Summer 2005

How do I...?

Each week we receive many calls from customers seeking advice on how to get the most from their systems. You probably already know that your Argus system is capable of accomplishing a wide range of control and monitoring tasks. You may also be thinking of changing, tweaking, or generally improving your overall management and control strategies. As always, feel free to contact us anytime with your questions and ideas. Also, if you have an idea for a topic or a question that you'd like to see addressed in this newsletter, please contact us with your suggestion and we'll try to respond in a future edition.

On a similar note, if you have developed a new control strategy or a novel application for your system that you'd like to share with others, let us know and we'll try to pass along your ideas in an "it worked for me" column in this newsletter.

In this issue we discuss irrigation strategies, considerations for selecting sensors, relay panel options, and introduce you to some of our newest staff. We'll be at the Ohio Short Course once again this summer, demonstrating our latest products. Hope to see you there!

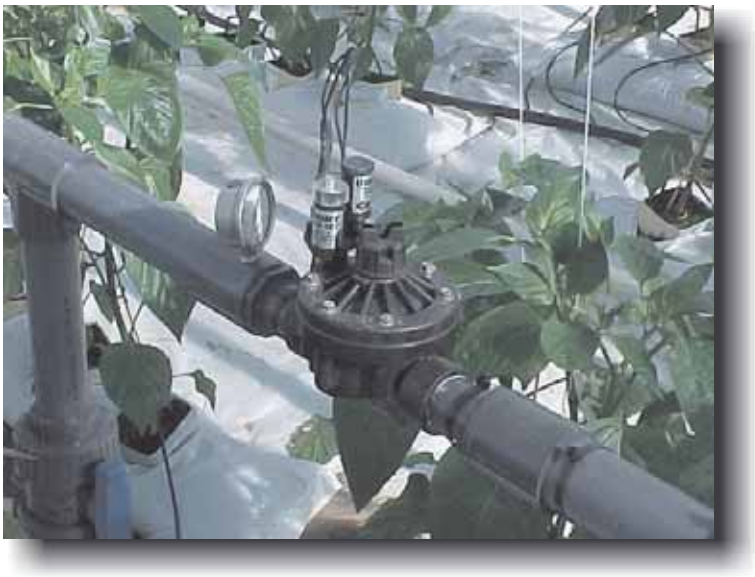
Alec Mackenzie

ARGUS CONTROLS

ARGUS ADVISOR

News for Argus Control System Owners

Irrigation Strategies



If you are currently using your Argus system for irrigation, you probably know that you have several options when it comes to scheduling waterings. These include:

Manual • Time Clock • Accumulation • Irrigation Equations

You can use any of these methods alone, or in combination for each watering schedule that you use. Deciding which one is best for your application will depend on your management style, the crops you are growing, your climates, and your irrigation equipment.

Manual Watering

Many growers prefer to initiate all waterings manually, after an inspection of the crop. With your Argus system, it's easy to set up manual watering schedules in advance. Then, with just a single entry, you can initiate a precision watering for one or more zones. If there are more zones than can be watered at one time, the Irrigation System Manager will queue them up, and water them in order within the limits of your system.

Trade Show Dates for 2005:

July 9-13th
OFA 2005 Short Course & Trade Show
Location: Greater Columbus Convention Center - Columbus, Ohio
www.ofa.org
See us at Booth 1021

Oct 5 & 6th
Canadian Greenhouse Conference
Location: International Center
Mississauga, Ontario,
www.canadiangreenhouseconference.com
See us at Booth 460

Nov 2-5th
International Hortifair
Location: Amsterdam RAI
Amsterdam, The Netherlands
www.hortifair.nl

Printed In Canada

Time Clock Watering

With this type of watering decision, you set up automatic watering events to take place at predetermined times. Time clock watering works well if you are manually managing system capacity and when the need for watering is highly regular. Many growers use time clock watering in combination with other types of scheduling. For example, you might establish the minimum watering frequency that is required, regardless of external conditions, and set this up as fixed watering times using the time clock (minimum watering frequencies are often needed to prevent salt buildups, provide liquid feeding etc.). Then you can use one or more sensor-based watering equations to add additional irrigations when conditions dictate.

