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How a California Quarry Doubles Production, Lowers Costs

APRIL 1, 2015 BY [JOAN JACINTO](#) — [LEAVE A COMMENT](#)

Canyon Rock turned to Siemens Totally Integrated Automation, TIA Portal engineering software and Profinet communications for rapid expansion and increased profitability.

Faced with completing one of the largest projects in its history, Canyon Rock, a Northern California quarry, knew success depended on making major changes to its operations—and making them quickly. It needed to double production to meet the specifications of the bid it had just won, a sizable effort that required outside help. Recognizing that increasing capacity so significantly meant a major modernization, the company turned to its long-time business associate, automation specialist EandM, along with the known quality and reliability of the Siemens automation products and systems EandM distributes, to make it happen.





A family-operated and community-minded enterprise, Canyon Rock produces aggregate and concrete. The quarry has helped build the foundation of Sonoma County, providing quality rock, concrete mixes, and sand to the area for more than 40 years. Its rock is in the surrounding roads, rail beds, and airstrips, as well as in stores, parks, and schools.

The company is continually incorporating advancements into its operation, upgrading its facility and equipment, striving for sustainability, and working to be an environmentally friendly good neighbor. It minimizes its carbon footprint by keeping its fleet performing above current emission regulation standards and annually planting trees in reclaimed areas of the quarry. The company was the first local aggregate producer to recycle concrete and asphalt starting in 1975, a practice that continues to this day.

Meeting the Challenge of Modernization

The major job Canyon Rock had just accepted presented new kinds of challenges. Meanwhile, a change in corporate leadership had recently occurred: the reins of the company passed from one generation to the next. The new management recognized the potential of incorporating state-of-the-art technology. The benefits of expanding and automating the operations were hard to ignore.

Specifically, the company sought to minimize noise pollution by using a greater percentage of conveyors (instead of loaders) to move materials from place to place. By automating the materials handling operations with sophisticated controllers, motor starters, and variable frequency drives (VFDs), Canyon Rock could continue its environmentally responsible policies of reducing its carbon footprint and cutting fuel costs while significantly increasing throughput.

Add to the mix the immediate driver: fulfilling the obligations of the new contract that was a large, time-sensitive job. Two urgent needs emerged:

- Double the capacity of produced aggregates
- Minimize labor costs



Meeting the demands of a modernization and the specifications of the contract depended on a collaboration of resources. To start, Canyon Rock called on EandM.

Founded in 1955, EandM is a California automation leader. They had worked with Canyon Rock almost from the organization's start, playing an important role in the construction of the original facility some 40 years ago. When it became apparent that the quarry needed a turnkey solution, EandM brought its subsidiary and system integrator, Serra, into the project to ensure a timely, cost-effective solution that would allow Canyon Rock to meet its contract deadlines, eliminate or minimize operations downtime, and promote flexible manufacturing.

As a long-standing Siemens Solutions Provider, Serra was familiar with Siemens' outstanding reputation, high-quality product lines, and global support and service, along with its Totally Integrated Automation (TIA) strategy. This concept promotes orderly handling of all automation components using a single system platform and tools with uniform operating interfaces. The concept is exemplified in Siemens' TIA Portal engineering software, a single programming tool for all components. The sophisticated but easy-to-use package was instrumental in helping Canyon Rock achieve its goals within the prescribed deadlines, saving programming time through reusability of code, enabling personnel to learn just one software package, and supporting diagnostics to determine failures anywhere on any device.

Meeting the Need for Speed and Efficiency

With time of the essence, Canyon Rock, EandM, Serra, and Siemens joined forces on a project that had totaled \$328,000 costs to date. The job, expected to top half a million dollars by the time all phases were complete, began with the installation of a plant-wide Profinet communications network and incorporated several Siemens product lines, including:

- S7-1200 PLCs
- 19" TP1500 SIMATIC HMI Comfort Panel, from which the entire plant is monitored and controlled
- 3RA1 and 3RA61 motor starters with 3RW40 soft starts and SIMOCODE pro motor management
- G120 VFDs
- Various I/O devices, pilot devices, breakers, and terminals
- TIA Portal programming software

Speed was imperative. "We faced incredibly fast commissioning," explains Grant Schulz, Serra's engineering manager. "We were behind schedule from the start. We had done basic motor starter panels for the quarry, but not PLC-based automation. Simple motor starters had been sufficient to drive the operation in the past. However, present management's strong belief in automation and technology gave us the opportunity to bring Siemens state-of-the-art controls and systems on board."

