



Improving Visibility & Unlocking Plant-Floor Data to Cultivate Efficiency

 CASE STUDY

Customer

As a leading manufacturer that supports data and digitization initiatives around the world, [Belden](#) works with customers across a variety of markets to help them modernize and transform their mission-critical infrastructure.

Employing more than 8,000 people, it has production facilities in several countries—including a large, 1960s plant in Canada. To keep up with demand, the facility uses a mix of new and legacy equipment to create more than 50 production assets across several manufacturing cells.

Challenges

Any plant that wants to improve productivity and efficiency must first measure its current performance. In today's world, these metrics must be not only measured, but also tracked in near real-time.

This Canadian plant still operated like it did 30+ years ago. Many processes and data points were documented on paper, with large gaps of missing information—especially in regard to weekend night shifts. When engineers or machine operators needed to troubleshoot, it was difficult to identify and resolve problems.

Because plant workers lacked visibility into key metrics like uptime or scrap, they couldn't tell how well the plant was performing, or where improvements should be made. Employees had to dig through every machine individually to identify and extract appropriate performance data points. With different machines running different products—each with its own settings and speed requirements—there was lots of information to sort through. And without contextualization, most of these numbers were useless noise.

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A complete network redesign and hardware transformation gave one of Belden's industrial plants a foundation to view and optimize performance in real-time, make faster equipment diagnoses and automate work.

Over a period of nearly four years, the local engineering team pieced together a mixed-vendor network to support their OT systems and implement basic monitoring.

This allowed the plant's support and management teams to identify critical gaps and define the benefits of a more broadly integrated approach. With minimal support, however, there were limits to what this homegrown solution could achieve for Belden.

First, the network lacked redundancy and was known to be unreliable. OT systems drive different priorities in their communications networks, which can make them more complex. In the past, a relatively simple device installation had taken the entire network down.

The network's lack of standardization also made it difficult to support. When something went wrong, it was sometimes easier to start over and build something new instead of troubleshooting several versions of components. A lack of available ports made density increases and expansion difficult, if not impossible.

Because of a divide between Belden's IT policies and the OT systems' needs, the OT network couldn't be integrated with the company's corporate network. Critical data from plant-floor machines couldn't be shared with the office—and vice versa.

In an effort to improve processes and track overall equipment effectiveness (OEE), the engineering team tasked one of its electrical engineers with investigating SCADA software options and launching pilots to test ways they could begin to bridge the gap between IT and OT.

Collaboration & Discovery

The plant's engineering team was aware of their limits and capabilities. They had a strong sense of what they wanted to accomplish, along with proofs of concept and ideas to bring their dreams to life.

Because they already had a strong foundation, they didn't need to start from scratch. They needed help designing and implementing a solution that was tailored to how they work, what IT requires, what had been accomplished so far and what they hoped to achieve in the future.

Belden's plant decided to take advantage of its own in-house resources and capabilities within the company's [Customer Innovation Centers](#) (CICs). These hubs serve as places of co-innovation, where Belden CIC experts work closely with customers to develop, test and validate solutions that address unique digital-transformation challenges. This time, the CIC team would be working to solve problems that existed within its own company.

Typically, CIC experts conduct network assessments or digital maturity assessments to better understand operational workflows, identify challenges and uncover opportunities. From there, solution designs are created, tested and deployed, and then followed up with customized training to help companies manage their new networks.

In this case, however, the plant's engineering team had already laid the foundation, minimizing the need for additional assessments. They required support to accomplish what they hadn't been able to do on their own.

Belden's CIC experienced professionals made recommendations about hardware and network design/layout to improve redundancy and speed; they also served as mediators between OT and IT to make sure both parties' needs were met for IT-OT convergence.

“Meeting IT compliance was a real challenge,” says Thomas Coupland, OT network specialist at the Cobourg plant. “We knew we needed to get IT onboard as a partner, but we didn't know how to make that happen. That's where experts from the CIC came in to help us bridge the gap between our OT and IT teams.”

