



From Smart Sumps to Smarter Mines

How Surety Automation modernized underground systems with digital communications and edge intelligence

OPTO 22
Your Edge in Automation.™

Opto 22

43044 Business Park Drive • Temecula • CA 92590-3614

Phone: 800-321-6786 or 951-695-3000

Pre-sales Engineering is free.

Product Support is free.

www.opto22.com

Form 2447-251218

© 2025 Opto 22. All rights reserved. Dimensions and specifications are subject to change. Brand or product names used herein are trademarks or registered trademarks of their respective companies or organizations.

FROM SMART SUMPS TO SMARTER MINES

How Surety Automation modernized underground systems with digital communications and edge intelligence



An underground sump pump station containing a motor, discharge piping, and staging platform with a water hazards barrier

In underground mines, water control is everything. Groundwater seeps constantly through fractured rock and old boreholes, collecting in the lowest drifts and slopes. Drilling and blasting release even more, as cooling water, drilling fluids, and natural inflows mix into heavy, sediment-laden slurries.

So when sump pumps fail underground, the consequences are immediate and severe. Water can rise 12 to 16 feet in a single day—tens of thousands of gallons per minute with nowhere to go. Flooded drifts can block escape routes, submerge electrical gear, and damage equipment beyond repair.

The risks go beyond lost production: trapped water creates real drowning and electrocution hazards for anyone underground. In mines where pumps are operated manually, the delay in reaching a flooded level to restart or repair equipment can turn a manageable problem into a days-long shutdown and a huge safety incident.

In early 2025, a major gold producer in northern Nevada approached Surety Automation™ to upgrade its sump controls. The existing systems were manual, disconnected, and risky in an environment where downtime and water rise fast.

From Smart Sumps to Smarter Mines

WHO IS SURETY AUTOMATION?



Based in Spring Creek, Nevada, Surety Automation designs and supports control systems for industrial and infrastructure projects across North America. Co-founder Chris Raymond, a seasoned automation engineer with decades of field experience in mining and process industries, built the company around a simple goal: to make automation practical, reliable, and easy to maintain.

Surety's team has worked in many industries from food and beverage to oil and gas, but mining remains the most demanding of all.



A sump pump motor and tank in an underground pump station

THE PROBLEM UNDERGROUND

For decades, sump control in mines followed the same formula: a concrete pit cut into the floor, a few pumps wired to float switches, and a tank with agitators to keep sediment from settling and clogging pumps. Starting from the lowest level, each station pushed water up only to the next level, then the process was repeated all the way to the surface. Generally, it worked, but only because operators were constantly checking it. When a pump failed or a float stuck, crews had to hike or drive down to restart it—sometimes through flooded levels.

“We realized early on that if we were putting control systems underground anyway, we should start pulling in all the utility data, too. Gas monitoring, air flow, water pressure, temperature—those are just as important for operator safety as the pumps are.”

- Chris Raymond, Surety Automation

Most of these systems had no remote visibility, no performance data, and no easy way to see a failure coming. The typical industry upgrade involved adding a large PLC panel—expensive, power-hungry, and difficult to maintain.

“Their systems were all dumb, and a lot of them still are,” Raymond says. “Even the few connected ones tend to follow the old model—big PLC racks, piles of analog I/O, and extra hardware just to make it all talk. It’s costly, takes up space, and it’s not practical underground.”

EXPANDING THE VISION

Surety's initial goal was to make the sump systems smarter and remotely controllable. But once design began, the scope grew. If new controls were going underground, they could also collect other critical data.

“We realized early on that if we were putting control systems underground anyway, we should start pulling in all the utility data, too,” Raymond says. “Gas monitoring, air flow, water pressure, temperature—those are just as important for operator safety as the pumps are. If we managed the sump project right, we could expand into everything else.”

The deeper the mine goes, the hotter and more complex conditions become. Raymond envisioned a system where operators would have a single view of underground health at all levels—combining safety, environmental, and production data in one place.

What started as a pump project was beginning to look like the foundation for a connected mine.

A NEW APPROACH: LESS ANALOG I/O, MORE DIGITAL INTELLIGENCE

Surety's team began by asking a simple question: what if the instruments themselves could deliver all the data we need—without racks of I/O cards?

