



Case Study: Cannabis Grower Reclaims Control with Industrial Automation

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open-source automation and future-ready
reliability*

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CASE STUDY: CANNABIS GROWER RECLAIMS CONTROL WITH INDUSTRIAL AUTOMATION

Pearl Pharma ditches closed systems for open-source automation and future-ready reliability

In a commercial grow room, you can't afford to lose control—not even for a minute. Airflow, temperature, humidity, lighting, and carbon dioxide levels must be maintained consistently. When things start going wrong, plant stress and crop damage can happen fast.

That's what happened at Pearl Pharma™, a cannabis cultivator in California, when their brand-new facility didn't work the way it was supposed to.

A HANDS-ON OPERATION

Pearl Pharma has been growing cannabis for more than a decade, starting in the medical era before officially launching in 2014. In 2018, when cannabis became legal in California for recreational use, they were ready with a full in-house operation.



Today, they produce a wide range of cannabis products—including dried flower (the smokable bud), vapes, and concentrates—all grown and made under one roof, giving them full control over quality and consistency.

Their cultivation strategy centers on smaller, carefully controlled grow rooms and years of hands-on refinement, resulting in a product line known for its flavor, strength, and reliability.

WHEN THE SYSTEMS DIDN'T DELIVER

In 2020, Pearl started building a new cultivation facility in Santa Rosa, California, with 17 grow rooms designed from scratch. The plan was to outfit each room with modern HVAC and lighting systems, all controlled automatically.



Individual seedlings at Pearl Pharma

But when the grow house went live in 2021, things didn't go as planned. The vendor-supplied controllers that came with their HVAC units were supposed to handle environmental control and data logging. Instead, they were a constant source of frustration.

"They put the controllers on, gave me a license for the software, and then I had nowhere to turn to make it work," said Michael Perlman, CEO and co-owner of Pearl Pharma.



Close-up view of cannabis trichomes on a flowering bud

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Each tower at the Pearl Pharma cultivation facility has its own panel to handle fans, pumps, and temperature sensors.

"Because the architecture was a closed environment, I was stuck with it."

These were commercial-grade systems, not built for the nonstop industrial demands of a grow room. They were closed, hard to troubleshoot, and fragile. A brownout in the area, not an uncommon occurrence, could knock multiple zones offline, and it might take hours to get everything back up and running.

Sometimes the controllers fried completely. Pearl burned through replacement boards every few months. "Every time [a brownout happened], some of the controllers would fry. The communication boards would fail every three months or so," Perlman said. "We had to buy new controllers a few times. It was crazy expensive, and they just kept failing."

It didn't take long to realize: if they wanted the facility to work the way it was supposed to, they were going to have to take control themselves.

FINDING A BETTER WAY

Before the hardware issues started, Pearl had already brought in Ignition® from Inductive Automation®, a software platform used to build dashboards, monitor equipment, and log data. But with the HVAC systems locked behind proprietary controllers, there wasn't much they could do when things went sideways.

What they needed was hardware they could actually work with—something open, modular, and built for industrial use. So in late 2023, Michael Perlman started searching online. He looked for terms like "industrial controller,"

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- Michael Perlman, Pearl Pharma

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groov RIO keeps three main pumps, with a local control cabinet, running in sequence.



The pump station circulates cooled water through the HVAC loop.

“open-source,” and “I/O devices,” and that’s when he came across Opto 22 and their [groov RIO edge I/O](#).

Opto 22 stood out right away. The platform was open, the documentation made sense, and the hardware looked like it was designed to last.

airflow, and CO₂. For lighting control, he stuck with Leviton® GreenMAX®, commercial lighting controls that were working as advertised.

FROM RESEARCH TO REALIZATION

Finding *groov* RIO was just the start.

“I used the [contact form](#) on Opto 22’s website and ended up talking to someone who gave me a great overview of the products and pointed me in the right direction,” Perlman said.

