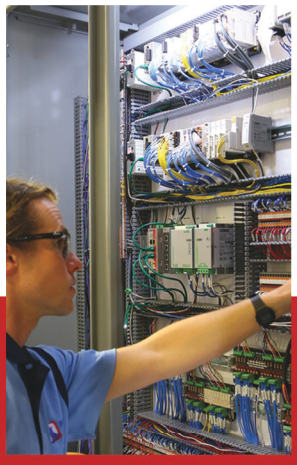

Case Study: When a Distributor Becomes a Manufacturer

How Rutherford & Titan started building their own liquid nitrogen systems

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CASE STUDY: WHEN A DISTRIBUTOR BECOMES A MANUFACTURER

How Rutherford & Titan started building their own liquid nitrogen systems

Liquid nitrogen is critical to various industries like biomedical research and forensic analysis.

As a distributor, you can choose what you sell, but you don't control how it's built, how consistent it is, or how it behaves when something goes wrong. You're tied to other people's factories, schedules, and quality standards.

RUTHERFORD & TITAN

Liquid nitrogen sits at the center of some of the most demanding work done today, from forensic analysis and IVF (in vitro fertilization) storage to biomedical research, dermatology, and manufacturing processes that depend on extreme cold. In these environments, liquid nitrogen is not just a convenience—it is infrastructure. When supply is interrupted or quality drifts, work stops, samples are put at risk, and safety margins narrow.

Most organizations treat liquid nitrogen like a background utility. As long as deliveries arrive on time, it stays out of sight and out of mind. But when demand spikes or equipment fails, the limits of that model show up fast. Reliability depends on trucks, schedules, and systems the customer doesn't control.

As a cryogenic equipment distributor, Rutherford & Titan® saw those limits firsthand.

LIFE AS A CRYOGENIC EQUIPMENT DISTRIBUTOR

Rutherford & Titan began operations in 2018, supplying systems used to store, handle, and work with liquid nitrogen. From the start, the company supported laboratories, clinics, and industrial customers by helping them select equipment, coordinate installations, and keep systems running once they were in service.

That role put Rutherford & Titan close to the realities of supporting cryogenic systems after installation. They worked directly with customers once equipment was in the field, helping troubleshoot issues, coordinate service, and keep systems running. When something went wrong, they were often the first call.

WHEN CUSTOMERS STARTED ASKING FOR MORE

As customer inquiries increased, Rutherford & Titan spent more time helping users work through issues with their existing cryogenic equipment. Those conversations were practical and hands-on, focused on understanding system behavior and keeping liquid nitrogen available.

Over time, a clear pattern emerged. Many of the biggest pain points traced back to overseas dependence: electrical standards that didn't align with U.S. requirements, slow access to replacement parts, limited design transparency, and long turnaround times when something went wrong. After the COVID pandemic exposed how fragile those supply chains could be, the pressure only increased.

Some of Rutherford & Titan's customers, who already relied on liquid nitrogen, started asking about alternatives to traditional delivery. Some wanted better cost control. Others were focused on reliability, safety, or logistics. Many simply did not know on-site generation was an option.

"We didn't go after anybody," says Amir Amirsadeghi, founder and CEO of Rutherford & Titan. "Customers were seeking us out. They'd say, 'I didn't know you could do this. Walk me through it.'"

