ESC engineering

project brief

Modernization Brings Keg Line into New Millennium

A major American brewing company operates a facility in Colorado, which is regarded as a model of efficiency and leading-edge technology within the brewing industry. Many of the process best practices in use at all of the company's breweries nationwide were designed and tested at the Colorado facility. Therefore, when the time came to update the aging control system for the draft keg line racker, the Colorado brewing company operations were selected as the proving ground.

SUMMARY:

Packaging Control System Optimization

GOALS:

- Replace obsolete and limited controls
- Enhance flexibility for future package additions
- Improve diagnostics and troubleshooting
- Improve visualization and reporting functionality

SYSTEM COMPONENTS:

- Distributed Programmable Logic Controller (PLC)
- Human Machine Interface (HMI)

HIGHLIGHTS:

- Successful upgrade with minimal downtime
- Improved operations and maintenance

APPLICATION:

The Colorado plant produces a wide range of brands, a portion of which is shipped out in draft kegs. The keg line racker consists of eight independent, parallel lanes, arranged in pairs. The racker lanes interface with in-feed and discharge conveyors, automatically detecting when to accept new kegs and discharge completed kegs.

In 2000, the brewing company approached ESC engineering to replace the control system for the existing draft keg line single-valve keg (SVK) racker. ESC engineering found that the control system was outdated and inflexible, preventing optimal line production. Because the Colorado plant was originally designed to accommodate 1/2- and 1/4-barrel kegs, it did not include package-specific operational parameters and controls for the newer 1/6-barrel keg size. While the line was capable of handling the 1/6-barrel package, inflexible system parameters led to an unacceptably high rate of "false rejects."

Furthermore, because the control system was proprietary, a single individual—rather than plant staff—was responsible for modifications and support, creating a potential risk to brewery operations.

ESC engineering advised the brewing company to utilize standard programmable logic controller (PLC) systems already in use elsewhere in the plant. ESC engineering also recommended a human machine interface (HMI) to provide a system format consistent with the rest of the packaging floor.

REQUIREMENTS:

- Replace obsolete controls with technology supportable by plant technicians.
- Increase system flexibility to accommodate changes in packaging requirements.
- Add diagnostics to implement intelligent troubleshooting on the line, by line operators.
- Increase overall line capacity by reducing rejects and improving overall efficiency.
- Utilize the company's existing equipment and software to implement the improvements.

CHALLENGE:

Due to the substantial re-wiring, new wiring and demolition required, ESC engineering was challenged to overcome many physical obstacles to complete the project on time. With just a five-day outage window allowed for system construction, start-up and commissioning, an efficient modernization process was imperative.

Unlike can or bottle lines, keg production depends heavily on strict process, timing and sequence to maintain process integrity. As part of the modernization, ESC engineering was asked to improve line security by implementing a system "lock down" to prevent unauthorized or unintentional changes to the operational parameters.

Modernization Brings Keg Line into New Millennium

SOLUTION:

ESC engineering's approach satisfied all requirements of the initial project abstract and subsequent meetings. In addition, the solution relied exclusively on components already in use within the brewery's system.

ESC engineering designed a modular system in which each pair of lanes would have a dedicated processor and local I/O, as well as a supervisor PLC to coordinate the overall racker operation. ESC engineering fit each pair with identical PLC programs, making it easier to check, maintain and troubleshoot lanes independently.

This design was based on Rockwell Automation's Allen-Bradley SLC-500 product line, specifically the 5/05 model, which was used to allow communications via Ethernet. The supervisor PLC at the Colorado facility handles all coordination between the racker and the other systems on the line, such as the conveying systems and weighing system. The supervisor and lane PLCs communicate using data message instructions to exchange information for operational parameters and monitoring information for the HMI.

The HMI solution was Intellution FIX32, which was the standard approach in the packaging side of the facility. In addition to communicating operational parameters with the supervisor PLC, the HMI also communicates directly with each of the lane PLCs to acquire current monitoring conditions. The HMI's comprehensive set of screens provides operators with a detailed view of racker operations. The HMI supplies emergent alarm information to the brewery's existing alarm application as well. ESC engineering also created custom diagnostic and help screens that provide additional assistance and detail to both operations and maintenance personnel.

To meet the tight outage schedule, ESC engineering proposed that a full modernization simulation be executed during the acceptance process at the panel fabrication facility. The original racker manufacturer provided a simulator to rehearse every step of the optimization. ESC engineering used the simulator to test each normal process as well as every alarm and fault condition, allowing the racker controls to be thoroughly verified prior to production outage.

RESULTS:

Three days of the five-day outage were devoted to construction, while two were spent on start-up and commissioning.

Thanks to the simulation, very few problems were encountered during start-up. In addition to adding operational parameters for the 1/6-barrel package, ESC engineering was able to slightly improve the processing time of each lane, resulting in more efficient processing and fewer false rejects. Finally, when problems did arise, the new diagnostics and help features allowed plant staff to resolve them more quickly.

By minimizing outage time, ESC was able to deliver results with less impact to plant operations and production capacity. Furthermore, the original goals of modernization were not only met but surpassed as a result of ESC's elegant redesign.

FOLLOW-UP:

In the years following the successful conversion of the keg line, ESC engineering has undertaken and completed a number of other conversions and additions.

In 2006 ESC engineering completed a comprehensive upgrade of the Colorado facility's SVK Detergent Set, a system used in keg cleaning. In spite of the difficulties posed by altitude, this successful upgrade was accomplished using Allen-Bradley ControlLogix components and has resulted in greatly improved temperature control.

ESC engineering's other upgrades to the Colorado facility include:

- adding a robotic depalletizer for the 1/6-barrel kegs
- converting the conveying system from PLC-2 to PLC-5
- improving the 1/6-barrel keg palletizer
- integrating the keg line into the company's MES architecture (planning and scheduling)

ESC engineering has successfully performed SVK racker upgrades at four other breweries using ControlLogix, which has become the new standard.

ESC engineering is also slated to perform the upgrade on an additional three to four breweries. Further SVK line upgrades are also being considered along with the racker upgrades.

ESC engineering

For more information, contact: Kevin Hartig, Project Manager
Email: controls@thinkesc.com
3540 JFK Parkway | Fort Collins, CO 80525 | Phone: (970) 224-9100
Toll-Free: (877) 224-9101 | Fax:(970) 224-9137 | **www.thinkESC.com**