Solution

A complete network redesign and hardware transformation involving upgrades to managed switches, next-generation firewalls and NAT (network address translation) gateways, along with the creation of redundant links, gave the engineering team a reliable OT network that complies with IT standards. **Finally, Belden's OT network could be integrated with Belden's corporate network, removing a major stumbling block from the company's digital-transformation journey and improving network resilience.**

Technical trainers from the CIC were onsite throughout the project's planning phase. A solutions engineer was also onsite to support deployment, including the several-hundred network infrastructure nodes and end devices that were brought online during the plant's annual five-day shutdown window.

The plant's CIC-designed solution involved many components and unites different data sources to make information more accessible and actionable

A Network that Eliminates Single Points of Failure

Originally, the plant's isolated OT network was made up of one central switch per production area or "flow," plus a switch in the server room. Because nothing was integrated, installation of many extra Ethernet runs was required, which wasted valuable maintenance time.

The new network design is a ring topology that supports isolation within three separate sub-rings to create network redundancy. With this layout, multiple connections can go down without interrupting production to ensure uptime.

Now, the network can maintain secure, reliable connectivity without the OT team having to worry about broken links, changes in network topology or volatile network conditions (such as surges in usage, for example).

A Foundation for Industry 4.0 Initiatives

The network upgrade supports the connection of 450+ devices, with the capability to support 100+ more in the future. In the next year alone, the plant plans to add another six production lines.

The engineering team is now positioned to advance Industry 4.0 initiatives, such as deploying temperature and humidity sensors to enable [predictive maintenance](#). This maintenance tactic optimizes equipment and detects potential problems before they occur.

Instead of relying on operators to write down important information for transcription later, or manually input information into an HMI (human machine interface), the team is already working on the rollout of next-generation HMIs that automatically pull in necessary information from employee and production schedules and order-entry systems.

The OT team now has the freedom and flexibility to securely process and store near-real-time data locally so that the plant's equipment and operators can be more responsive to changing conditions.

A Safer Work Environment

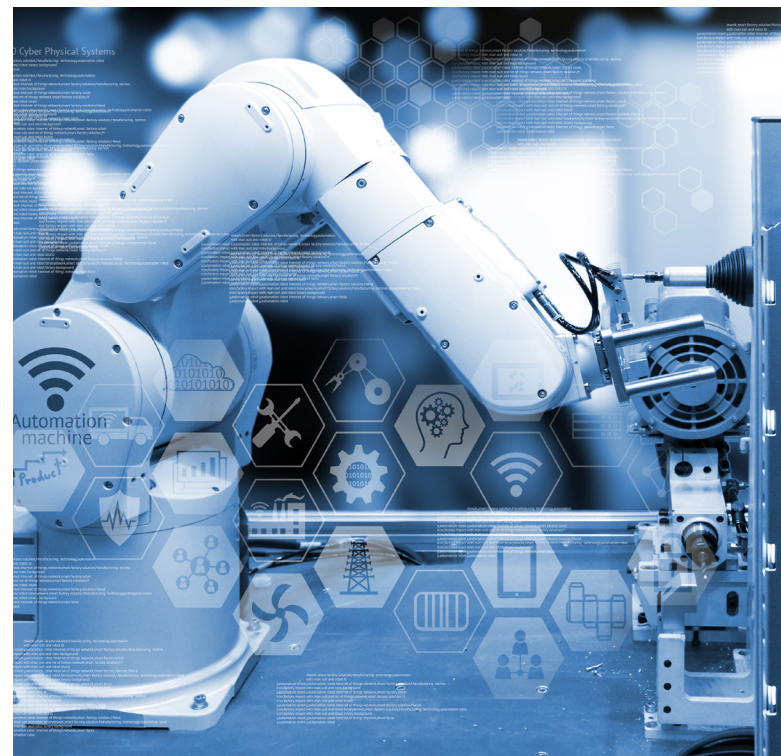
As part of the IT-OT network integration, production asset network addresses needed to be migrated to a new schema that was compatible with the corporate range defined by IT. To comply, engineers were readdressing every device on every production line, including safety devices. This required a significant amount of manual effort from the engineering team as they reviewed thousands of lines of logic to ensure that operators and assets remained safe.

After discussing with the engineering team, however, the CIC identified a workaround to avoid the risks associated with readdressing safety devices: A NAT gateway was placed between the OT network's backbone switches and the machine-level networks. This gateway allows IP address mapping between the network segments, even if the original addresses are used elsewhere in the network.

