



Case Study: Automating Ecuador's Largest Regional Water Project

Modern automation ensures safe water for five municipalities in the Andean highlands

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CASE STUDY: AUTOMATING ECUADOR'S LARGEST REGIONAL WATER PROJECT

Modern automation ensures safe water for five municipalities in the Andean highlands



The Pesillo water treatment plant in Ecuador, set against the Andes mountains, has solar arrays to support sustainable operations.

In the mountains north of Quito, Ecuador, clean water is an abundant natural resource, but it also presents civic challenges. While the region's subterranean rivers provide a plentiful water source, delivering safe, treated water across rugged terrain to a fast-growing population requires more than pipelines and pumps. It requires control, visibility, and resilience.

PESILLO IMBABURA

Local leaders in Northern Ecuador envisioned a new regional water treatment plant in Pesillo Imbabura, a province in northern Ecuador. The goal was to construct a plant designed to process 700 liters of water per second and supply clean water to more than 300,000 people

across five municipalities—one of the largest infrastructure projects ever undertaken in the area.

Civil construction began in 2019, led by H&H™, a large Latin American contractor with experience in dams, tunnels, and municipal works. H&H brought strong civil engineering capabilities, but the project also required a modern SCADA and automation system to manage treatment operations.

For SCADA expertise, H&H looked for local specialists who understood both the technology and the needs of Ecuadorian municipalities. That search led them to Next Control™, a Quito-based system integrator founded by José Estrada. With a background in automation and years of experience supporting infrastructure projects in the region,

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Estrada and his team were well positioned to take on the challenge.

WHO IS NEXT CONTROL?

Automation engineer José Estrada founded Next Control, an IoT-certified OptoPartner, in 2018 after nearly three decades in the field. He drew on that experience and a focus on practical, cost-effective solutions to show the company as a strong fit for a project that demanded reliability on a limited budget.

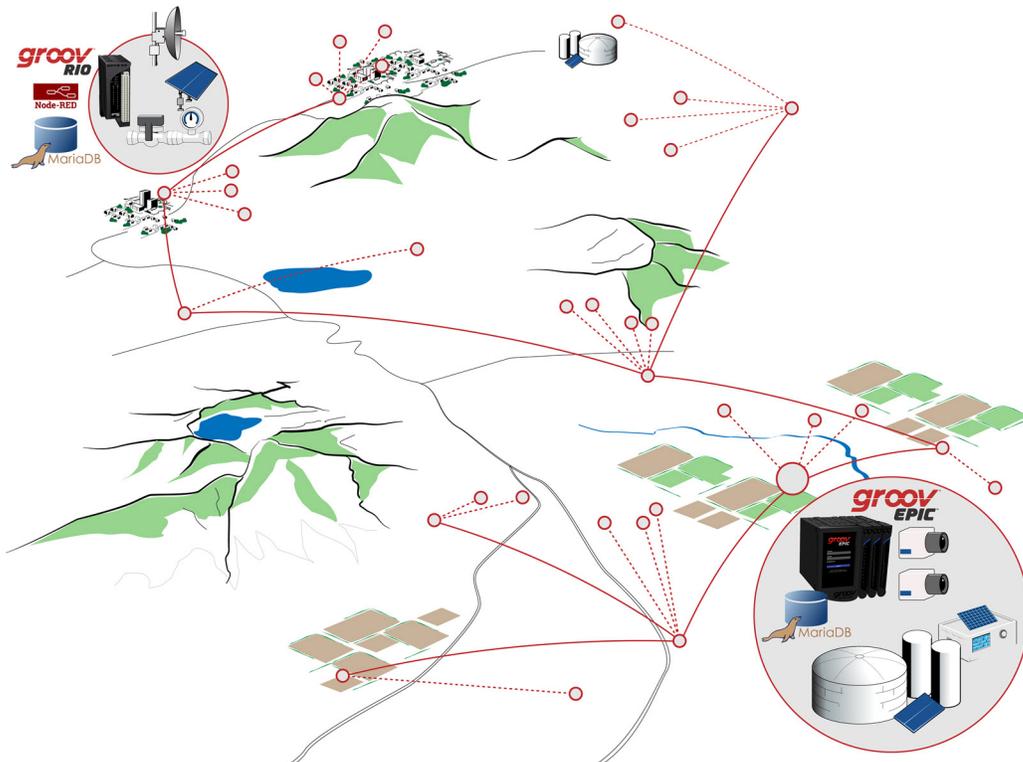


THE CHALLENGE: A BRAND-NEW PLANT

Next Control joined the Pesillo Imbabura project in 2019 after crews had begun building the plant, but no one had defined a control or monitoring strategy. Without SCADA, operators would have no centralized visibility, no historical data, and no alarms to warn of faults. The municipalities also had to coordinate distribution across five independent service areas, each with different daily and seasonal demands.

