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Reference

Brewing bigger and better

The third-largest beer company in the U.S. achieves upgrade, expansion and operating goals ahead of schedule with SCALANCE solutions

Constellation Brands, Inc., is one of the world's largest manufacturers and marketers of spirits, wine, and beer. The plant capacity expanded 250 percent in three years. The solution: Deployment of a comprehensive, standardized network based on SCALANCE network components, assisted by Siemens Professional Services. Exceeding expectations, the plant released its first brew seven months ahead of schedule, with a standardized networking model.

Constellation Brands, Inc. (CBI) is among the world's top manufacturers and marketers of spirits, wine, and beer, operating in the U.S., Mexico, Canada, New Zealand, and Italy. As the third largest beer company in the U.S., its well-known beer lines, such as Corona, Modelo, and Pacifico, are among the nation's fastest-growing brands. But before 2013, CBI was strictly an importer, not a producer, and had never brewed a single bottle of beer. That year, the company agreed to acquire from Grupo Modelo its U.S. brand rights and massive Nava brewery in Mexico.

So, with the stroke of a pen, CBI found itself in the challenging world of large-scale beer brewing and bottling operations.

Since then, the Nava brewery has become the world's largest of its kind with an annual production capacity today of nearly 27.5 million hectoliters. Its operations cover 885 acres near Piedras Negras, Mexico, just a few miles from the U.S. border. Rail lines bring in raw materials, mostly rice, barley malt, and corn grits, where they are mixed with water.



In just two years, Constellation Brands, Inc. expanded the existing capacity of its Nava Brewery in Mexico by 250 percent, making it the world's largest brewery.

After brewing, sixteen packaging lines put the beer in bottles, cans, and kegs to be palletized and loaded back on trains that take them to market.

Expand plant capacity 250 percent

According to Manufacturing Systems Vice President Chris Renken, the Grupo Modelo Nava brewery and bottling operations were considered state-of-the-art when built in 2010. Under the terms of its acquisition, the operations had to be completely self-sufficient, run without any Grupo Modelo assistance, by June of 2016.

"What's more, based on the success of our brands in the U.S. we had to expand its annual production capacity from 8.5 to 20 million hectoliters in the same timeframe to meet anticipated market growth," he recalls. "We were coming into the business having only been an importer, never a producer, so we really had no corporate functions to speak of related to operating a brewery. But with such an aggressive timeline to get things done, we quickly assembled the engineering, finance, and legal teams we needed, then got to work. The project was 100 percent schedule-driven. Our mission statement was simple: "Get it done by June 2016."

As Renken describes it, the plant's expansion strategy was straightforward but hardly easy. Construction would happen alongside the existing plant operations, which had to continue during that time, to be followed by a series of carefully orchestrated integrations of key systems.

"As we were building the new plant expansion, we had to keep the existing brewery running, while making tie-ins to critical infrastructure such as water treatment systems, ammonia systems, power generation systems, everything," he says. "It was like doing heart surgery in just about every aspect of the brewery's operations for two years."

In addition to CBI having no engineering staff of its own, Renken says the plant's existing network standards did not provide the necessary segregation and availability required by best practices. "On top of that issue, the six packaging lines, all the laser-guided automated transport vehicles, and our high-density storage facilities operated on a single, flat Layer 2 network," Renken says. "So, anytime we had a broadcast storm on the network, or someone accidentally plugged in a loop, the entire packaging hall would be disrupted, with huge costs in lost production."

Deployment of a comprehensive, standardized network

For assistance, Renken engaged Siemens Professional Services for Industrial Networks, a team of skilled networking experts. "With our tight schedule, we didn't have time to do anything but bring in expertise familiar with both the challenges of securely and effectively linking operational technology and the best practices to address them," he says, noting that ultimately the plant's upgraded and expanded network would connect more than 4,000 production-related devices, plus 1,500 Siemens SINAMICS G120 drives.



In the plant's upgraded and expanded network more than 4,000 production-related devices, plus 1,500 Siemens SINAMIC G120 drives are connected.