Accumulation Watering

This style of watering decision uses the accumulation of one or more measured or calculated factors as a trigger for watering. Outdoor light levels are the most common source of accumulation since there is a generally good correlation between the total light accumulated and the need for irrigation, particularly in protected crops. You can also use other calculated accumulation values that represent a combination of factors such as vapor pressure. This type of watering decision contains many options for controlling how and when the accumulated values will influence and trigger your watering events. It is equally useful for short interval applications such as misting cuttings, and longer interval waterings used for container crops, substrates, and ground beds. In our experience, once it is properly tuned, an accumulation watering decision can provide very accurate and reliable irrigation in all types of weather.

Watering Equations

You would typically use a watering equation when you want to use a moisture sensor or a weight scale to trigger irrigations. This is often called closed-loop watering because the sensor is used for initiating the watering and for measuring the results. This type of watering can be very accurate and responsive, although it is somewhat more prone to problems due to sensor failure or sensor placement problems. You need to make sure that the sensor measures a representative sample of the target crop. You may also require one or more sensors for each zone and crop type. Equation watering can be used for anything from misting cuttings to field irrigation. You can also combine equation watering with other decision types for increased safety and flexibility.

With the irrigation scheduling options outlined above, you can select the water application strategy that best suits each situation, or you can combine several decision types for an integrated strategy. Feel free to review your irrigation control needs at any time with your Argus service representative.

Tips for Selecting Sensors

When it comes to selecting sensors for climate, irrigation, and nutrient control, there are thousands of choices. Here are some ‘rules’ we have learned over the years:

1. There is no such thing as the perfect sensor - each one is a compromise of some sort.
2. The most accurate sensors are generally too large, too fragile, and too expensive to be practical.
3. Sensors with the highest sensitivity and resolution generally have a measurement range that is too narrow.
4. You get what you pay for - the cheapest sensors tend to be less reliable, less accurate, or shorter lived.

Argus continually tests, selects, and stocks a range of standard sensors that we feel provide the best combination of performance and value for our customers. We also test a large number of third party sensors that we do not regularly stock, but which we can routinely recommend and provide. Since our technical staff have extensive experience with these sensors, they can assist you with quick installation, setup, and troubleshooting.

While you are by no means limited to these Factory supplied choices, we highly recommend that you choose alternate sensors with great care. If you are selecting sensors that we are not familiar with, we’ll be glad to help you with installation and interfacing issues, but you’ll need to do the research yourself to make sure they are suitable for your application, and compatible with your control system. To assist you, we’ve assembled a list of performance criteria and interfacing considerations on the following page that you can use it as a checklist for comparing and evaluating sensors.

Sensor selection always involves finding the most appropriate sensor for your application. In addition to sensor performance, installation, and interfacing issues, there are other management factors to consider. For example, some sensors can be a nuisance to use, requiring constant cleaning, recalibration, replacement parts, or other maintenance. Also, many sensors carry a restricted warranty since they are often subject to damage or a reduced life span in certain environments. In the end, your choice of sensor will usually come down to the best one you can justify at a given cost.

Understanding Sensor Characteristics

Here's a list of items to consider when selecting sensors. Not all specifications apply to all sensors, and others may have additional properties and requirements that are unique to their construction and use.

Accuracy - although this term is often used loosely to describe the general quality of a sensor, it should refer to how well the sensor agrees with a known standard. Resolution and repeatability are also important aspects of overall accuracy.

Resolution - this is the smallest change in input stimulus that will produce a detectable change in the sensor output. It is the smallest resolvable unit that can be measured.

Repeatability - this is the ability of a sensor to reproduce identical readings when the same input is applied repeatedly. As an example of poor repeatability, many bathroom-type spring scales will give you a slightly different reading each time you step on them (even without cheating).

Linearity - for instruments that produce a linear output, this is the maximum deviation of any readings from a straight line when drawn as a "best fit" through the calibration points. It is usually expressed as a percentage of the full-scale range.

Range or Span - this is the range of readings over which the sensor is designed to be used. Whenever the manufacturer states the accuracy, resolution, linearity, or repeatability data, it applies to this range or a sub-region within the range.

Response Time - the lag time before the sensor produces an accurate reading. Some sensors may also have a warmup or equilibration time when they are first installed and energized. This can be significant if you need to make fast control decisions.

Sensor Size - will the sensor physically fit your application? For example, some moisture sensors are too bulky to use in small container crops. Also, the mass of the sensor may affect it's response time. Generally, with temperature sensors, the smaller the sensing element, the faster the response time.

Drift - some sensors are prone to drift over time and may require periodic calibration. Baseline drift is a gradual change or offset in the signal from the sensor. Span drift (or sensitivity drift) is a change in the specific response of the sensor.