In early 2024, after connecting with Opto 22 application engineer Selam Shimelash, Perlman learned about [groov EPIC](#) (Edge Programmable Industrial Controller), a rack-mounted controller built for more complex applications.

groov EPIC gave him exactly what the old systems didn’t: an open, industrial-grade platform built with reliable I/O and the flexibility to expand and scale as the facility grew.

THE FIRST ROOM

Each grow room at Pearl Pharma operates as its own independent zone, with two HVAC units and about 40 lights. For the first room’s retrofit, Perlman focused on environmental control, including temperature, humidity,



Fans pull air through wet media to cool the water.

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***groov* RIO connects to VFDs, relays, and sensors—everything needed to run the fans and pumps—while the *groov* EPIC handles the logic.**

The HVAC units are water-source heat pumps with multiple solenoid valves used to redirect refrigerant depending on mode. In dehumidification mode, specific solenoids close to return neutral, dehumidified air to the space.

To handle this logic and control the equipment, Perlman retrofitted the existing panel with a *groov* EPIC (GRV-EPIC-PR1) running [PAC Control](#), Opto 22's free flowchart-based programming software, and the following I/O modules:

- [GRV-IDCSW-12](#) modules to monitor discrete inputs like fan status and unit mode
- [GRV-ODCI-12](#) modules to control solenoid valves using DC relays
- [GRV-OAC-12](#) modules to operate dampers through AC outputs
- [GRV-IV-24](#) modules for 0–10V analog input, used to monitor condenser water valves
- [GRV-OVMALC-8](#) modules to regulate CO₂ output into the grow room
- [GRV-ITR-12](#) modules for thermistor inputs—tracking five temperature points per room, including supply and return temps for each unit, plus a canopy-level sensor

By the end of the first installation, the room had gone from a black box of unreliable hardware to a system they could monitor, adjust, and trust. And since *groov* products integrate seamlessly with Ignition software, system visibility was easy.

Using Ignition's Vision Module, Perlman created dashboards to visualize key data like temperature, humidity, valve positions, and fan status. Ignition's Historian Module stores the data long term, and the Alarm



Outdoor panel houses fan VFDs and *groov* RIOs for local control

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Notification Module alerts Pearl's team of potential issues before they become serious problems.

SCALING THE SOLUTION

Once the first room was up and running, the rest followed quickly. Each of the 17 grow rooms was built using the same layout—two HVAC units, 40 lights, and the same environmental control needs—so replicating the setup was mostly a matter of copying what already worked.

"The first one had a few fine details to work through," Perlman said, "but once we figured it out, the next 16 were painless."

With a repeatable design and hardware they could trust, the team rolled out one or two rooms per month until the whole facility was upgraded.

"The stability is huge. We used to cross our fingers every time power dipped. Now we don't even think about it."

- Michael Perlman, Pearl Pharma

WHAT CHANGED

With all 17 rooms retrofitted, the difference was immediate. Brownouts, which used to knock systems offline for hours or kill a controller entirely, became non-events. The *groov* EPICs powered back up without issue, and environmental control picked up right where it left off.



The tightly controlled environment supports consistent, high-quality cannabis growth.



Precision lighting and irrigation systems line Pearl Pharma's indoor cultivation racks.

"The stability is huge," Perlman said. "We used to cross our fingers every time power dipped. Now we don't even think about it."

For remote access, Perlman uses DWService™, a secure VPN client that lets him connect to his control network from his laptop or phone to monitor performance or make changes anytime.

More than just uptime, the upgrade shifted how the Pearl Pharma team thought about operations. Instead of reacting to failures, they could focus on dialing in performance and planning for what's next.

"One of the primary benefits from old to new is that before we were trying to keep things going—just keep things alive," Perlman said. "Now we're looking toward improvement and additions."

BUILDING ON THE FOUNDATION

Once the room controllers were in place, Pearl extended the system to cover more of their facility, specifically large, outdoor, evaporative cooling towers that provide tempered water to support the water-cooled HVAC units.

