

GROWERTALKS

Features

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Integration, Intelligence & Accessibility

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Still controlling your fans, heaters and curtains with a couple of Dayton two-stage thermostats and a swimming pool timer? Or perhaps you've long been a user of step-type controllers, but have grown large enough to invest in an integrated control system. Either way, now is the time to upgrade, as manufacturers are working hard to make their controls do more for your crops. Our experts pointed to four key areas their engineers are focused on:

Integration—Getting the whole greenhouse talking to itself

"Growers increasingly want the control company to serve as the integrator rather than creating another walled garden," said Yen Pham, CEO of Link4 Controls of Anaheim, California. "This is especially true for mid-sized to large commercial growers."

Wadsworth's Nick Earls explains their new Juniper controller, which brings the modern user experience of their robust Seed controller to a broader range of growers.

A greenhouse is still filled with equipment from different manufacturers: heating, cooling, energy screens, lights, fertilizer injectors and other systems that don't always communicate well with one another.

Said Yen, "Historically, the choices were either to buy nearly everything from one manufacturer and stay within that ecosystem or for the grower to become the system integrator and piece everything together themselves, often with spreadsheets filling the gaps. That model is breaking down. Growers increasingly want an open control platform that can communicate with other manufacturers' equipment without requiring a custom integration project every time."

Nick Earls, who does sales and customer support for Wadsworth Control Systems of Arvada, Colorado, agrees. "I feel there has finally been a major push toward having everything integrated into one control system rather than using separate controllers for climate and irrigation. This allows growers to manage all of their equipment from a single system, making operation and monitoring much easier."

We know irrigation, temperature and light are intertwined, so controls that combine the functions can optimize crop

growth while minimizing disease risks. The goal is one place to monitor and manage the operation, with different pieces of equipment working together rather than in silos. And as Nick said, it's easier and more efficient for the grower.

It's no different than having your sales and production teams meet frequently to discuss customer needs and wants, what's ready to ship, production issues, and the like—today, you can't operate without open cross-functional communication. And the larger and more diversified your business, the more critical it is, whether it's sales and production or climate and irrigation.

Turning data into decisions, not just dashboards

The subheading above comes directly from the notes of Henry Vangameren, regional marketing manager for the Americas for control company Priva, headquartered in De Lier, the Netherlands.

"The industry spent years collecting more data," said Henry. "Now the shift is toward systems that interpret that data and act on it, so growers aren't spending their day reading graphs."



Wadsworth CEO Patricia Dean (who tag-teamed with Nick on answers to my questions) agrees. "There is much more emphasis on using the data these systems collect—not just displaying it—to understand the growing environment, identify inefficiencies and make better decisions around energy, crop performance and overall operation.

Priva One can integrate with more than 20 partners, such as Blue Radix, for autonomous climate and irrigation steering.

It's true—many growers utilize little to none of the history stored in their systems. This is where integrated platforms are pulling ahead of simple standalone controllers, which can log temperature and humidity, but can't then connect that to irrigation, labor or yield forecasting the way an integrated system can.

But you're not alone if you haven't a clue how to utilize all that data your climate control system may be storing.

"As controls collect more information, the challenge is increasingly not just access to data, but knowing what to do with it," said Patricia. "We've found that many growers benefit from follow-up support after their detailed training once they have real operating data to work with. That gives us an opportunity to help them interpret trends, fine-tune strategies and get more value from the control over time."

Making controls easier, more accessible & more adaptable

If manufacturers are doing anything that will make you want to upgrade your system, it's this: Making controls easier to use, more intuitive, more accessible and more adaptable. This will show up in several forms, including mobile/remote access (already common with many controls), better sensing, easier interfaces, scalability and systems that can help compensate for the loss of experienced growers. In other words, make sophisticated controls easier for more people to use—and useful as the operation grows and evolves.

Connectivity not only cuts the ties that binds the grower to the greenhouse, it allows for better technical support. Smart systems with built-in diagnostics can help pinpoint problems much faster and, in many cases, allow the manufacturer to help troubleshoot without someone having to be physically on site. At the same time IT security has

to be a bigger part of the conversation if hackers can find their way into your business via your environmental control computer.

Henry specifically mentioned how controls will help to bridge the experience gap by capturing institutional knowledge.

“Labor shortages and generational turnover mean fewer growers coming up with decades of hands-on climate intuition,” he said. “Manufacturers are responding with tools that translate that expertise into the system itself, so a newer grower can manage more area with more consistent results.”

Again, AI will be a big help with that as it converts years of crop data history into future greenhouse climate settings.

Lastly, with more flexible controls comes a need for more flexible sensors, especially for higher level sensing, such as vapor-pressure deficit (VDP), leaf temperature and conditions within or below the crop canopy.

Said Patricia, “Wireless sensors make it possible to place sensors around a facility, collect data, identify a problem and then move them elsewhere. Sometimes the answer isn’t more automation—it may simply show you that an HAF fan needs to be adjusted.”

Energy as a strategic lever, not just an expense

A key data set that growers need to utilize is energy—how much electricity or fuel are they buying to heat, cool and ventilate the greenhouse, and can it be done in ways that reduces energy consumption and hence energy costs? This is getting more and more critical as operating costs rise while prices stay stagnant.