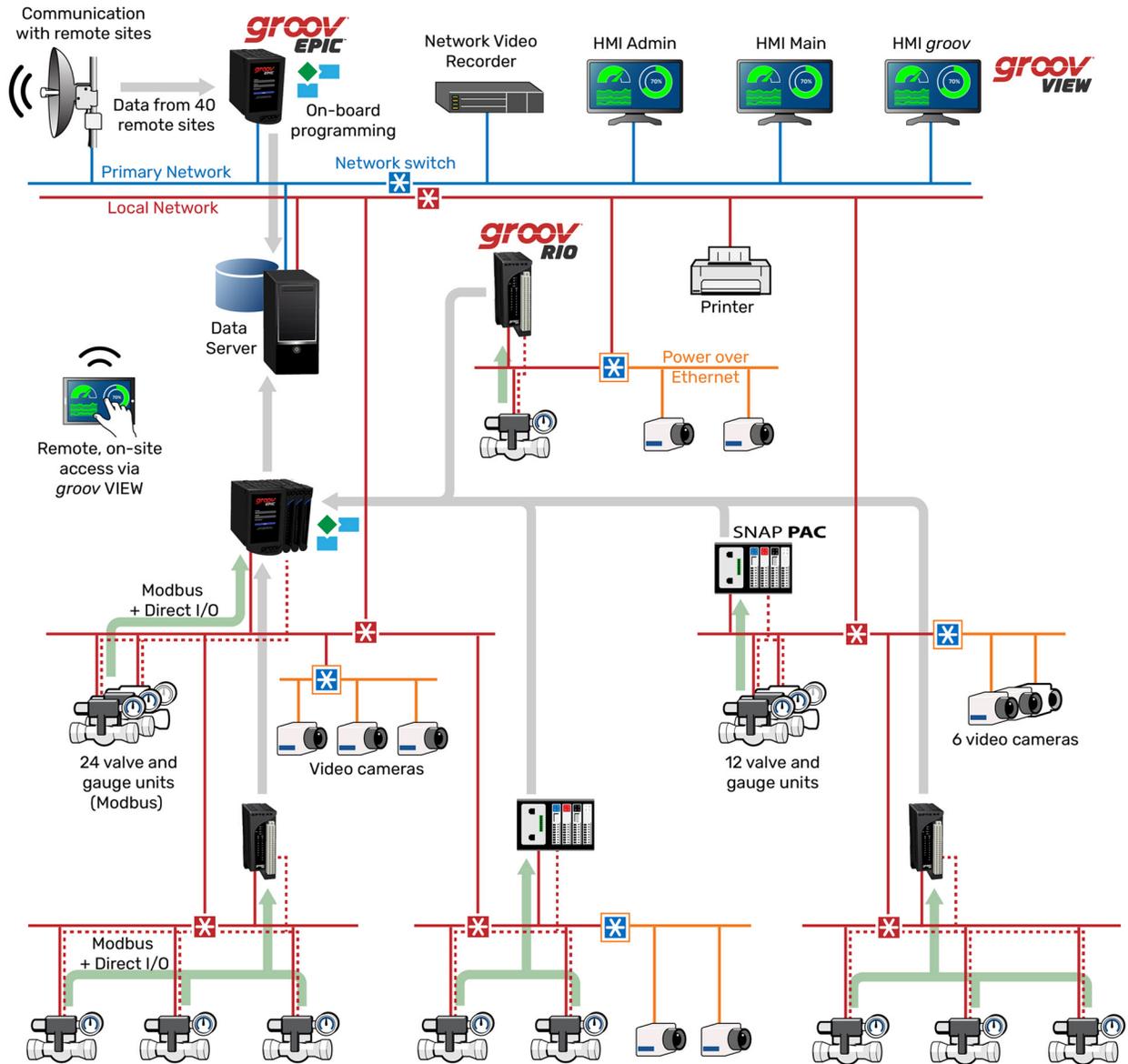
Estrada's team considered several automation systems, but expensive software licenses and locked hardware platforms made them a poor fit for a municipal system that needed flexibility and affordable operation.

"The municipalities needed a system they could count on for decades," Estrada recalls. "It had to be reliable in the mountains, simple for operators, and resilient to communications outages. That's what we designed."



A geographic view of the SCADA system linking water treatment and distribution sites across Ecuador

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Network architecture of the treatment plant using *groov EPIC*, *groov RIO*, and *groov View* for control and monitoring.

CHOOSING THE RIGHT PLATFORM

Next Control proposed a different path. Estrada had worked with Opto 22 since the 1990s and trusted the company for reliable, cost-effective water projects.