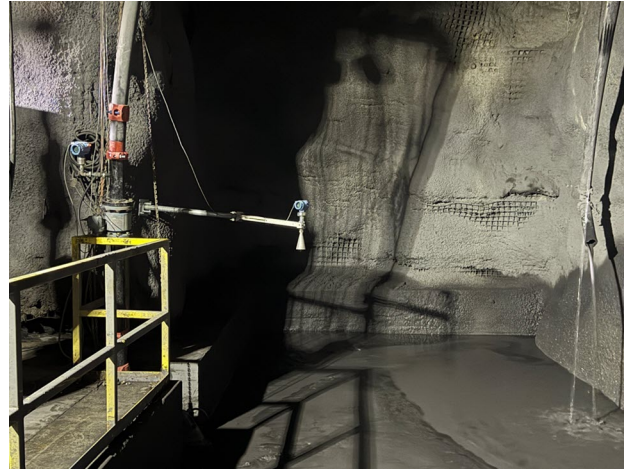
Traditional analog wiring meant every pressure, flow, or temperature transmitter required its own pair of wires, terminal blocks, and I/O card channels. That kind of system quickly becomes costly and unmanageable. By shifting to digital communications, Surety could carry far more information on a fraction of the wiring.

They started in the lab with the idea of using a Moore Industries® HES HART-to-Ethernet Gateway™ to collect the critical utility and environmental data. The gateway collects data from up to 16 HART instruments and converts to Modbus/TCP, a standard, Ethernet-based, industrial protocol.

Each loop can carry multiple devices, so instead of wiring every sensor separately, transmitters for pressure, flow, temperature, and gas monitoring could all share a single



The upgraded underground sump pump station with dual slurry pumps and tank



Discharge piping diagnostics collected through a pressure transmitter and ultrasonic level sensor over the sump

pair of wires. This approach simplified design and installation while adding access to advanced diagnostics like sensor health and calibration status—features that aren't available with standard analog signals.

"It's not just about saving space," Raymond says. "Digital communication gives you data you could never get from analog—device health, diagnostics, calibration—all on the same pair of wires. Our approach also eliminates the need for costly specialty I/O."

Of course the primary scope of the project, the sump pumps and agitators, needed modernizing as well. The mine was already upgrading to more specialized slurry pumps for handling the abrasive, sediment-heavy water. The new pumps required soft starters, which needed more specialized control. Surety chose motor controllers to manage both the pump and agitator motors through digital communication over EtherNet/IP.

This setup replaced traditional relays and contactors with intelligent motor modules, giving Surety full control and status feedback without adding physical I/O in the PLC panel. Additionally, smarter logic, such as stopping the agitators when tanks were empty, saved power and reduced wear on the motors.

With those decisions made, the team had reduced nearly all of the physical I/O, leaving just a single hardwired emergency stop (E-stop) for safety.

From Smart Sumps to Smarter Mines

FINDING THE RIGHT PLATFORM

Surety needed a control platform that could tie everything together—handling downstream communications like Modbus/TCP from the Moore Industries HES gateway, EtherNet/IP from the motor controllers, and even a single hardwired input for the E-stop, while also connecting upstream to the customer’s existing AVEVA® Wonderware® SCADA system.

They looked at several options but found the same problems everywhere: too much hardware, too many licenses, and not enough flexibility.

“Everything could do part of what we needed, but nothing could do it all without a pile of extra hardware and licenses,” Raymond says. “We wanted something open, small, and simple.”

His online search led him to Opto 22’s *groov RIO*. The compact design, built-in networking, and capability to run CODESYS® (an IEC 61131-3 PLC programming environment) checked every box. Just as important, its wide operating temperature range (-20 to 70 °C) and

