

Master Irrigation Control System

For

Fiddler's Creek Community Irrigation System

(Presentation Summary)

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Current System: Overview and Description

The irrigation system at Fiddler's Creek is a large community system that has several points of connection with pump stations that produce a combined flow capacity of approximately 15,000 gallons per minute. The system has a robust mainline pipe network that handles the distribution of nearly a billion gallons of water per year over the residential and community landscapes. While the piping in general is adequate, there are localized areas that have improper cross connections which are limiting flow and pressure and components in need of repair.

Electrical Control Sub-System

A major component part of the irrigation system is the electrical control subsystem, which actuates all the distribution valves and sprinklers. The control subsystem components (field controller pedestals, electric valves and wire cable) have the shortest useful life expectancy of any part of the irrigation system, which is approximately 15+ years. This part of the irrigation system is unfortunately beyond its useful life in many areas and is also quite obsolete, technically speaking. In some of the earlier developed areas of Fiddler's Creek, the control system is over 25 years old and very unreliable. The numerous electrical components within the control pedestals (90+ units) are aged and many of the installed electrical cables in the field have been damaged.

The existing control system is also very limited due to its relative age and technically obsolete when compared to newer irrigation control systems. Contemporary irrigation control systems are designed to greatly enhance the ability to manage irrigation throughout the piping network by

sensing and monitoring the flow at specific points in the system. This is a fundamental and critical operation within any irrigation system, especially a system of relative size such as Fiddler's Creek. Without flow management, excessive amounts of water flow (velocity) can cause severe damage and wear over time that will lead to mainline pipe failures and property damage. Unfortunately, there is currently no way to accurately measure/manage the flow levels within the pipes of the existing system at any given moment, thus exposing the system to certain eventual problems.

Another current limitation is the fact that the entire control subsystem is not centralized. In other words, this implies that the capability **does not** exist to communicate with all the field controllers (90+ units). Field controllers should be adjusted periodically when climate conditions change (wet season/dry season, cool/hot temperatures, etc.), however without communication capabilities a field controller will need to be manually adjusted and programmed for scheduling. This requires a significantly greater amount of time/labor each time the field controller needs changing/adjusting. Centralized communication with all field controllers is a necessity that all large systems must employ to maximize performance and efficiency from the overall irrigation system.

Necessary Improvements - Smart Irrigation Control

For at least 10 years, the concept of "smart" irrigation control has been on the market and has gained significant momentum due to the inherent benefits of resource conservation. This idea was first employed in the western United States in areas such as California and Arizona where irrigation water resources have been a relative commodity for decades.

Schedule/Programming:

The notion of smart irrigation is simply **not to apply irrigation unless the current conditions justify** the need. Unfortunately, the typical automated irrigation control system will naturally overwater the intended area throughout the course of the year due to a lack of information regarding the real-time climatic conditions. For example, if the control system is set to a weekly schedule that includes running its zones on Monday, Wednesday and Friday, then that is exactly what it will do. Even if the ground is saturated from a storm that occurred the day before, the system will run the next cycle, nonetheless. This is not only wasting the irrigation resource, but it can also be detrimental to the general health of the landscape plants and turf.

Smart irrigation control may utilize rain and soil **moisture sensors** that are in specific locations on the site. This information is permits managers of the system to more effectively make decisions regarding run-time scheduling for zones. By continually making these adjustments over time, management of irrigation systems utilizing the smart control system are capable of water resource savings compared to management utilizing conventional control and program scheduling.

Managing Flow and Maximum Allowable Flow (5ft./sec.)

Utilizing a smart irrigation control system can also help protect the pipe in the system from “water-hammer”, which is the result of allowing too much flow to through the pipe at any given instance. A rule of irrigation system design is to allow ***no more than 5 feet per second flow velocity*** to occur within any pipe at any time. Exceeding this value puts the pipe in the system at risk of the dangerous effects associated with water hammer that can lead to premature failures, especially at junctions and tees in the pipe system where the flow is abruptly redirected.

Flow and pressure sensors may be placed and installed strategically within the piping circuit that will constantly monitor the actual flow. This gives the irrigation manager vital information that can be applied to developing “safe” irrigation program schedules that will maximize the efficiency of applying the needed water while avoiding exposing the pipes to danger from excessive flow. Ultimately, if the current flow within the system exceeds the preset default value, the controller will automatically shut down the flow in that portion of the pipe system via a “master valve”. This situation may arise from a pipe break, a stuck zone valve, or simply too aggressive program scheduling for that part of the piping system.

Conclusions and Takeaways

Large community irrigation systems analogous to the system in place at Fiddler’s Creek should be employing a totally centralized and “Smart” irrigation control subsystem. The benefits of having enhanced capabilities to control and manage the system are numerous and ultimately will reduce the costs of operation and ownership over time. Some of the more obvious rewards are:

Less water required to irrigate over a given period, minimize wasted water

Less energy/electricity required to irrigate over the same given period

Less pump station wear, maintenance and repair

Protecting system piping by limiting excessive flow and potential water hammer

Significantly reduced time required to make schedule run-time adjustments

Adjustments to system can be made remotely from anywhere – tablet/smart phone

Increased overall operating efficiency

Increased plant health due to avoiding constant over-watering

Conserving water protects/enhances the environment in general

The goal is to conserve water in times of drought, yet still irrigate the landscape with optimal efficiency. The only way to consistently achieve these objectives is to utilize intelligent “smart” irrigation control. There is an axiom in the irrigation industry that states simply; “If you can’t measure your water, then you can’t manage it, much less conserve it...”.