Said Nick, “Graphing and data analysis are becoming increasingly important for both small and large growers, allowing them to better understand their growing environment, identify inefficiencies and make more informed decisions.”

It’s even more critical in Europe. Priva’s Europe-based customers have certainly seen energy volatility unlike their North American counterparts. That’s why Henry said manufacturers are building tools that let growers who take advantage of CHP (combined heat and power) equipment actively participate in the energy market rather than just minimize their consumption. When energy is expensive, a grower can sell surplus energy to the grid and store the unwanted heat in a buffer tank. But doing that efficiently takes data and data analysis “That’s almost entirely an integrated-controls conversation,” Henry said. “Simple controls can dim a light on a timer; they can’t bid flexibility into a spot market.”

What about AI?

AI will be playing an increasing role in analyzing the vast amounts of environmental and crop data greenhouses have been accumulating, identifying patterns and opportunities that may otherwise be difficult to spot. This will be most useful initially for high-value crops (plugs, vegetables, cannabis) and in monoculture settings.

“A facility producing a single crop under relatively consistent conditions has a much cleaner data set and is generally a more straightforward opportunity for AI and increased automation,” explained Patricia. “That is one reason highly automated greenhouse production has been so successful in markets such as the Netherlands, where large mono-crop operations are more common.” She added that AI needs to solve real problems for growers “rather than simply adding another layer of technology.”

But what is AI, exactly, and will your controls actually be making use of it? Said Yen from Link4, “Much of what is marketed today as ‘intelligence’ in controls is still essentially analytics and visualization”—not true AI.

Yen said that for manufacturers, the more important question is whether the system can actually learn and then act autonomously at the edge—“including when the internet is unavailable at two in the morning.”

He actually holds a U.S. patent under the fancy title, “Horticulture growing system with control system with optimized parameters driven by cloud-based machine learning.” In plain English, the idea is to take data from a bunch of greenhouses, let machine learning figure out what growing conditions produce what results, then use that knowledge to continuously improve the control strategy in each individual greenhouse.

“The concept is to use AI at the highest level, such as optimizing grower profitability, and translate that intelligence all the way down to very specific control actions, such as determining when an injector valve should turn on today versus tomorrow,” said Yen. “That is a very different level of AI than simply asking an AI system to diagnose an IPM issue from a photograph—impressive as that capability already is.”

What they’re working on today

Much of the above is where controls are headed. But what’s available now? What are company engineers putting inside those mysterious weather-sealed boxes you hang in your greenhouse?

At Priva, their control system is called Priva One. “We frame it as a center of intelligence, not just a cockpit of data,” said Henry. “An open platform where growers choose the best tools for their operation. And Priva One brings everything together into one picture and one set of decisions.”

That includes more than 20 integration partners—such as Blue Radix for autonomous climate and irrigation steering, Aranet for wireless sensor data, IUNU for AI-driven yield forecasting, Grodan for rootzone data and Skye (their newest partnership)—for bidding energy flexibility into spot markets.

“The thread running through all of it: growers pick their tools and Priva One makes them work together instead of sitting in silos.”

Link4 is on a similar path with their Pearl control platform. “We call it a platform rather than simply a control system because of its scalability and modularity,” explained Yen. “The same core components can be used in a roughly \$2,000 control system or a \$250,000 system.”

Climate and fertigation applications also share the same Pearl architecture. It’s intentionally open and uses industry-standard protocols so growers aren’t locked into one manufacturer’s equipment.

Both Priva and Link4 are paying attention to irrigation, as well. Priva has added three models to its Vialux M-Line UV-C disinfection system, while Link4’s Pearl can now monitor EC, pH, flow and totalized volume from an injection skid and bring that information into the cloud with history, alarms and exception notifications. They also offer a lower-cost (about \$1,000) 16-station irrigation controller called HydroRoot 16, which waters based either on schedules or environmental demand, including parameters such as VPD. Like all their products, it’s cloud-connected.

At Wadsworth, they’ve been modernizing their control line, said Patricia, who’s been rolling out their new Juniper controller at Cultivate and other trade shows. She explains that Juniper brings the modern user experience of their robust Seed controller to a broader range of growers. It was designed to give smaller and less complex facilities a modern, intuitive control without requiring them to buy more control than they need. You can add functionality as your facility grows or becomes more sophisticated, without replacing the underlying control hardware.

“Controls that were designed many years ago simply weren't built around today's expectations for mobile access, cloud connectivity, cybersecurity and the amount of data growers now want to collect and use,” she said. “At the same time, component availability made it increasingly important to move to newer technology platforms.”

Seed, meanwhile, has gotten added capabilities around sensing, data, system intelligence and integration.

“A lot of our development across both platforms comes back to the same question: How do we take all of the information a modern greenhouse can produce and make it genuinely useful to the person making growing decisions?” said Patricia, who concludes, “Ultimately, I think the challenge for control manufacturers is not adding technology for technology's sake. It's taking increasingly sophisticated technology and making it genuinely useful and understandable for the grower.”

Lastly, good news for growers on a budget: The distinction between simple versus integrated controls is beginning to collapse, said Yen, in large part due to cloud technology, which has removed much of the historical price cliff between the two.

“A smaller grower can now have remote access, historical logging, alarms and increasingly sophisticated automation without purchasing a six-figure integrated control system,” he said. “That may be a bigger change to this market than any single feature introduced in recent years.” **GT**