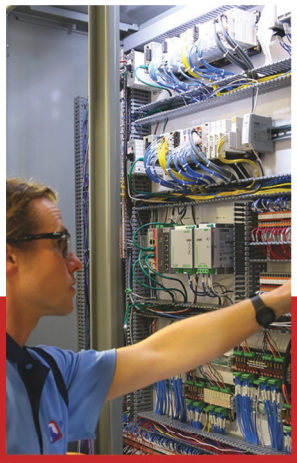

Case Study: Ridge Vineyards Enhances Sustainability with Advanced Wastewater Automation

Streamlining wastewater treatment with integrated control systems

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CASE STUDY: RIDGE VINEYARDS ENHANCES SUSTAINABILITY WITH ADVANCED WASTEWATER AUTOMATION

Streamlining wastewater treatment with integrated control systems

In late 2024, Ridge® Vineyards—a historic California winery—faced a growing operational challenge: debris from wine production, including grape skins, stems, twigs, and sediment, was clogging filters and pumps in their wastewater treatment system. The blockages caused frequent maintenance issues and costly unplanned shutdowns, disrupting day-to-day operations.

ABOUT RIDGE VINEYARDS

Ridge Vineyards has production facilities in Cupertino and Healdsburg, where the winery focuses on making single-vineyard wines, especially Zinfandel and Cabernet Sauvignon.

Ridge is known for a hands-off, precision-driven approach to winemaking—using natural yeast, minimal additives, and tight control over fermentation to highlight the natural character of the grapes and vineyard. The same philosophy extends to their operations: Ridge farms organically and maintains detailed records of grape origin and handling, ensuring transparency from vineyard to bottle.

Ridge farms their vineyards organically, avoiding additives.

The wastewater system at the Ridge Vineyards production facility blends into the landscape.

DEFINING THE WASTEWATER CHALLENGE

Wine production generates significant wastewater containing organic matter. Although Ridge had automated several parts of its winemaking operation—such as temperature-controlled systems for heating and cooling fermentation tanks, as well as the boiler—they still managed the wastewater process in a more "old school" fashion, relying on manual checks and with limited visibility into system performance.

The need was clear: an automated, scalable, and reliable solution to effectively pre-treat wastewater by removing large contaminants. The new system should integrate smoothly with existing treatment systems as well as provide real-time control and monitoring capabilities to Ridge Vineyard's operators.

DESIGNING THE PRE-TREATMENT SYSTEM

Ridge Vineyards brought in DNR Systems™—a California-based systems integrator (and OptoPartner) with deep expertise in industrial controls across food and beverage, oil and gas, and agricultural sectors. DNR, led by President Ryan McCollum, specializes in delivering full-stack control solutions, from panel design to field implementation and HMI development.

To address the specific challenges of winery wastewater, DNR worked with Ridge to design a mechanical process that could reliably remove solids before water reached the downstream treatment system.

Ridge's hillside wastewater system sits just below the main tasting room.

The plan began with a rotary drum screen to capture large debris such as grape stems and twigs. Although the rotary drum already existed on-site, Ridge wanted to repurpose it with improved control and better integration.

"The drum was there, but the built-in controller was limiting," said DNR's team. "We had to adapt the system to deliver more reliable, coordinated behavior with the other components being added." Coordinating behavior across various equipment and instruments required real-time adjustments during commissioning.

Next, a clarifier tank would slow the flow and allow finer particles to settle naturally. A polymer dosing system was

The clarifier tank separates solids from process water.

The enclosed pump station supports wastewater flow control.

The clarifier and holding tank manage the flow of water and solids.

The polymer dosing system improves solids removal.

included to bind small particles into larger clumps, making removal more efficient.

Finally, a sludge press would compress the collected solids into a dry, manageable form for potential reuse as fertilizer. Together, these components would form a robust front-end system—but they still needed coordinated control to operate reliably and scale effectively.

SELECTING THE OPTIMAL SOLUTION

After selecting the key components of the pre-treatment system, DNR Systems turned their focus to control and integration. To tie the entire process together, they recommended Opto 22's *groov* EPIC (**E**dge **P**rogrammable **L**ogic **C**ontroller) as the foundation for the new control system.

The decision was driven by DNR's long-standing success with Opto 22 products, valued for their flexibility, reliable performance, and ability to integrate easily with a wide range of hardware and protocols.

> **"Opto 22 solutions have always been very comfortable for us. They're open-ended controllers, highly versatile, and reliable."**
>
> **- Ryan McCollum, President, DNR Systems**

Another key factor was Glen Jacob, Ridge's Maintenance Director, who had worked with Opto 22 at a previous facility. Based on that experience, he's now aiming to transition all of the winery's control systems to Opto 22.

"Opto 22 solutions have always been very comfortable for us. They're open-ended controllers, highly versatile, and reliable," said McCollum. "Ridge needed precise control of multiple pumps, continuous analog readings from level and flow sensors, and clear on/off status indicators—all integrated into a centralized operator interface. Opto 22's *groov* EPIC checked all the boxes."

