

Automated controls have become a standard feature in most greenhouses across the country. But what are they, and how can they save you time and money?

Simplify Your Greenhouse Operations

Developed to coordinate the operation of heating, ventilation and watering systems, automated equipment has seen many improvements over the years.

By David Flood and Alec Mackenzie

In the days before automated controls, you shoveled some coal into the boiler if you wanted heat and got out the hose if plants needed watering. As heating systems evolved, electric thermostats could open valves for directing steam or hot water heat into the growing zones. Similarly, the first automatic irrigation systems were created by connecting clocks to electric water valves. These first automated devices were the beginnings of a revolution in greenhouse control.

Isolated thermostats, vent openers and time clocks were certainly an improvement over manual methods, but they required a lot of manual synchronization and oversight. They were typically inaccurate, so the heating and cooling setpoints had to be well separated to avoid unintentionally operating the heating and cooling equipment at the same time. Each device was an “island of control” that had to be manually coordinated, with all the other devices acting on the same environment.

The first solid-state automated greenhouse control systems were developed to better coordinate the operation of the heating and ventilation equipment and manage watering systems. Improvements in sensor technologies made it possible to measure the current conditions more accurately and operate the controlled equipment with much greater preci-

Benefits of Automated Control Systems

Greenhouse manufacturers, industry professionals and growers typically cite the following reasons for using automated control systems:

- Increased yields, better plant uniformity, decreased shrinkage, and reduced disease and pest pressure, all resulting from improved climate control
- More efficient use of inputs such as energy, water, fertilizers and chemicals
- Improved labor efficiency (e.g., automated watering versus hand watering)
- More efficient and faster response to changing external conditions
- Catastrophe prevention through continuous monitoring of climate conditions and equipment states and alarm annunciation when deviations occur
- Reduced energy use and mechanical wear through intelligent management of controlled equipment
- Improved information for management to help repeat past successes and avoid past mistakes

sion. Single- and multizone controllers were developed that could simultaneously manage all of the equipment used for heating, cooling, supplemental lighting, shade, irrigation, et cetera.

The next step was to integrate these isolated controllers over a communications network to provide site-wide operations management. This integration became economically practical with the simultaneous development of personal computer systems and computer communications standards. Cen-

tralized management of the greenhouse equipment brought about many benefits, including:

- Outdoor weather compensation using information from a central weather station
- Central monitoring and alarm annunciation to both on-site and remote recipients
- Central data collection and historical displays of the control information
- Remote system access via modem, ethernet and Internet

Today, most greenhouse control systems are accessed via a PC interface, though the actual control processing is still resident on highly reliable, dedicated controllers. This eliminates any control disruptions due to PC-related problems.

Greenhouse Control Systems

Unlike conventional building control systems, automated greenhouse control systems are designed with crop production in mind, and the companies that build them

understand the needs of horticulture. Typically, there are programs for managing high-pressure-sodium lighting systems; thermal, shade and blackout curtains; CO₂ supplementation; irrigation systems, fertilizer injection; and a

range of other horticulture-specific applications.

Structures and Equipment

It is extremely important to get the engineering right when selecting greenhouse structures and equipment. Although a greenhouse control system can overcome some design shortfalls, if your equipment is not physically capable of modifying the climate to meet the growing targets, the control system can't make it perform miracles. For example, if your heating equipment is physically incapable of producing a uniform temperature, this cannot be corrected with computerized controls alone.

Do Your Research Before You Buy

Greenhouse control systems vary in both the number and range of applications they support and the depth of control options and features within those applications. Simpler greenhouses with less equipment and relaxed crop requirements can often get by with simple control systems. More complex greenhouse facilities requiring custom equipment operational sequences are best served by a fully

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Integrated control systems provide central access and convenient monitoring features.

The control system can't tell you everything; you'll still need to walk through the crop regularly.

integrated control system. Integrated control systems are also beneficial when there are large numbers of zones to be managed regardless of complexity, since they provide central access and convenient monitoring and reporting features.

Managing a Greenhouse with an Automated Control System


An automated control system helps you to focus on the crop rather than the controlled equipment. Once it is properly config-

ured, the system 'knows' the rules for safely and efficiently operating each piece of connected equipment. These rules are pre-programmed into the control applications running on the controllers. As the system operator, you simply specify the control targets and the control system does the rest.

The greenhouse control system continuously monitors the current conditions in the controlled areas and compares them to your targets. It applies specific control strategies to maintain these target levels at all times. These strategies often consist of a delicate balance between maintaining the setpoint targets in ever-changing external weather conditions and the need to run the equipment as intelligently as possible to avoid excessive wear and needless operation cycles.



A range of continuous monitoring strategies and alarms will automatically notify you of any 'out of bounds' conditions that could signal an equipment failure, improper settings, extreme weather, et cetera. On systems that record the control data continuously, you can compare the measured conditions against your targets and equipment operation data.




Summary

A healthy crop is often the least expensive to produce while providing the best returns. Greenhouse control systems are an important tool for managing costly inputs, producing repeatable results, and avoiding catastrophes. The control system can't tell you everything; you'll still need to walk through the crop regularly. However, a greenhouse control system should give you more time for 'eyes on the plants' than the days when growers had to be constantly adjusting the equipment. 

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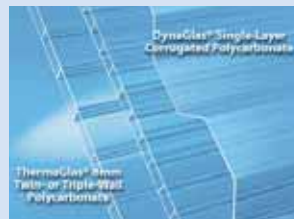
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