With a project of this magnitude, the commissioning of each phase would normally take some four to six weeks, but Canyon Rock had only one week for that task to meet the terms of the contract. The company would have been subject to substantial penalties if it failed to deliver in the specified time frame. Further, the renovation had to be completed with little or no downtime of existing operations.

“We needed a way to catch up, and we found it in Siemens’ TIA Portal programming software,” says Schulz. “With TIA Portal, we were able to program all the Siemens products involved in the modernization with one package. A more traditional approach would have required three or four software tools and three or four diagnostic tools to do what we did with TIA Portal alone. It gave us the efficiency to roll out the systems with a speed that no other diagnostic tool could match.”

All components in the project were programmable using the TIA Portal software package, a capability Canyon Rock and Serra recognized as the major reason the goals of the project were achieved. “Everything really did turn on TIA Portal,” notes Schulz. “We were able to commission everything in a week. Without TIA Portal, we could not have done it that fast. We could not have met contract obligations.”

Implementing a Phased Approach

Use of a phased approach also helped smooth the road to improvement. Following the general flow of the material as it moves from aggregate to sand, Serra divided the work into stages covering five areas:

- Scalping, or removing available exposed rock and loading it into the system
- Rock crushing
- Secondary screening, which involves sorting aggregate into various sizes
- Tertiary screening, or rescreening, which separates out finer-sized particles
- Wash plant

The success of the phased approach turned largely on the implementation of Profinet, the new communications architecture. “Before this project, the plant had no network,” Schulz observed. “Once we rolled out a backbone for the entire plant, and put all components on a common network, the PLCs could talk to the HMIs which could talk to the VFDs and the motor monitoring devices.”

Faced with keeping production up and running in all areas of the plant throughout the modernization, Serra personnel upgraded one area or process at a time. When one was done, they called it complete and moved on to the next one. To date, four areas have been completed in

four separate projects. That minimized the impact, and production continued as the overall plant was improved.

Schulz explains the role of TIA Portal in the phased approach:

“Each phase required essentially the same elements. Once the first phase was complete, the lion’s share of the work was done. The standardized library of code developed for the PLCs, the VFDs, and even the HMIs was reusable with TIA Portal. The capability of TIA Portal allowed us to collapse the design cycle and the installation cycle. We knew the functions in the second phase were going to work because they had already been tested and applied in the first.”

Simply put, TIA Portal programming software makes the entire operation flexible. The global library lets you reuse parts of a project and share them again and again. By not having to reinvent the wheel, considerable programming time is saved.

The results underscore this point: Phase 1 took four and one-half months to complete. Phase 4, which was at least 30 percent larger than Phase 1, took a month, including commissioning. “Speed increased with experience,” notes Schulz. “Programming the HMIs was faster than programming the PLCs; the VFD commissioning went faster than previous components as subsequent standardized components were reused.”

Benefits from the Get-Go

Started in February 2013, the modernization program is expected to be finished early in 2015. “Currently, we are in the fourth of the five phases,” says Schulz. “At this point, we have already doubled throughput. In Q2 2015, we’ll probably be at greater than 150 percent of the original capacity. Production will have risen from 4,000 tons to 10,000 tons of aggregate a day.”

Other benefits include reducing the amount of wiring required in the project by incorporating Profinet across the plant. “Instead of running the traditional half dozen wires from one PLC to one VFD, we use one Profinet cable,” explains Schulz. “The network was integral to achieving the level of automation Canyon Rock wanted and needed. And the quarry can now do other things, thanks to the connectivity. What’s more, we are incorporating some non-traditional devices into the network to provide remote access for monitoring and controlling parts of the plant previously under manual control.”

The ongoing effort holds the promise for more progress in the future. “We started out with five major phases in the program,” says Schulz. “Along the way, we picked up a half dozen to a dozen additional smaller projects that bring individual functions or smaller islands of control into the larger picture.”

That picture is looking very bright for Canyon Rock.

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