California Steel Industries, Inc.

Designed for Success

Results

- Significantly decreased downtime due to unscheduled shutdowns
- Achieved tremendous cost savings, with project return on investments (ROI) in less than three months
- Increased the line's exit by 3-4 seconds, alleviating a process bottleneck and enabling faster production speeds
- Optimized control sequencing, driving up overall line productivity
- Improved maintainability and maintenance processes with better data and remote troubleshooting – allowing more time for process optimization
- Reduced material scrap from unscheduled line shutdowns
- Boosted product quality with smoother production
- Put in place a system for analysis and long-term continuous improvement

"In steel processes, it is critical for timing to be right. Galvanizing – normally – doesn't stop for anything. And, if we can increase speed, we can lower costs."
Marc Sandford
Senior Electrical Engineer
California Steel Industries, Inc.

Putting the Pedal to the Metal

California Steel Heats Up Production with High-Speed Data Acquisition.

When two of the world's largest names in the steel industry came together to establish a viable West Coast steel source in the U.S., some hot results were nearly a guarantee. California Steel Industries, Inc. (CSI) – a collaboration between Japan's JFE Steel Corporation and Brazil's Companhia Vale do Rio Doce (CVRD) – has more than tripled its production output since its founding in 1984 and grown by 100% just since 1992. CSI is now the leading producer of flat rolled steel in the Western United States, boasting the widest range of products.

On a quest to produce the highest quality steel and achieve production levels to support its growing customer needs, CSI completed a five-year, $265-million modernization program. This spirit of modernization and improvement continues – and the team at the company's #2 Continuous Galvanizing Line recently embarked on its own mission, implementing a FOCUS HSDA (high-speed data acquisition) system from Binnington Development Corporation, using technology from GE Fanuc Automation as well as new software for collecting and archiving data. After having the FOCUS HSDA system in place for just three months, the team improved productivity, increased quality, reduced downtime and material scrap costs, and achieved full return on investment – helping #2 Galvanizing Line heat up performance at Fontana, Calif.-based CSI.

Galvanizing Production
CSI produces galvanized coil and sheet by adding a zinc coating to cold-rolled steel for additional corrosion resistance. The company offers a broad range of thicknesses, widths, and coatings of galvanized products. The two galvanizing lines at the 450-acre site each focus on different thicknesses and unique customer applications.

On #2 Galvanizing Line, CSI produces very light, very high quality steel – often in the range of .0098-inch gauge. The team runs an average of 300 tons/shift, and speed and quality are essential. The galvanized steel from #2 Line usually gets fabricated right into end products for building and construction such as HVAC, roofing, decking, flexible conduit, studs and siding, walk-in coolers and drop-ceiling rack systems.

The finish must be exceptional, as CSI's customers often paint the steel prior to fabrication and require a smooth, consumer-ready finish.

With demand running high, the team on #2 Galvanizing Line needed to improve productivity by reducing unexplained shutdowns that were occurring approximately every three weeks and lasting 10-15 minutes. Each shutdown resulted in lost production time as well as material scrap. Electrical Planner Mike Coyle and his team accepted the task of reducing the shutdowns by using as much of the line's existing technology as possible.

Like the rest of CSI's production, #2 Galvanizing Line uses a CIMPLICITY® HMI system from GE Fanuc. The team also employs four Series 90™-70 PLCs, Genius® I/O, DC2000 drive controllers and Data Historian for analysis, networked over standard Ethernet. The automation system was logging the shutdowns, but Lead Electrical Maintenance Electrician Larry Gantner and Senior Electrical Engineer Marc Sandford could not determine the causes of the faults due to lack of resolution in system operational report data.

"Production runs so fast and is such a series of complex processes that in many cases, the system could not log the data at a high enough resolution to capture the reasons for the line stop," Gantner explains. "We were trying to troubleshoot with any data that we had, but the potential was there to lose thousands of dollars per minute during each line stop."

The team attempted to build traps in the controller logic, but the large number of monitored points mired their efforts. Working in close collaboration with Binnington Development, the CSI engineers explored the possibility of enhancing its existing controls with a FOCUS HSDA high-speed data acquisition system – enabling the high speed capture of operational data and exposing the reasons for shutdowns.

"Plant productivity is often considered from a macro overview of the process, but this may not reveal improvements to be had from a micro view of individual plant systems and machines," notes Michael Rhodes, business development manager with Binnington Development. "The CSI team knew that it needed a micro view – and, in this complex process, that could only be achieved through high-speed data acquisition. CSI had a valid control system in place, and by teaming up, we could leverage their existing assets to make them even more effective and give the line a significant boost to productivity."

Heating Up

In combination with GE's hardware and software technology, the CSI and Binnington engineering team implemented a FOCUS HSDA system that can read all the data tables in the control system 100 times per second (10 ms resolution) or more. The system reads and logs some 20,000 points from the data tables in the four PLCs, capturing every transaction and event in the controllers as well as the devices interacting with them. The team can view production information and configure points on the CIMPLICITY HMI Plant Edition software, while the automation solution displays all FOCUS HSDA plant data and trends on a GE Control System Solutions Toolbox, featuring a new interface developed by Binnington to provide more detailed information for the PLCs and drive controllers. The HSDA logs the data for a configurable number of days and can archive it for future analysis as well.