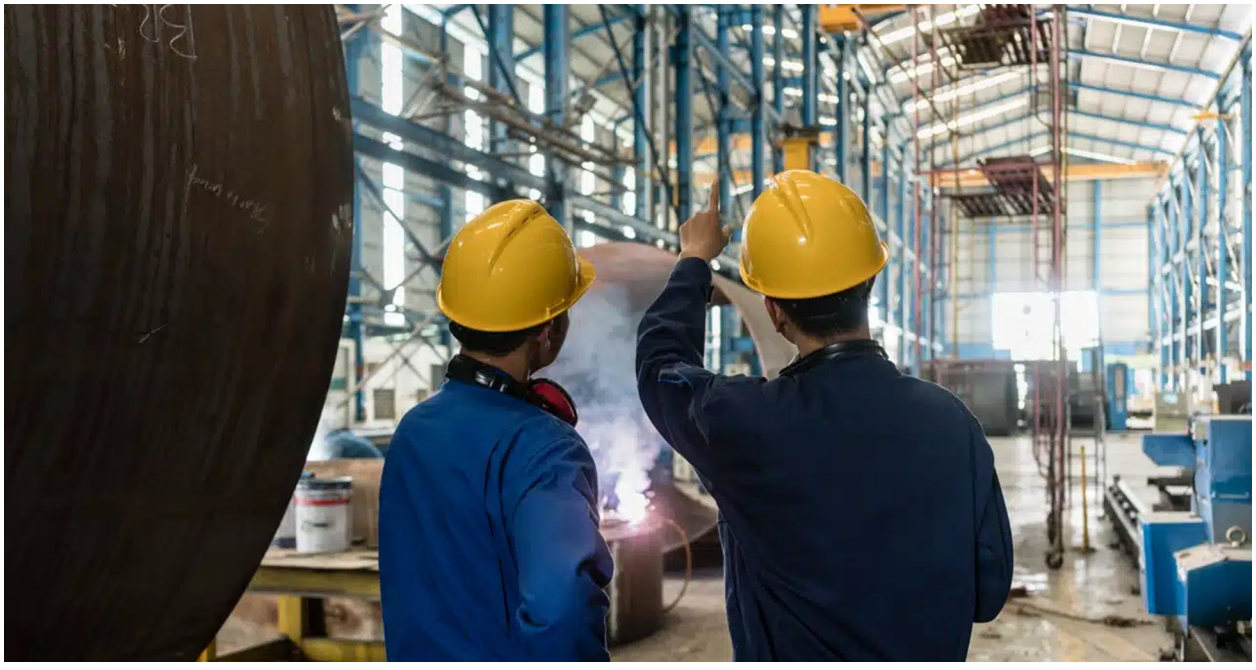
Those conversations shifted from education to expectations. Customers were no longer just curious about how on-site generation worked. They wanted to know who controlled the design, how systems would be serviced, and what long-term support actually looked like.

"We started asking why we weren't building this [on-site liquid nitrogen generators] ourselves in the U.S.," says CEO Amir Amirsadeghi.

DEFINING THE CONTROL PROBLEM

Designing liquid nitrogen generators meant taking responsibility for how the system behaved under every condition, not just how it was specified on paper. The machines had to meet U.S. electrical standards, scale across multiple sizes, and remain serviceable once deployed, often without immediate on-site access.

Each generator combined compressors, valves, pressure regulation, temperature control, and safety logic. Small



Rutherford & Titan understands the realities of supporting cryogenic systems after installation.

Each liquid generator combines compressors, valves, pressure regulation, temperature control, and safety logic.

systems and large systems shared the same fundamentals, but not the same hardware footprint. The control platform had to adapt without forcing redesigns at every size.

Visibility was just as important as control. Once systems were in the field, Rutherford & Titan needed to see what was happening inside the machine in real time. Diagnosing issues remotely, understanding trends, and reducing unnecessary service visits were core requirements.

Amir Amirsadeghi partnered with an engineer, Evan Kuklinski of Enthim Industries, LLC., who had built and supported refrigeration systems before. His view was shaped by experience: the platform had to expose data cleanly, support flexible I/O, and remain usable over time, not just at commissioning.

"He kept coming back to the same point," Amirsadeghi says. "If we're going to support these systems properly, we need intelligence from the field."

A CONTROL PLATFORM THAT COULD SCALE

The control platform was no longer just a way to run the machine. It was part of the service model.

Rutherford & Titan evaluated several established PLC platforms. In practice, many were too rigid, too complex to work with efficiently, or difficult to support once systems were deployed. Those limitations made them poor fits for a growing OEM that needed flexibility and long-term serviceability.

The team ultimately selected Opto 22's *groov* platform based on a small set of practical requirements. Control logic needed to be developed using an IEC 61131-3 standard environment, which led them to CODESYS®. Secure remote access had to be available directly on the controller, without external hardware, which *groov* supports through OpenVPN®. And the I/O architecture needed to remain flexible as generator designs evolved, whether through software-configurable I/O or expandable modular hardware.

Rutherford & Titan has a number of offerings as an OEM of liquid nitrogen generators.

One of Rutherford & Titan's liquid nitrogen generators

On the larger systems, the control hardware is paired with a consistent set of I/O modules chosen for flexibility and reuse across generator models:

- GRV-IMA-24 modules handle analog inputs such as pressure, temperature, humidity, and current monitoring.
- GRV-ODCIS-12 modules drive discrete outputs for air handling equipment, compressors, valves, and fans.
- GRV-CSERI-4 modules interface with Modbus®-enabled helium and refrigeration compressors, allowing operating data to be pulled directly into the control system.
- GRV-MM1001-10 multifunction modules provide mixed-use capability where dedicated modules were not practical. These modules are used for digital inputs, liquid sensing, Class C relay outputs for condensing units and alarms, and analog outputs such as 0–10 V signals to drive potentiometers or PWM (pulse width modulation) fan controllers.

That mix allows Rutherford & Titan to keep the same control logic across system sizes while adjusting I/O at the hardware level.