For Pesillo Imbabura, he recommended using Opto 22's *groov EPIC* (Edge Programmable Industrial Controller) and *groov RIO* (IIoT-enabled remote I/O modules)—modern platforms that handle control, monitoring, and data

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A PAC Display interface with an integrated live camera feed for alum sulfate dosing at the Pesillo water treatment plant

integration without locking customers into specific protocols or a proprietary ecosystem.

Next Control designed a two-layer system:

- At the treatment plant, two *groov* EPIC controllers handled centralized control with redundancy.
- Across the distribution network, 36 *groov* RIO modules measured flows, controlled valves, and logged data locally.

"The EPICs gave us reliable control at the core," Estrada says. "And with RIOs in the field, each site could keep running even if communications went down."

USING FREE TOOLS

Estrada's team reviewed several software options, but the municipalities had little budget for additional software costs. A custom .NET system was possible, but stakeholders wanted something standardized and easier to maintain.

Thankfully, *groov* EPIC works with the Opto 22 PAC Project suite, a free software set with tools including:

- **PAC Control** for real-time programming
- **PAC Display** for operator screens, alarms, and data logging with SuperTrends
- **PAC Manager** for system configuration

Next Control also used the Opto 22 free .NET SDK to integrate video feeds and reports directly into the operator interface, and configured local MariaDB® databases at remote sites via shell access. Together, these free tools gave the plant supervisory control, operator visibility, and

historical data logging—everything needed for a SCADA system—without additional license costs.

IMPLEMENTATION: BUILDING RESILIENCY INTO EVERY LAYER

Inside the plant, *groov* EPIC controllers automated core processes: dosing chemicals, removing sediment, and moving treated water into the pipelines. Operators used PAC Display on a local server to monitor everything in real time.

Next Control also extended operator visibility. They connected live cameras to the HMI, and when an operator clicked a section of the plant in PAC Display, the system



Control cabinet with Opto 22 *groov* RIO module and network components for remote monitoring

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launched a .NET application that opened the video feed. The same mechanism generated reports, so operators could handle daily tasks without leaving their familiar interface.

Across the mountains, each of the 36 remote sites needed to keep running even when communications failed. Next Control configured every *groov* RIO with its own Node-RED logic—simple, flow-based programming that runs directly on the device—and a local MariaDB database, an open-source system for storing data. Local control and data storage allowed each site to operate on its own for days or even weeks, then automatically sync its records back to the plant once the link returned.

To connect the network, the team installed 5.8 GHz directional antennas across valleys and ridges. This private system gave municipalities secure, reliable communications without relying on public internet services.

OPERATOR EXPERIENCE

Operators quickly felt the difference. Instead of relying only on local equipment panels, they could now see treatment processes, alarms, and remote site data in one interface. Camera feeds gave extra confidence because operators

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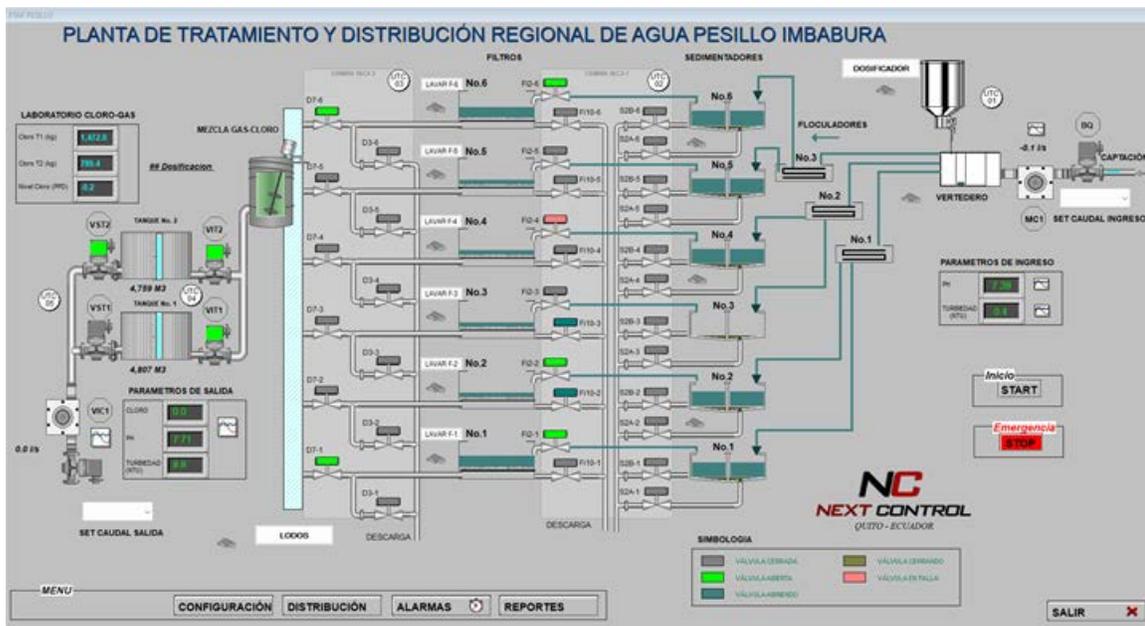
- José Estrada, Founder of Next Control

could check valves and tanks directly on screen rather than trusting numbers alone.

