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Using SCADA for Adaptive Irrigation Management

Part Two of Four – Automatic Irrigation

What is Automatic Irrigation?

Irrigation is generally defined as the artificial application of water to the soil.

An automatic irrigation system does the operation of a system without requiring direct human involvement.

ICCS – The Game Changer!

One of the most phenomenal innovations to have been introduced into the water industry is the Irrigation Central Control System.

As the name suggests, the technology enables the programming, monitoring and operation of small to very large and even mega scale irrigation systems from a central location, allowing operators to control single or multiple sites from a single log in.

The benefits of a fully functional Irrigation Central Control System are almost immeasurable. Apart from the obvious time and labour savings, the improved efficiencies of the irrigation scheduling result in significant water and energy consumption which can provide a quick return on investment.

Key components of an Irrigation Central Control System

There are five main layers in a full function Irrigation Central Control System.

Starting from the ground up, they are:

- The field equipment such as machines, instruments, and actuators.
- The PLCs and / or RTUs.
- The communication networks

- The SCADA host software

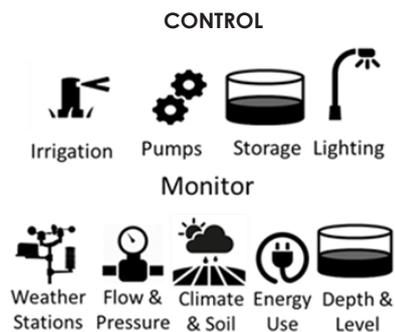
In today's IoT world, there is also another layer that is often at play:

- Third party systems

Here are the main functions of each layer.

1. Field devices

Sensors and actuators are the devices that connect to the field equipment such as control valves, pumps, filters, injection systems, relays, lighting systems, rain switches, flow meters, pressure and level sensors, weather stations, soil moisture probes and water quality sensors.



2. Controllers and RTU's

Connected directly to the field devices via multiwire, two-wire cables or wireless networks, the controller/RTU is much more than a simple time clock.

It serves the dual purposes of a local terminal for the ICCS to access the field networks as well as being an access point for the field operator to access the ICCS.



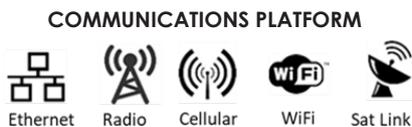
"Built for purpose RTU's" are unlike some of the "off the shelf" hardware that some systems use. It will have useful types of I/O available, and should feature a easy-to-use HMI (Keypad and Screen) that will allow stand alone control functionality in case of a communications outage or a manual start requirement.

3. Communications platform

Hopefully your ICCS platform has been made to be communications agnostic and can connect to a wide range of available communications devices.

Some manufacturers make the fatal mistake of populating communications devices on the RTU's motherboard. This can lead to early obsolescence of the hardware, as the speed that communications protocols evolve, far outpaces the development of control technology.

4. Management software



Most commercially available ICCS software are a comprehensive, application specific, advanced and accurate water scheduling, control and management system.

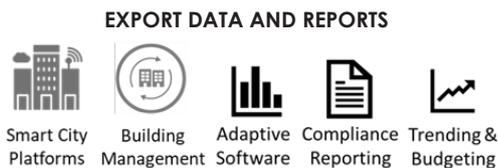
These provide a reliable, centralised and remote irrigation control environment which communicate with all the system's installed devices while monitoring and controlling all relevant sites.



Most "built for purpose" systems are generally designed to operate on standard PC's, but can also be hosted on a virtual server or in the cloud on a web hosting service.

5. Third party systems

Many ICCS platforms are designed to interact with third party software systems or can export data to hierarchical users.



Some examples of these third-party systems can include adaptive software such as ETo management or compliance monitoring packages for water allocation. More advanced types of software include Building Management Systems and Smart City Platforms.

Why is SCADA a smart choice?

Around the world, Supervisory Control and Data Acquisition (SCADA) systems are the norm at municipal utilities and manufacturing facilities, and are the ideal platform to build ICCS software on.

In most applications nowadays, the operators will require real-time data, as the systems are as much about data collection from installed sensors as it is about the control of critical equipment. This is the ideal application for SCADA.

What makes SCADA based systems different from other ICCS is that it doesn't just monitor sensor data, it can also control a wide variety of equipment and execute complex algorithms.

How Is SCADA used in Automatic Irrigation?

SCADA technology can be used in many ways when it comes to an automated irrigation system.

In water distribution networks, farms and cities, the irrigation systems can be vast and include hundreds of kilometres of pipes and cables. Sometimes these systems are also located in remote or sparsely populated areas that would take individuals hours of travel time to monitor the system. In addition to this, the sheer number of control points in some networks means it can take weeks to shut systems down for winter and a similar amount of time to adjust up watering budgets during a dry spell.

A properly designed "built for purpose" Irrigation Central Control Irrigation System automation can get rid of these problems while freeing up workers to focus on the real issues at hand. ICC Systems built on SCADA also help irrigation managers solve any problems quickly by sending alarms and emergency notifications.

Some problems are immediately addressed using pre-set directions. Others can be solved remotely using the RTU. But most importantly SCADA based ICCS ensures that crops and turf are kept healthy always using just the right amount of water. These systems reduce the possibility of under-watering or over-watering and will also lower energy costs and eliminate fertiliser runoff.

Irrigation managers and operators who are looking for a smart way to automate their irrigation systems should consider the benefits of SCADA based systems when choosing their management platform.

 **Next chapter - Practical applications**