Sludge press in action, removing solids from wastewater

Opto 22's *groov* EPIC integrates drives, I/O, and control in one enclosure.

IMPLEMENTING THE *groov* EPIC SOLUTION

The new pre-treatment automation system revolved around Opto 22's flagship processor, the *groov* EPIC—specifically the GRV-EPIC-PR1. The EPIC served as the central automation hub, orchestrating the entire wastewater pre-treatment process.

The project integrated several *groov* EPIC I/O modules, each chosen to fulfill specific operational requirements:

- GRV-IMAI-8 analog input module to capture critical analog signals including water flow, level transmitter readings, and pressure measurements
- GRV-OVMALC-8 analog output module to control setpoints for multiple variable frequency drives (VFDs), essential for precise operation of pumps and filtration devices
- GRV-IACDCTTLS-24 digital input module for monitoring equipment status signals, including VFD faults, drum status, safety switches, and emergency stops
- GRV-ODCI-12 digital output module to manage start/stop functions for pumps and other critical equipment, ensuring coordinated operational control

One challenge during implementation was connecting *groov* EPIC to Ridge's existing C-more® HMI screens. DNR's lead programmer Nick DeCosta explains, "We had to get creative using the scratchpad [*groov* EPIC's internal memory tags] and Modbus®/TCP mapping. It wasn't the most straightforward setup, but it worked. That's one thing we like about Opto—you can always figure out a way."

The integration with Ridge's existing C-more HMI screens via Modbus/TCP enabled operators to monitor and manage the entire pre-treatment process visually. For additional flexibility, the *groov* View interface (a web-based HMI included with every EPIC processor) provided mobile monitoring capabilities that allowed winery personnel to securely access monitoring screens from smartphones or remote office locations directly through local networks.

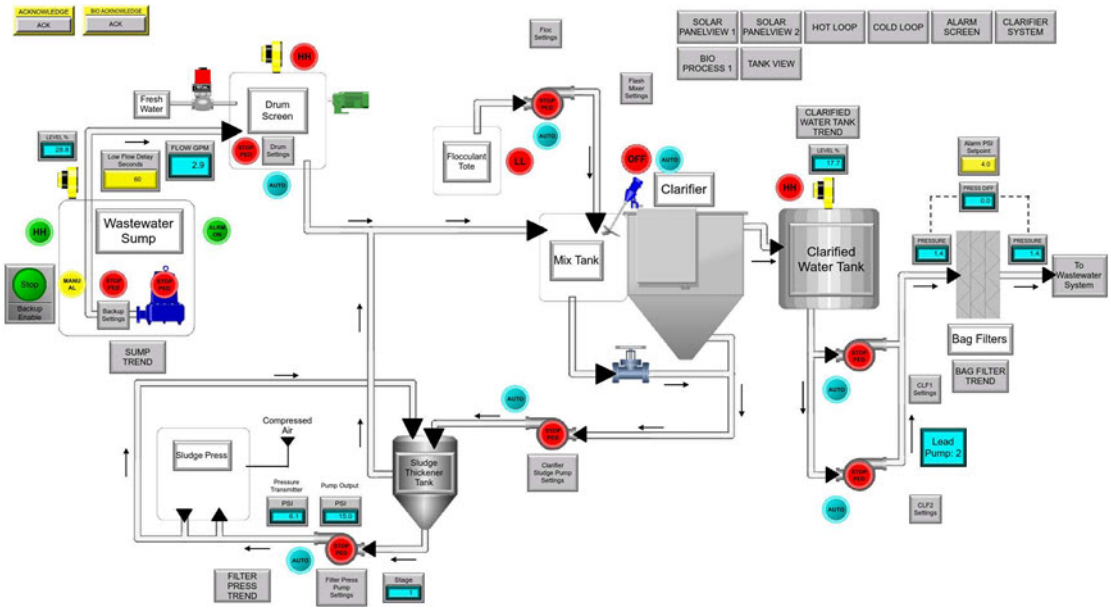
"Opto 22's *groov* EPIC made integration straightforward," McCollum noted. "The flexibility allowed us to accommodate existing hardware, streamline implementation, and maintain scalability for future expansions."

ACHIEVING REAL-WORLD RESULTS

Automating the pre-treatment system immediately reduced the need for manual intervention. Tasks that once required constant on-site monitoring—such as checking pump status, flow rates, and drum operation—could now be managed remotely.

Unplanned downtime caused by clogging and filter issues dropped significantly thanks to better control overflow and debris removal. The team also gained more consistent process data, which improved day-to-day decision-making and reduced time spent troubleshooting.

Ridge's control panel has VFDs and a touchscreen interface.