“Siemens, with its proven track record in setting up hundreds of large-scale industrial networking projects, took the risk out of our choice,” Renken says. “We were confident they could help us design and deploy a standardized network model that could serve us with the Nava brewery and any future requirements we might have.” The Siemens team included a highly credentialed networking consultant and architect in the lead. Together with Renken, they assessed the plant’s current network landscape, then designed a target network model that would be secure, resilient, and redundant. The model would be deployed for three separate networks, each for a distinct plant operating function – brewing, packaging, and utilities – and operationally separate from the CBI enterprise network.

Secure, resilient network design

The new network design was optimized for automation, highly segmented with virtual local area networks (VLANs) for security and resiliency. Each of the three plant networks features separate control and operations networks on one-gigabit fiber rings over PROFINET industrial Ethernet using the High-speed Redundancy Protocol (HRP) to ensure network resiliency and availability.

Within those rings are three layers: A floor-level access network with SCALANCE XC-200 managed switches interconnects the plant’s Siemens SIMATIC S7-200, S7-300, and S7-400 PLCs, ET200SP remote I/O, and WinCC servers and HMIs. In turn, the rings connect via SCALANCE X307-3LD managed switches to a higher-level data distribution layer. These layers then connect to a core layer that uses a SCALANCE XM-408-8C Layer 3 managed switch to link securely to the CBI plant wide industrial core network.

Further safeguarding the OEMs’ connections were Industrial Security Appliances SCALANCE S with built-in firewalls. “The SCALANCE security modules was important to ensure that we could securely manage their VPN tunnel connections to their equipment for performance monitoring, condition-based maintenance, and remote diagnostics,” Renken points out.



A wireless network from Siemens is supporting the plant’s laser-guided vehicles (LGVs), with 78 of them operating in production and 48 in shipping.

Simplified network management

Network management is provided by Siemens SINEMA Server software, which is designed for sophisticated industrial applications such as the Nava brewery. With more than 200 switches and other network devices managed by it, the software provides full operating visibility of the plant’s networks with such features as automatic topology recognition, 24x7 network monitoring, and comprehensive diagnostics and reporting functions. Network diagnostics are integrated into the plant’s WinCC HMI/SCADA systems and can issue warnings and error messages via the integrated OPC interface. Event logs and alarms are captured for performance audits, too.

Upgraded LGV network

Another big project requirement was to upgrade the wireless network supporting the plant’s laser-guided vehicles (LGVs), with 78 of them operating in production and 48 in shipping. Together, the LGV fleet is the largest in the world’s food and beverage industry.

For this, a SCALANCE wireless network was deployed, using SCALANCE W770 and W780 access points on the LGVs communicating over the 5 GHz band to avoid interference issues. Previously, the LGV wireless network used the 2.4 GHz band, which conflicted with all kinds of other devices using that frequency, causing communication problems.

The SCALANCE W access points help guide the LGVs using WiFi. This enables them to communicate with their own traffic manager as well as the plant's manufacturing execution systems (MES), which assigns pick-up and delivery points. Siemens mobile scanners and HMIs offer floor workers with operating flexibility working around the LGVs.

Secure, resilient, and scalable network model

Exceeding expectations, the plant released its first brew seven months ahead of schedule, with a standardized networking model. Renken is quick to credit Siemens for its help in exceeding the aggressive timetable milestones mandated by CBI's acquisition of Grupo Modelo's brewery and brand assets. Among the achievements he considers most notable at the expanded 20-million-hectoliter Nava brewery are these:

- Completed its first brew six months ahead of schedule
- Passed its efficiency test (95+ percent) two months ahead of schedule
- Started up five new packaging lines on schedule, including one capable of processing 4,000 cans per minute
- Completed a 5-million hectoliter expansion ahead of schedule
- Trained an industrial networking team that is now self-sufficient

In addition, CBI's successful upgrade of the Nava brewery's acquired capacity and expansion validated the industrial network model standardized on common networking protocols and components from the Siemens SCALANCE portfolio. "We now have a secure, resilient, and scalable network model backed by Siemens that we can handle any further expansions, such as the 2.5-million hectoliter one that's now underway," Renken says.

"We are also able to apply the networking model and our new expertise at a 5-million-hectoliter greenfield brewery we're building in Mexicali and at another existing brewery in Obregon, Mexico. Having a proven standardized networking model to deploy will save us months in these build-outs compared to doing each one from scratch."

Security information

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept. For more information about industrial security, please visit <https://www.siemens.com/industrialsecurity>

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