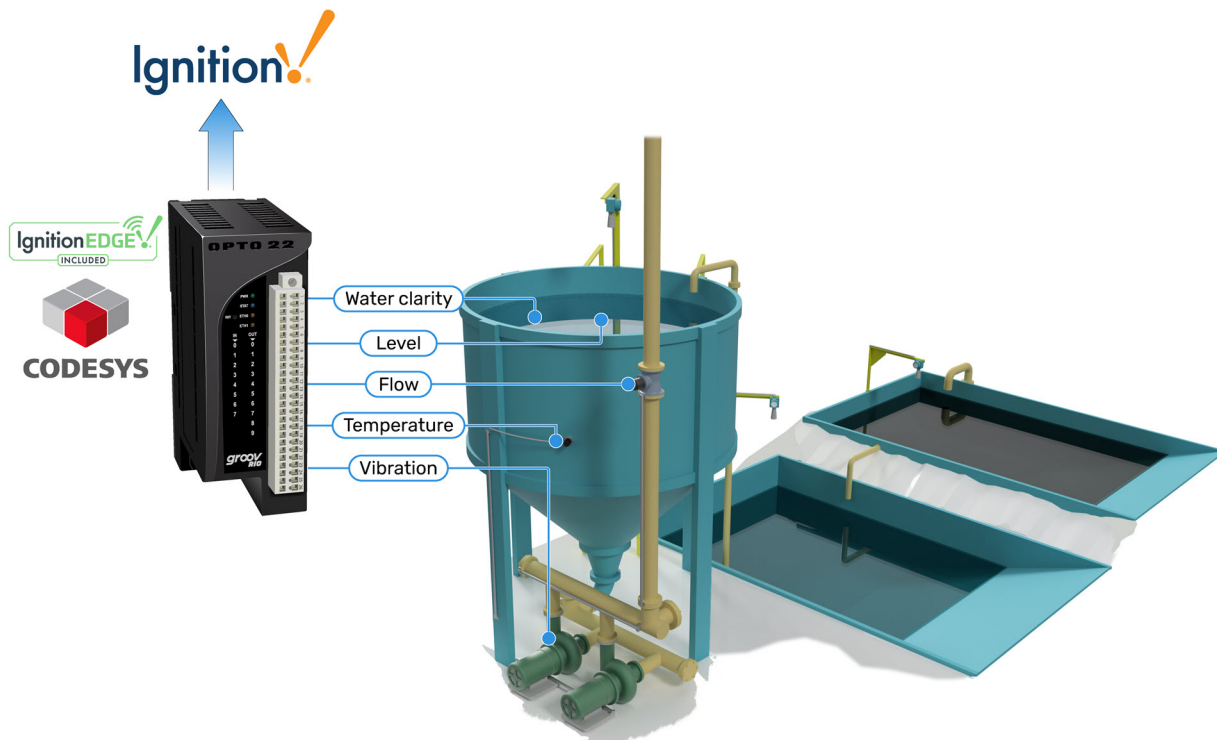
UL Hazardous Locations approval made it suitable for the harsh, variable conditions underground.

“I was looking through data sheets and when I got to *groov RIO*, I said, ‘this is it.’ The form factor was perfect, and it already supported everything we needed,” Raymond says.

Surety ordered a *groov RIO* for testing and built a small system to prove out the concept. The learning curve was minimal.

“We just started playing with it. Once we saw what it could do with CODESYS, it completely changed how we thought about control,” he says. “Everything we wanted—logic, visualization, data logging, communications—was possible with a single box that costs about a thousand dollars. This is a much better solution than the larger OEM systems we are used to working with.”

Licensing, which often becomes a long-term burden for many platforms, turned out to be refreshingly simple.



A diagram showing how the sump skid instrumentation provides the *groov RIO* the data needed for monitoring level, flow, clarity, temperature, and vibration

From Smart Sumps to Smarter Mines



The new sump control panel runs Ignition for pump monitoring and control.

“The licensing aspect was one of the biggest surprises. We just bought the \$100 CODESYS Runtime license [GROOV-LIC-CRE-RIO] for each *groov* RIO, plus \$60 for EtherNet/IP. It already does OPC UA® and Modbus. That’s it—one and done for the life of the device. No annual fees, no renewals. The total cost of ownership and ROI are immediate. It’s fantastic.”

“We just started playing with [*groov* RIO]. Once we saw what it could do with CODESYS, it completely changed how we thought about control.”

– Chris Raymond, Surety Automation

DISCOVERING IGNITION

During testing, Raymond realized *groov* RIO came preloaded with Ignition Edge®, a lightweight version of the Inductive Automation® Ignition® platform (GROOV-LIC-EDGE8). That discovery opened a new set of possibilities.

“We were originally planning to use AVEVA Wonderware on a panel PC for visualization,” he says. “But when I saw Ignition Edge built into *groov* RIO, I thought, why not try it?”

Surety had never deployed Ignition before, but it quickly proved to be the missing piece. With Ignition, the team

could build screens, trend data, and manage alarms quickly and easily.

“Ignition with the historian and alarm manager was fantastic,” Raymond says. “It reduced our workload by weeks.”