Cross Sensitivity - some sensors are affected by the presence of other factors. For example, some CO_2 sensors may be affected by quantities of other gases in the air. Many ion-specific probes used for nutrient measurement are also affected by cross sensitivity.

Operating Limits - most sensors are rated for use over a specified range of temperatures, humidities, pressures, and other factors. Operating outside these ranges may produce temporary inaccuracies in readings or permanent damage to the sensor if the absolute operating limit is exceeded.

Robustness - this is the overall ruggedness of a sensor and its ability to withstand its intended environment. This often depends on the sensing element itself, and how the manufacturer has packaged it with the associated electronics.

Life Expectancy - everything fails eventually. Some sensors will degrade over time, producing less accurate readings as they age, while others may fail suddenly. Manufacturers are often reluctant to publish life expectancy data for their sensors since much depends on the environment where they are used. However, it is worth asking.

Storage Life - some sensors such as pH probes have a limited shelf life, so don't buy replacement stock too far ahead.

Sources of Error - this can be electrical noise, magnetic interference, self heating, or other localized sources of inaccuracy. A greenhouse can be a very noisy environment for using sensitive instrumentation due to fluctuations in temperature, humidity, and the influences of nearby electrical equipment. Troubleshooting these problems can be expensive, time consuming, and frustrating. Wherever possible, try to select sensors that are impervious or resistant to these influences.

Sensor Interfacing

Selecting a sensor based on its performance data is only part of the job. You also need to get it to work. In particular, you need to consider the following:

Input Power Requirements - most sensors require some form of electrical power to operate. Depending on the sensor, you may be able to use on-board power from your Argus hardware, or you may need to supply the power separately.

Wiring Requirements - some sensors can suffer signal degradation due to long wiring runs or improper wire selection.

Output Signal - this is often where a seemingly 'bargain' sensor can become very expensive to use. Sensors produce many types of output signals. These include variable AC or DC voltage, variable current, and digital frequency. Depending on your system hardware, your Argus system can support all of these types of signals over a specified range. However, certain sensors may require additional signal conditioning or amplification before you can use them. Sometimes these interfacing costs can be many times the cost of the sensor. **Before purchasing a new style of sensor, check with Argus to make sure it is suitable for use with your system.**

Relay Panels - Build or Buy?


Argus Combination Panel

Electrical system interfacing is often the most overlooked component of good greenhouse design even though it is critical for the reliability, efficiency, longevity, and safety of your controlled equipment. Interfacing involves the switching of low voltage output signals from your control system into the line voltage loads needed to operate many of your equipment systems. It can include the proper selection of:

- Relays and contactors
- Overloads
- Wiring and cables (to manage voltage drops)
- Grounding (for safety and lightning protection)

Whether you are planning a new facility or retrofitting an existing one, your line voltage interfacing equipment must be carefully designed to match the electrical requirements of each controlled system. This can be performed on-site by a competent electrical contractor, or you can have Argus provide a custom engineered interfacing package.

Our CUL/UL listed panels are custom designed for each installation with a variety of available options. These can include stand-alone panels or combination designs that provide the control hardware, line voltage relays, overloads, and power distribution circuitry in a single enclosure. Your custom panels will arrive fully tested, pre-wired, and warrantied, saving you time, money, and hassles during installation. For more Information, contact Argus or your Argus representative.

New Faces at Argus

Argus is pleased to welcome the following additions to our staff:

LORI ANDREWS

Ext 103

Lori joins Argus with 15 years experience in accounting and customer service. As part of the Argus team, Lori can assist you with any concerns regarding your account as well as many other service related issues.

ANDREW WRIGHT

Ext 118

Andrew compliments the research and development team as a Windows Software Programmer. A second generation employee, his father, Greg Wright, helped develop the original hardware for the Argus system. Andrew is a recent Computer Science graduate specializing in Software Engineering. He combines his education, training, and experience to provide the Argus team with the latest software architectural analysis and design practices.

ROCKY BLONDIN

Ext 113

Rocky's education in electronics engineering technology, specializing in automation and control, make him a valuable new service team member. He relies on his experience in the automotive repair industry to effectively troubleshoot and solve technical problems. Rocky is also available to assist you with system specifications and design and configuration issues.

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1281 Johnston Road, White Rock BC, Canada V4B 3Y9
Sales: +1-800-667-2090 or 604-538-3531
Service: +1-888-667-2091 or 604-536-9100
E-mail: argus@arguscontrols.com
Web: www.arguscontrols.com
Printed In Canada