The built-in alarming tool in PAC Display proved especially valuable. It gave operators clear alerts and ensured they never missed urgent conditions.

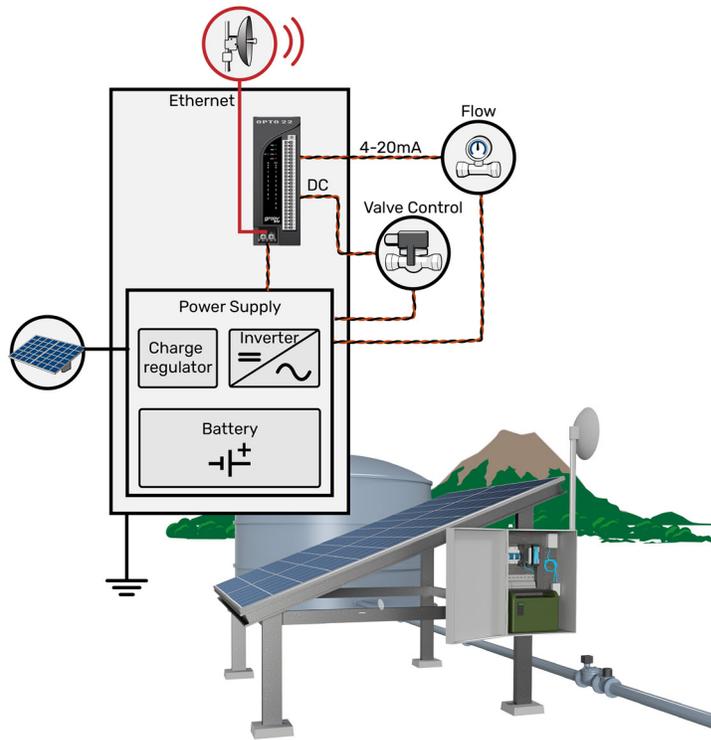
Over time, operators also learned to trust the system itself. When communications links dropped in the early months, distribution continued without interruption. Each *groov* RIO followed its local control plan until the connection was restored.

“If the link goes down, each site keeps working on its own,” Estrada says. “That reliability is what makes the system work in Ecuador.”



Real-time PAC Display overview of the Pesillo regional water treatment and distribution plant

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groov RIOs automate each solar-powered, remote flow and valve control system.

RESULTS: RELIABLE WATER FOR FIVE MUNICIPALITIES

By 2024, the plant was fully online, treating 700 liters of water every second and supplying more than 300,000 people across five municipalities in northern Ecuador. The system now delivers safe drinking water to homes, schools, and businesses in the region, giving communities a dependable supply every day.

LESSONS LEARNED

The project reinforced the need to push resilience out to the edge. By giving each remote site its own logic and data storage, the system continued to function even when the central link was down.

"In this region you cannot assume perfect links or big budgets. You have to design for independence and reliability."

- José Estrada, Founder of Next Control

The team also saw the value of right-sizing SCADA to match local resources and adding simple tools like cameras to strengthen operator trust. Above all, redundancy across controllers, communications, and databases proved essential to uninterrupted service.

"In this region you cannot assume perfect links or big budgets," Estrada says. "You have to design for independence and reliability."

A MODEL FOR THE FUTURE

The Pesillo Imbabura project is finished, but its impact reaches further. Across Ecuador and much of Latin America, many communities face the same issues: dependence on imported systems and limited budgets for long-term support.

This project proved a different path is possible. Open platforms and careful design can deliver reliable water treatment that communities can afford and maintain.

"Critical infrastructure doesn't have to rely on costly or complicated systems," Estrada says. "What matters is

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reliability, simplicity, and partners you can trust. With Opto 22, we gave these municipalities exactly that.”

ABOUT NEXT CONTROL

Next Control, operating in Ecuador, is made up of highly trained professionals that provide comprehensive automation solutions to their clients' needs. From consultation to supply, design, installation, commissioning, and technical support, Next Control is there for every phase of their customer's project. Following strict quality standards and deadlines, their goal is to be a leading company in the national market of integrated engineering solutions.

For more information, please visit:
<https://www.nextcontroltech.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.

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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