The visual interface (HMI) for monitoring and managing Ridge Vineyard's wastewater operations

"We've seen considerable reductions in manual labor and an increase in overall process accuracy," said McCollum. "Now, operators can oversee the wastewater system directly from their phones or offices. It's a game-changer."

CUSTOMER FEEDBACK AND FUTURE PLANS

The successful implementation has sparked enthusiasm for future projects and expanded automation within the winery. Ridge has already planned additional automation projects with DNR Systems, including lighting upgrades and automation for their crush pad operations, further emphasizing their commitment to continuous improvement and innovation.

"They've been very happy with the system," McCollum reported. "Our partnership has grown, leading to several upcoming projects across multiple Ridge facilities. It speaks volumes about their trust in both DNR Systems and Opto 22."

LESSONS LEARNED AND ADVICE FOR OTHERS

Reflecting on the project, McCollum emphasized the importance of flexibility and communication.

"The scope you initially envision often changes significantly throughout a project. Stay closely engaged with your customer's evolving needs. Constant communication is key to avoiding scope creep and ensuring successful outcomes."

For example, integration with their existing C-more HMI screens wasn't part of the original scope. Another late addition was enhanced tracking of polymer dosing. Close

"Opto 22's *groov* EPIC made integration straightforward. The flexibility allowed us to accommodate existing hardware, streamline implementation, and maintain scalability for future expansions."

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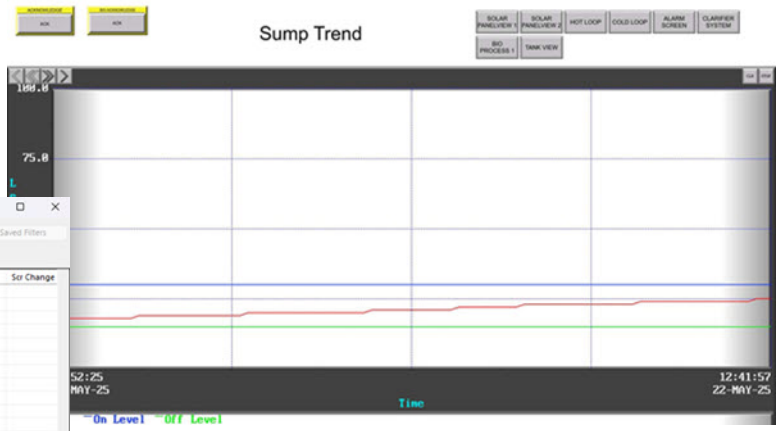
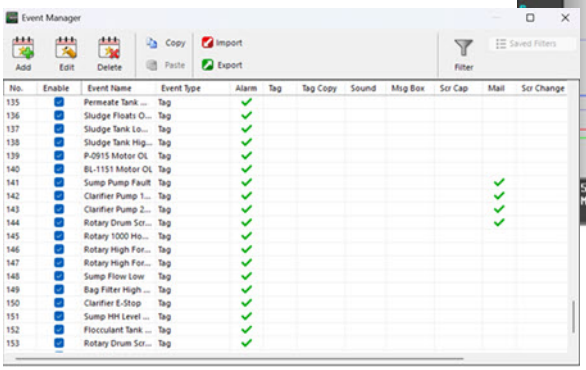


Real-time sump trend data prevents overflows.



The Event Manager tracks faults and system alerts.

collaboration throughout the process made it possible to adapt and deliver exactly what the customer needed.

McCollum praised Opto 22's product reliability and responsive support.

"Even when we encountered minor complications—like challenges integrating Modbus/TCP with C-more—Opto 22's support was quick and effective," McCollum said. "Their solutions consistently deliver, and their team is genuinely invested in helping integrators and customers succeed."

A SUSTAINABLE FUTURE

With greater efficiency, enhanced environmental compliance, and reduced manual labor, Ridge is better positioned to meet their environmental goals and sustain their legacy of excellence in winemaking for generations to come.

"Our relationship with Ridge Vineyards continues to thrive," concluded McCollum. "Together, leveraging Opto 22 technology, we're setting new standards in sustainable wine production and efficient resource management."

ABOUT RIDGE VINEYARDS

Since 1962, Ridge Vineyards of California has championed single-vineyard winemaking, embracing "pre-industrial" techniques that avoid modern additives and over-processing to bring the most high-quality and authentic tasting wine. Based in Northern California, Ridge is one of the largest farmers of organically certified grapes in the Sonoma County and Santa Cruz Mountain appellations. They are critically acclaimed for their consistent wine quality and steadfast approach to winemaking.

For more information, please visit:
https://www.ridgewine.com

ABOUT DNR SYSTEMS

DNR Systems, Inc. is a California-based systems integrator with expertise in industrial controls across food and beverage, oil and gas, and agricultural sectors. They specialize in delivering full-stack control solutions from panel design to field implementation and HMI development. Their services also include panel fabrication, piping, electrical, and programming services.

For more information, please visit:
http://www.dnrsys.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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