BALANCING HYDRAULICS BASED ON ALLOTTED TIME

It has been a few months since I've put together an article for "Thru The Green", so I'll try to pick up where I left you hanging.

The last few articles I've written have concentrated on gathering the kinds of data that you may find useful when organizing your irrigation control programming schedule. We have dealt with sprinkler precipitation rate calculations, programming control zone separation and ranking by importance, development of seasonal baseline sprinkler schedules for each type of control zone, organization of control zone schedules into programming groups, and rough calculations of the time required to irrigate your course vs. the time available for irrigation.

Because each golf course is different in size and method of irrigation control, you may have found that some of this data does not apply to your situation. My main intent in writing each of these articles has been to inspire thought about the interconnection between the environmental factors present at your course and the physical factors of your irrigation system that you must control in order to water your turf effectively.

Regardless of what type of control system you have, you are limited by two opposing factors when you get down to the nitty gritty of setting up your program; how much time do you have available to water and how much water can you push through your system at any given time. In the August issue I described some methods of determining how much time you have available to irrigate during various seasonal conditions. The amount of water your irrigation system can provide a a given time is usually dependent on four factors: your water source, your pump station, your mainline pipe network, and your control system.

Your water source and your pump station must be compatible with each other to ensure efficient water distribution and energy usage. Most pump stations are designed to operate at a high efficiency based n a maximum volume of water provided at a specific pressure increase. If you try to distribute a volume of water that is greater than the pump station is designed for, it may not provide the pressure increase you need to run your system. Conversely, if your pump station doesn't have multi-stage capabilities, you may be wasting energy (and dollars) if your system is regularly running at a lower volume than the maximum efficiency range that the pump station is designed to achieve.

Your mainline pipe network is designed to accommodate a certain volume of water without producing excessive water velocity and friction loss between the water source/ pump station and the sprinkler outlets. The faster the water moves through the pipe, the greater the pressure loss due to friction over a given distance. The smaller the pipe diameter, the faster a given volume of water will flow. Therefore, you need to control the volume of water moving through the various legs of mainline pipe that make up your irrigation system. Most manufacturers of Polyvinylcholoride (PVC) pipe and fittings recommend that water velocity be controlled so that it does not exceed 5 feet per second (F.P.S.) under normal operating conditions. Engineering data that describes typical velocity and flow characteristics for different types and sizes of pipe are available from most pipe manufacturer representatives or distributors. An example of maximum flows (to maintain a 5 F.P.S. or lower velocity) in various sizes of PVC class 200 PSI pipe are as follows*:

2" @ 55 GPM = 4.85 F.P.S
2 1/2" @ 80 GPM = 4.82 F.P.S.
3" @ 120 GPM = 4.88 F.P.S.
4" @ 200 GPM = 4.92 F.P.S.
6" @ 425 GPM = 4.82 F.P.S.
8" @700 GPM = 4.68 F.P.S.

*Data Source: Buckner Irrigation Systems Design Manual, First Edition 1988

You need to be aware that pressure loss accumulates over the distance that water travels through the pipe. If your system is engineered correctly, the pipe network is sized based on a "maximum assumed flow" within the pipe over the entire distance, and elevation change, that the pipe routing encounters. This "maximum assumed flow" is estimated by determining how many sprinklers will be operating at any given time along each leg of mainline on your course. And as I indicated before, the number of sprinklers that need to run at any given time is dependent on how many zones you have, how much time each zone must run, and how much time you have available to water.

Next Month: Wrapping up this series on Irrigation Programming (hopefully)....

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