Remote Access to Critical Systems

For the first time, this Belden plant can access process water compressors and heating systems for full visibility and control from anywhere in the plant.

Employees can remotely monitor these critical systems to track performance, find and resolve issues early and adjust settings from anywhere. This enhances operational efficiency and reduces the need for troubleshooting and problem resolution to occur solely on the factory floor.





Belden personnel reviewing the dashboard to identify and diagnose machine drive performance issues in real-time

Education to Ensure Future Success

To help the plant's engineering team succeed at managing their network, the CIC created tailored training focused on the layout and devices and software in use. This provides an opportunity for the team to close skills gaps and learn to optimize their new system.

Consolidating to a single vendor and a few specific models also makes it easier for the team to maintain the network with minimal effort.

A Secured Network

Previously, the plant's IT and OT environments were separate, but they were run to the same desk—a computer sitting next to a computer. If the network jack was moved, separation wasn't always maintained.

With a new converged IT-OT network, connected devices are now properly managed and secured.

Impact & Results

An initiative seven years in the making, the network-performance improvements established by Belden have already generated a big payout for this industrial plant.

Nearly one-quarter of the total project spend was recouped within the first four months, and the payback period is expected to accelerate from there.

In addition, the plant **has improved OEE by 5%, resulting in expected yearly savings of \$735,000 CAD (or close to \$550,000 USD)**.

The time spent on deploying and commissioning new machinery is also expected **to drop by four to eight hours per machine**. When new assets are built, they're pre-commissioned with the correct IP addresses to enable a plug-and-play approach.

Faster Troubleshooting and Diagnosis

Problems that previously took weeks to pinpoint and diagnose now take a few hours. Using Hirschmann's Industrial HiVision network management software and the Belden Horizon™ platform, plant-wide production can now be monitored 24/7. In the event of a disconnection, engineers are notified right away about what's happening and which lines are impacted.

When a production line has an issue, operators no longer have to call a supervisor who creates a maintenance ticket. Instead, they simply push a button on their HMI to generate an automated maintenance ticket that simultaneously alerts a supervisor about the issue.

Automated Order Batching

All orders from the ERP are accessible to every production line. The operations team can view and access information about shop orders, product specs, material requirements and recipes.

When sales enters an order, it shows up in the system right away, eliminating the need to manually combine orders for batching. The system batches the order without manual intervention and pushes it to the correct machine. Runtime information can be adjusted based on recipes. This connectivity also facilitates innovations like automated material ordering for faster production.