BRINGING IT ALL TOGETHER

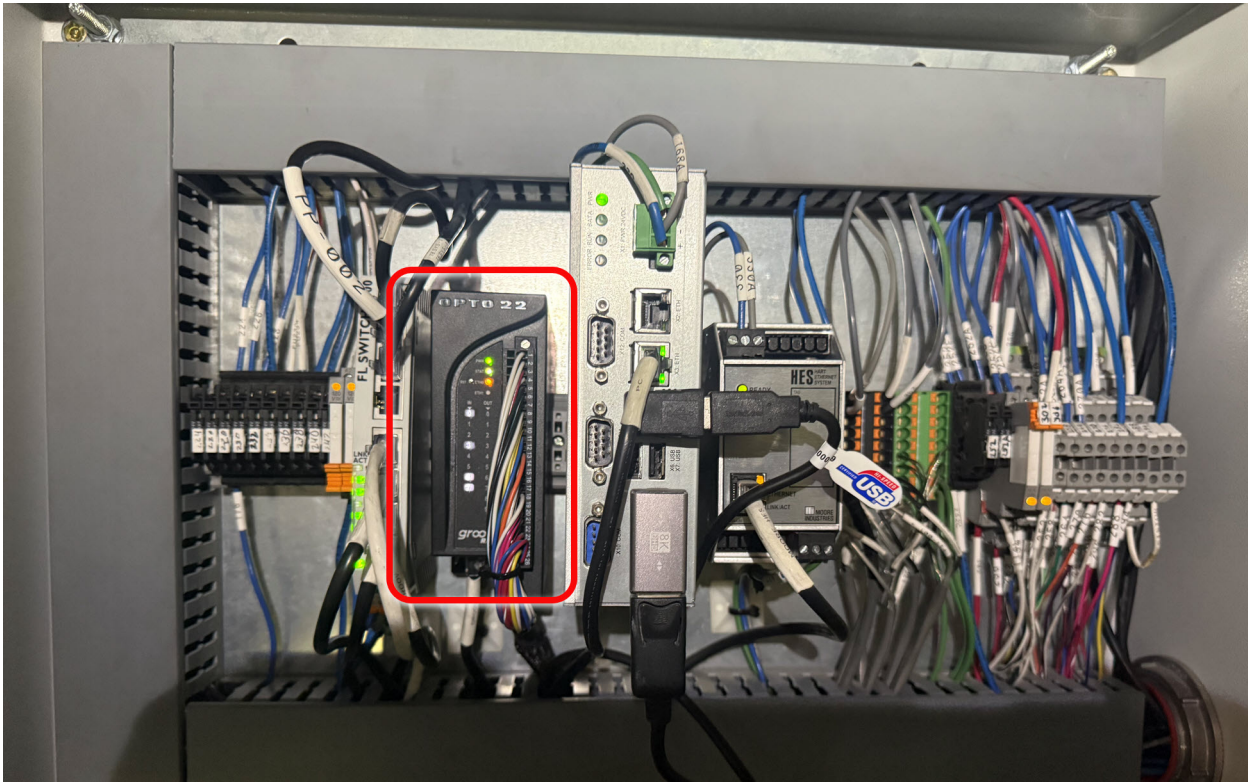
Once the test rack was built, Surety began integrating all the pieces into a single connected system and deploying it underground. Each level was equipped with a *groov* RIO, which served as the bridge between field devices and higher-level systems—collecting Modbus/TCP data from HART transmitters via the Moore Industries gateway, managing motor control through EtherNet/IP communication to the TeSys® Island, and sharing everything over OPC UA.

“The EDS [Electronic Data Sheet] files made integrating the motor controllers with CODESYS incredibly easy,” Raymond says. “Once we imported them, all the device objects and



Visualization through an easily accessible HMI screen outside of the control panel

From Smart Sumps to Smarter Mines



Inside the new sump control panel, a *groov* RIO is the bridge between the field devices and higher-level systems.

parameters were ready to use—no manual setup or trial and error. It saved hours during commissioning.”

The architecture was straightforward but powerful:

- **Control and logic**—CODESYS running on *groov* RIO handled all local control using function blocks and structured text.
- **Instrumentation**—A Moore Industries HES gateway connected HART transmitters via Modbus/TCP.
- **Motors and agitators**—Smart motor starters communicated directly with CODESYS over EtherNet/IP.
- **Visualization and historian**—Ignition provided local visualization, alarming, and data buffering through OPC UA.
- **Safety**—A single hardwired E-stop was wired into *groov* RIO’s physical I/O for emergency shutdown.