Pearl outfitted each tower with a *groov* RIO edge I/O module to handle a small set of I/O: supply and return water temperature, outside air temperature and humidity, and control of the water wall pumps.

The RIOs also manage a set of six 7.5 hp fans. Using PID loops, they monitor water temperature and adjust fan speed through variable frequency drives to keep the

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temperature within the target range, typically between 90 and 92°F.

Pearl uses an EPIC inside the facility to coordinate actions with the outdoor RIOs, but in the event of a network issue or power outage, each RIO fails over to its own local logic using Node-RED. That local autonomy helps maintain cooling performance even if part of the system is temporarily offline.

WHAT'S NEXT

With environmental control and fluid cooling dialed in, the next focus is irrigation. Pearl is preparing to automate watering across all rooms using the same control infrastructure.

"We wanted to get most of the units deployed before spending [development] money on irrigation," Perlman said. "Now we're just about ready."

The setup includes five central nutrient tanks, each with its own pump. When a room calls for water, the system will verify water pressure, select the appropriate tank, and irrigate one zone at a time—four zones per room. If multiple rooms request water at once, the system will queue the tasks and handle them in sequence.

Moisture sensors in the grow media will provide real-time data to guide irrigation timing and volume. The goal is to create closed-loop control that responds to actual plant needs instead of relying on timers or guesswork.

LOOKING BACK

After nearly a year of retrofits and expansion, Perlman says the biggest lesson was simple: if you want control, start with the right tools.

"If I'd known about Opto 22 from the start, it would've saved me hundreds of thousands of dollars," he said.

One example still stands out. Early in the buildout, Pearl spent \$125,000 in commercial lighting panels—systems



Controlled irrigation is next for Pearl Pharma.

that worked, but at a steep cost. Looking back, Perlman realized he could have achieved the same results with a few I/O modules added to each *groov* EPIC.

"For just a few hundred bucks per room, we could've done the lighting ourselves, on the same system," he said.

Now, instead of relying on third parties or closed systems, Pearl runs the facility with the tools and confidence to fix issues in-house, scale when needed, and keep improving as they go.

ABOUT PEARL PHARMA

Pearl Pharma, based in Santa Rosa, California, operates a state-of-the-art indoor cannabis garden where they take pride in developing optimal growing conditions for their crop as well as honing in on pheno-selection and genetics for next-level flavor, aroma, and potency. Founded in 1998, their mission was to provide patients with the highest quality medical marijuana on the market (under California Proposition 215). Their constant research and risk-taking R&D eventually led to a refined menu of cannabis, which is what sets them apart.

For more information, please visit:
<https://www.pearlpharmainc.com>

ABOUT OPTO 22

Opto 22 was started in 1974 by a co-inventor of the solid-state relay (SSR), who discovered a way to make SSRs more reliable.

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- Michael Perlman, Pearl Pharma

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Opto 22 has consistently built products on open standards rather than on proprietary technologies. The company developed the red-white-yellow-black color-coding system for input/output (I/O) modules and the open Optomux® protocol, and pioneered Ethernet-based I/O.

Famous worldwide for its reliable industrial I/O, the company in 2018 introduced *groov EPIC*® (edge programmable industrial controller). EPIC has an open-source Linux® OS and provides connectivity to PLCs, software, and online services, plus data handling and visualization, in addition to real-time control.

groov RIO Ethernet-based edge I/O modules, introduced in 2020, include I/O and IIoT software in a compact industrial package that goes anywhere.

All Opto 22 products are manufactured and supported in the U.S.A. Most solid-state SSRs and I/O modules are guaranteed for life.



The company is especially trusted for its continuing policy of providing free product support, free online training, and free pre-sales engineering assistance.

For more information, visit opto22.com or contact **Opto 22 Pre-Sales Engineering:**

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