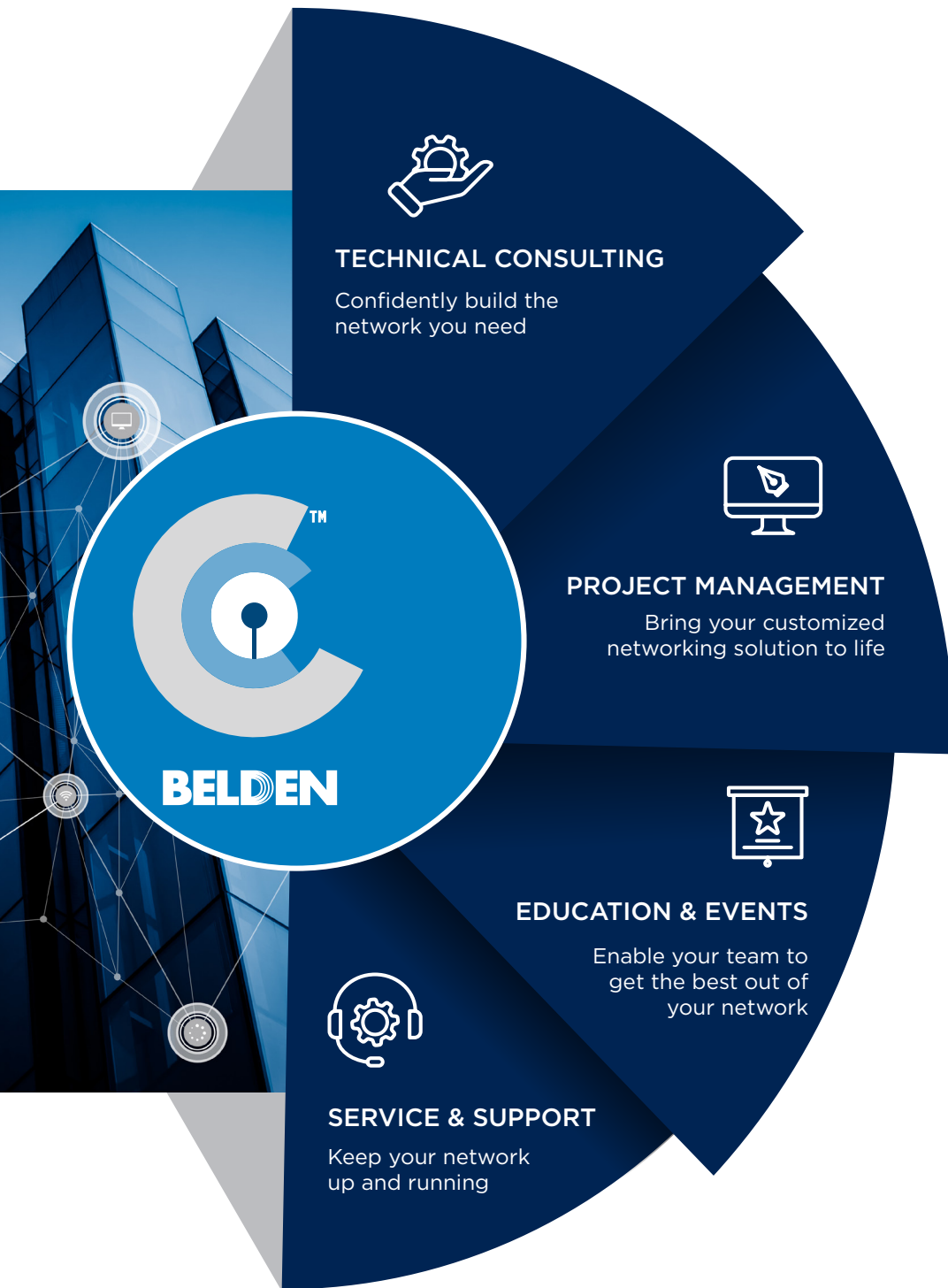
New Levels of Operational Visibility

A new network layout and enhanced connectivity provides Belden's engineering team—and other plant employees—visibility into the data they need. Operators can see their performance in real-time, engineers can monitor and optimize production processes, and the vice president of production can check in remotely to see how the plant is running.

If operators want to see new or different KPIs to gauge performance or evaluate the efficiency of a change, then the engineering team can make modifications within minutes. To encourage collaboration and discussion on the plant floor, a KPI dashboard is displayed on a large touchscreen for everyone to interact with as they walk by.

This newfound level of visibility enables the company to make top-to-bottom improvements. For example, a single operator was found to be running at 60% to 70% of the expected rate. After coaching, however, that number soared to an average of 95%. **This translates to an extra \$7,000 per shift for a single production line.** With these changes in place, Belden will continue to see improvements in performance that optimize time and costs.

“These solutions ensure that our customers aren't just receiving performance improvements today,” says Mike Fisher, solution architecture manager at Belden, “but are also set up for future success as technologies advance and unlock new possibilities.”



Belden Customer Innovation Centers: Breaking Down Barriers to Innovation

In today's fast-moving times, data and insights are more essential than ever. And with the convergence of OT and IT, organizations have an unprecedented opportunity to build the backbone required for operational success.

As experts, we know getting there isn't easy. This is where the Belden Customer Innovation Centers can help. As connectivity and networking experts, we're dedicated to helping customers accelerate the design and implementation of robust, reliable and secure networks to deliver the data and insights that drive better business performance.

Visit [belden.com/cic](https://www.belden.com/cic) to learn more.

About Belden

Belden Inc. delivers the infrastructure that makes the digital journey simpler, smarter and secure. We're moving beyond connectivity, from what we make to what we make possible through a performance-driven portfolio, forward-thinking expertise and purpose-built solutions. With a legacy of quality and reliability spanning 120-plus years, we have a strong foundation to continue building the future. We are headquartered in St. Louis and have manufacturing capabilities in North America, Europe, Asia, and Africa. For more information, visit us at www.belden.com; follow us on [Facebook](#), [LinkedIn](#) and [X/Twitter](#).