CODESYS exposed all tags natively over OPC UA to Ignition, replacing the mine’s previous AVEVA system with a more open and easily scalable solution. The connection required

no drivers or custom tag mapping—Ignition simply discovered and imported everything automatically.

“The moment we saw the data flowing straight from CODESYS into Ignition over OPC UA, we were dancing,” Raymond laughs. “No drivers, no manual mapping—Ignition just sucked in every tag. It was perfect.”

SMARTER PANELS THROUGH SPARE I/O

Even after meeting all the control and communication needs, Surety saw room to do more. And since the *groov* RIOs have ten total I/O points, Surety was able to use the remaining I/O channels for additional diagnostics—a rarity in typical panel designs.

“By freeing up the *groov* RIO’s built-in I/O—using just one channel for the E-stop—we suddenly had nine spare points to work with,” Raymond explains. “I used them for signals we never bother monitoring in a standard panel: the DC power supply health relay, Type II surge arrestor status, power filter health relay, and the contactor wear relay on the soft starter bypass contactors.”

From Smart Sumps to Smarter Mines

Those extra points gave Surety and the mine operators a new layer of visibility into system health—data that’s typically ignored because of I/O cost or complexity. In fact, the finished panel ended up costing roughly 30–40% less than their previous design while delivering far more insight and reliability.

RESILIENT DATA AT THE EDGE

Underground networks take a beating. The mine’s Cisco® networking backbone faces frequent interruptions as fiber and copper lines are damaged by blasting or heavy equipment. But losing data wasn’t an option.

To handle that reality, Surety relied on *groov* RIO’s built-in Ignition Edge Sync Services with store-and-forward capability. When connectivity drops, each RIO buffers tag and historical data locally—holding it for days if needed. Once the connection returns, Ignition automatically synchronizes the stored data with the central server,

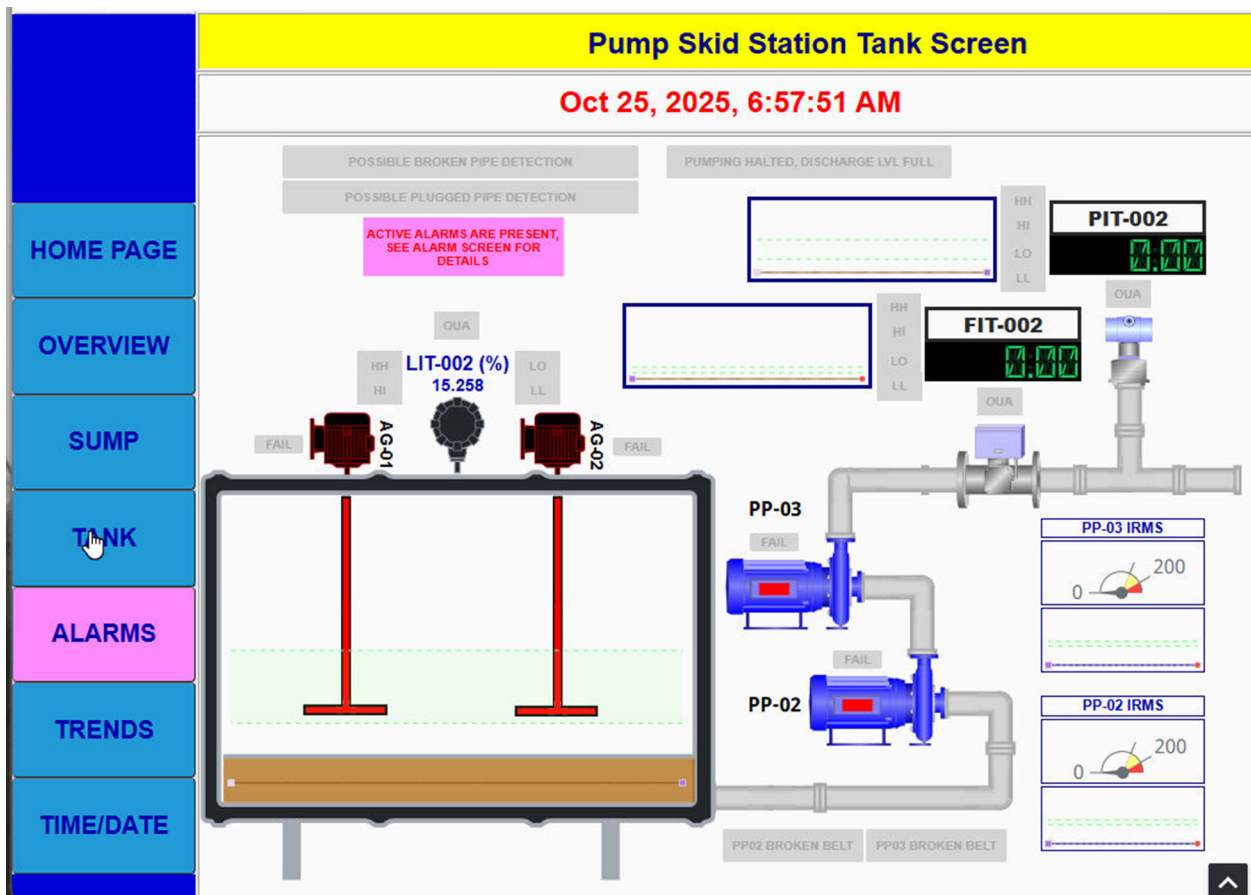
maintaining a continuous, gap-free record without needing manual recovery.