INSIDE THE LIQUID NITROGEN GENERATOR CONTROL SYSTEM

Rutherford & Titan uses two control architectures across its liquid nitrogen generators: a compact, flexible approach for smaller systems, and a modular and even more flexible design for larger units. Both follow the same control philosophy, but the hardware scales with system size and I/O density.

Smaller generators use *groov* RIO, an industrial-grade intelligent edge device that combines control, I/O, networking, and remote access in a compact footprint, making it well suited for 10- to 30-liter-per-day liquid nitrogen generators.

Larger generators, including 60- and 250-liter-per-day systems, use *groov* EPIC (**E**dge **P**rogrammable **I**ndustrial **C**ontroller). These systems have higher I/O counts and more instrumentation to support additional compressors, valves, sensors, and safety interlocks. *groov* EPIC's modular rack-based I/O lets Rutherford & Titan scale channel count and signal types without redesigning the control architecture.

For control hardware, Rutherford & Titan selected Opto 22's *groov* EPIC for their larger units and *groov* RIO for their smaller generators.

With new controls systems in place, high-quality, real-time data helps diagnose issues before becoming alarms.

RESULTS IN THE FIELD

Once the first systems were deployed, the impact was immediate. With secure remote access built into each generator, Rutherford & Titan can connect to live systems and see exactly what the machine is doing.

Instead of reacting to alarms or dispatching technicians blindly, the team diagnoses problems by looking at real-time pressures, temperatures, valve states, and compressor behavior. Most problems are resolved remotely. When a site visit is needed, technicians arrive with context.

> **"They're always surprised that we can actually see what's going on inside the system. No one else does that."**
>
> **- Amir Amirsadeghi, Rutherford & Titan**

"That's been huge for us," says Amirsadeghi. "We can remote in, find an issue or a leak right away, and avoid unnecessary service calls."

The savings add up. On average, the company avoids hundreds to thousands of dollars per service event. And customers notice the difference.

"They're always surprised that we can actually see what's going on inside the system," Amirsadeghi says. "No one else does that."

SCALING PRODUCTION AND FUTURE ENHANCEMENTS

By the end of Q1 2026, the company has roughly 20 liquid nitrogen generators deployed, with new systems going into government agencies and research labs where uptime and support expectations are high.

And Rutherford & Titan's control systems aren't static. As the team spends more time working within the *groov* platform, they've begun extending it beyond core control and diagnostics. What started as a way to run and service generators is becoming a broader visibility and support layer that grows alongside the product.

"As we've gone deeper into the platform, Selam [Shimelash, Opto 22's Application Engineer] has also helped connect us with people who understand both

Complete system visibility, from generator to storage tank, is central to Rutherford & Titan's service model.

"Opto 22 understands what we're building and why. Building the system ourselves only works if we can support it ourselves. Opto 22's *groov* products make that possible."

- Amir Amirsadeghi, Rutherford & Titan

controls and visualization, which opens up more options as we keep evolving the system," says Amirsadeghi.

Today, engineers connect directly to deployed systems using CODESYS for live diagnostics. Rutherford & Titan has future plans to expand operator- and service-facing dashboards using *groov* View, separating day-to-day monitoring from deeper control access.

For the smaller generators, the team is evaluating Node-RED dashboards, which can run directly on *groov* RIO. The goal is the same either way: faster answers, fewer service calls, and clear visibility without logging into the controller for every question.

CHOOSING PARTNERS, NOT JUST PLATFORMS

Moving into manufacturing forced Rutherford & Titan to think beyond hardware specifications. Once systems were in the field, support, availability, and day-to-day usability mattered just as much as control performance.

"Local expertise, coverage, and product availability are huge for us," says Amirsadeghi. "Opto 22 understands what we're building and why. Building the system ourselves only works if we can support it ourselves. Opto 22's *groov* products make that possible."

ABOUT RUTHERFORD & TITAN

Founded in 2018, Rutherford & Titan is an American industrial gas solution provider in Texas. They are a nationwide cryogenic installation and servicing company with strategic relationships with key industry partners and deep experience in cryogenics. They specialize in the production, transfer, and storage of industrial gases. Working directly with their customers throughout their projects, they help select, install, maintain, and more—providing a comprehensive range of services. Rutherford & Titan strives to be a partner for their clients that helps them navigate the complicated world of cryogenic systems.

For more information, please visit:
https://www.rutherfordtitan.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**:

Phone: **800-321-6786** (toll-free in the U.S. and Canada) or **951-695-3000**
Email: systemseng@opto22.com

OPTO 22 www.opto22.com
43044 Business Park Dr. Temecula, CA 92590-3614

SALES sales@opto22.com
800-321-6786 • 1-951-695-3000

SUPPORT support@opto22.com
800-835-6786 • 1-951-695-3080