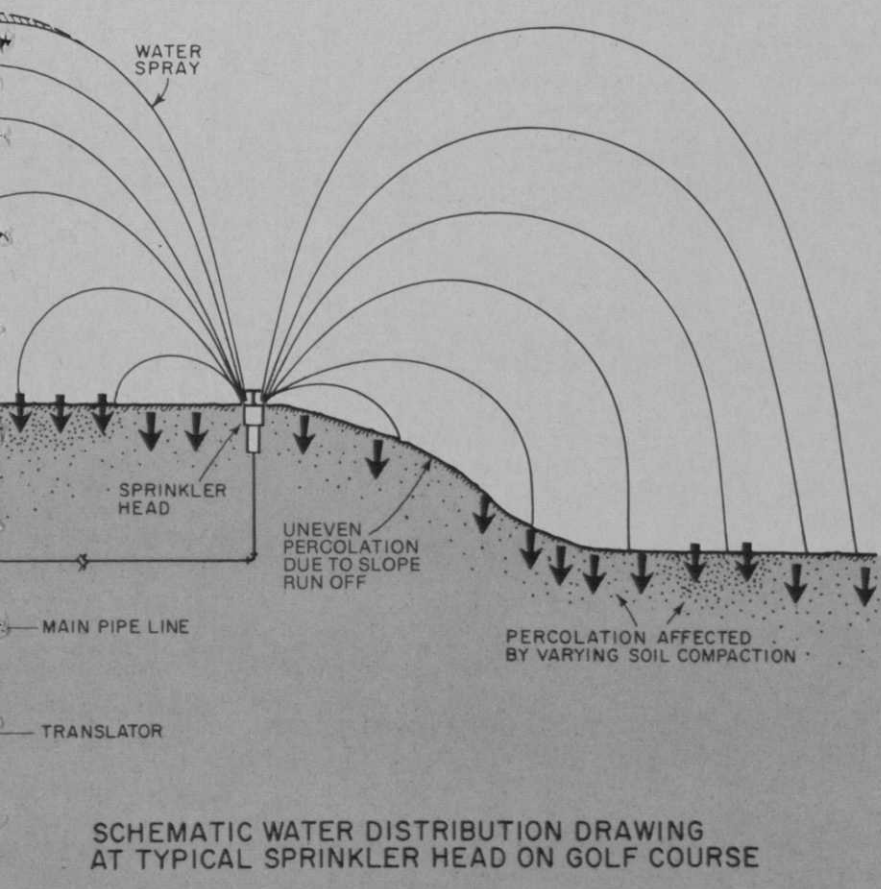
Properties of materials

New component materials, such as plastic heads, eliminate the corrosive effects of chemicals. Problems of solubility and the abrasive action of some compounds may be eliminated completely by water soluble materials. The economics of such products may preclude their use in some cases.

In certain situations, fertilizer solutions may "salt out," *ie.*, the dissolved materials crystallize and settle. The resulting sludge may clog controls and valves, and the composition and strength of the fertilizer would be altered.

Salting out is a temperature phenomenon and may occur (depending on the material and the strength of the solution), from 55 to 60 degrees to well below zero. In general, the lower the temperature, the more likely salting out will occur.

Evidence indicates that low fertilizer rates, especially nitrogen, applied daily or at the time of irrigation are beneficial to uniform, healthy growth. This is the area which shows the most promise to date. Injectors and metering devices that place the correct amount of chemicals into the irrigation system are available. Golf course superintendents in different parts of the country have installed such devices to permit application of nitrogen through their irrigation systems. Their experiences confirm that chemical application is only as effective as the uniformity of water coverage. □



SCHEMATIC WATER DISTRIBUTION DRAWING AT TYPICAL SPRINKLER HEAD ON GOLF COURSE