That local resiliency minimizes the impact of daily network outages. Operators might lose real-time visibility during interruptions, but all data is captured and automatically synced once the network comes back online.

KEEPING CREWS INFORMED UNDERGROUND

Surety also developed a creative solution for underground marquee signs—large LED displays used to communicate critical information to crews. These signs must continue working even when network connections drop.

Surety attached a *groov* RIO to each sign, using PoE (Power over Ethernet) for power and Node-RED for local control. When communications are online, the RIO exchanges data



Extra I/O on the *groov* RIO combined with Ignition means another layer of data visibility.

From Smart Sumps to Smarter Mines

“The licensing aspect was one of the biggest surprises. We just bought the \$100 CODESYS Runtime license for each groov RIO, plus \$60 for EtherNet/IP. It already does OPC UA and Modbus. That’s it—one and done for the life of the device.”

- Chris Raymond, Surety Automation

with the signs over Modbus/TCP and reports status to Ignition via MQTT Sparkplug® B.

If the network goes down, operators can still use pushbuttons wired to the RIO’s I/O to cycle through preloaded messages stored locally. It’s a simple, resilient design that keeps communication reliable where it matters most.

RESULTS: LESS HARDWARE, MORE CAPABILITY

The impact was immediate. By eliminating traditional I/O racks, Surety cut hardware and wiring costs by roughly 30–40% per skid. A complete automated sump skid—including controls, instrumentation, and wiring—came in around \$98,000, well below the projected cost of a conventional system.

What began as a five-skid project quickly expanded to twelve. The cost savings, simplicity, and speed of deployment made expansion an easy decision.

Engineering time dropped sharply. Configuration and testing that once required man-weeks in PLC and SCADA software could now be completed in hours. The HART-enabled instrumentation added valuable diagnostics, giving maintenance teams early insight into device health and allowing proactive repairs that reduced downtime.

Just as importantly, each skid was compact and self-sufficient. With groov RIO running CODESYS and Ignition Edge, every system could operate independently, buffer data through network outages, and automatically resynchronize once connectivity returned. Signals rarely monitored in standard panels—such as power supply and surge arrester health relays—provided deeper visibility into system status and reliability.

RETHINKING WHAT AUTOMATION CAN BE

Surety Automation set out to solve a simple problem: give mine operators visibility and control over their sump pumps. But along the way, they found a new way of thinking about automation.

Instead of adding more hardware, they removed it. Instead of building larger panels, they built smaller, smarter systems that did more with less.

That shift has influenced everything they’ve done since. The team now uses Ignition as their standard SCADA platform and is developing new projects with groov EPIC for building management and energy systems.

Reflecting on the experience, the team summed it up simply:

“These devices make you rethink everything you know about control. Once an automation engineer gets one in their hands, it changes how they design.”

ABOUT SURETY AUTOMATION

Veteran-owned and operated Surety Automation, based in Spring Creek, Nevada, has over 40 years of combined automation experience across various industries: from food and beverage, oil and gas, to mining. An IoT-Certified OptoPartner, Surety supports control systems for industrial and infrastructure projects across North America. Their mission is to make automation practical, reliable, and efficient. For more information, visit: <https://surety-automation.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.

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.

From Smart Sumps to Smarter Mines

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:

Phone: **800-321-6786** (toll-free in the U.S. and Canada)
or **951-695-3000**

Email: systemseng@opto22.com