With the new high-speed data acquisition system in place, the team on #2 Galvanizing Line has been able to:

- Significantly decrease downtime due to unscheduled shutdowns;
- Achieve tremendous cost savings, with project return on investments (ROI) in less than three months;
- Increase the line's exit by 3-4 seconds, alleviating a process bottleneck and enabling faster production speeds;
- Optimize control sequencing, driving up overall line productivity;
- Improve maintainability and maintenance processes with better data and remote troubleshooting – allowing more time for process optimization;
- Reduce material scrap from unscheduled line shutdowns;
- Boost product quality with smoother production; and
- Put in place a system for analysis and long-term continuous improvement.

"With the FOCUS HSDA, CSI can optimize their processes using information from the controllers to reveal small flaws in process control sequencing," Rhodes says. "Valves opening fractions of a second too soon or too late, motors starting or stopping a few hundredths of a second late, sensors not being detected in a timely manner are common sequencing errors that may only be in the range a few hundredths of a second and not be detectable with conventional means. Now, with the ability to detect small flaws, CSI has the opportunity to make corrections for a dramatic cumulative improvement. Additionally, preventive maintenance measures can be put in place now, as the team knows when a component in the system is not reacting as planned."

Leveraging Existing Assets

To achieve the fastest, most cost-effective system enhancement, CSI worked with Binnington to leverage as much of #2 Line's existing control components as possible.

Trina Tran, senior process control engineer, explains, "We started by configuring a new computer interface dedicated to the high-speed data acquisition system and testing the HSDA software using the latest version of CIMPLICITY HMI Plant Edition and the GE Control System Solution Toolbox."

For data archiving and display, Binnington Development leveraged the line's existing Data Historian. "Binnington understood our need to use current equipment and worked to make software integration a success," Gantner says. "They were very receptive and helpful, and

we were pleased that they were able to use their expertise to our advantage. Not only did it reduce the cost of new hardware and software, but it helped to minimize training time, which means faster results."

Electrical Planner Mike Coyle was also able to use the line's existing Series 90-70 PLCs by adding new GE Fanuc PACSystems™ Control Memory Xchange (CMX) modules to the VME backplanes to enable the FOCUS HSDA. The CMX cards utilize patented reflective memory technology to share large quantities of control data over a fiber-optic deterministic network up to 200 times faster than Ethernet. With this new technology, data transfer is absolutely automatic – which resulted in large cost savings in software development, since little application code had to be written, tested, documented, or maintained for assembling messages, decoding messages, and distributing data from incoming messages. Additionally, Coyle was able to achieve speed as well as higher reliability with PACSystems Control Memory Xchange and the use of a fiber optic network.

"We can actually now see events occurring and modify the logic in the PLCs," Gantner comments. "With this process, we are looking to decrease the time that events are occurring. We'll be able to speed up the line's exit by three or four seconds, which is a tremendous benefit. This area has been a bottleneck and that benefit will then trickle through the rest of the system."

Sandford explains, "In steel processes, it is critical for timing to be right. Galvanizing – normally – doesn't stop for anything. And, if we can increase speed, we can lower costs."

The team members are especially excited because, while results to date are impressive, they are still just beginning to uncover benefits from the system enhancements. "We aren't limited to any one area," Gantner says. "While we're starting with the line's exit, we'll also be looking at other areas, too. This is all about coordination between sequences, and each result multiplies through the line and process."

Easier Maintenance

Keeping the system in top shape is also easier. With the FOCUS HSDA to help identify faults, the team can make sure that individual faults do not continue to cause problems. Troubleshooting is much faster because the system captures exactly where the fault occurred.

"We now have data on every point," Gantner says. "And, the system helps our operators maintain higher productivity, too. With improved data, we can provide better instructions on how to operate the system for peak performance – from hitting a button at a certain time to watching for a certain alarm."

When there is a problem on the line, the team can access the system remotely for the fastest response time, Tran notes. "We can remotely troubleshoot problems through a VPN – which saves time. During the project startup, Binnington engineers also used remote access to help speed up the commissioning"

With the new FOCUS HSDA high-speed data acquisition system in place, the team on #2 Galvanizing Line has put the pedal to the metal. Fewer unscheduled shutdowns translate into higher productivity and less material scrap – as well as higher quality derived from smoother production. A faster exit at the end of the line has helped speed production overall, with more improvements throughout the line still to come. Easier troubleshooting – including remote connectivity – helps the team reduce maintenance and drive peak performance. For the team on the #2 Galvanizing Line, the spirit of modernization and improvement is alive and well – helping CSI meet production and quality goals, maintain the broadest range of galvanized products in the industry, and "steal" the show from its competitors.

Binnington Development Corporation

Binnington Development Corporation (BDC) is an innovative Controls Engineering firm that specializes in the optimization of industrial operations. For over 15 years, we have spearheaded the progressive use of existing and emerging technologies in process control, systems integration, networking, consulting, design, and maintenance.

One of the many things that sets us apart from our competitors is our belief that optimization does not have to mean replacement. We pride ourselves on finding the best control strategies and optimization options for increasing our client's productivity and profitability. Our goal at Binnington Development Corporation is simple:

To provide our clients—regardless of their industry—with the right tools to competitively manufacture the best products in the most cost-effective way.

Our suite of engineered industrial products—FOCUS-HSDA™, FOCUS-SOE™, and FOCUS-AI™—are unique solutions to the contemporary productivity and maintenance issues that plague many industries.

Binnington Development Corporation
300-1727 West Broadway
Vancouver,
604.742.1677 Fax: 604.742.1679
E-mail: info@binnington.com
www.binnington.com

GE Fanuc Automation Information Centers

USA and the Americas:
1- 800-GE FANUC
or (434) 978-5100

Europe, Middle East and Africa:
(352) 727979-1

Asia Pacific:
86-21-3222-4555

Additional Resources

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