A 60-Hour DCS Migration

Author: Automation World

In Hennepin, Ill., Marquis Energy operates the largest dry-mill ethanol facility in the U.S.—with a production capacity exceeding 300 million gallons per year. Management at the plant recognized the need to upgrade its aging APACS+ DCS legacy system and wanted to integrate control of a second 150+ million-gallon unit they were constructing into this migration project. The company wanted to have both units operating on the same system to leverage the advanced control strategies offered by a new DCS.

Considering that Marquis had been happy with the APACS+ DCS they had been running for years, the company chose to upgrade to a Siemens Simatic PCS 7 system. Siemens acquired Moore Products Company, the supplier of APACS+ technology, in 2000.

There was just one catch to this upgrade project: To avoid losing thousands of dollars a day in income, Marquis Energy wanted to migrate to the new system during a planned facility shutdown over a weekend.

That's where Trident Automation enters the picture. As an industrial professional services company, Trident supports an array of automation products, including Siemens PCS 7 DCS, Siemens APACS+ OS, Profibus DP and PA, AS-interface and HART fieldbuses. They also have a great deal of experience in the ethanol industry.

Jason D. Hurst, principal and controls engineer at Trident Automation, says the company provides engineering services to 122 ethanol plants, has experience migrating 35 ethanol plants to Siemens APACS+ OS, and has performed full DCS replacements at four ethanol plants as well as creating virtualized DCS environments for ethanol plants.

This depth of experience placed Trident Automation in a good position for the Marquis Energy DCS upgrade considering the project requirements included:

- Completion of the DCS replacement within 60 hours;
- Run the DCS on a virtualized environment because of the facility's small server room and overall server room design;
- Remove the legacy advanced process control and implement Siemens model-predictive control. This was a key reason for the upgrade, said Hurst. "After all, you don't buy a new DCS to mirror an old DCS; you buy it for new technology capabilities." He added that Trident Automation has deployed four MPC ethanol applications: slurry solids, drying, syrup and distillation.
- Secure access to the new DCS;
- Use UL listed enclosures and panels;
- Remove and rewrite all code conforming to Advanced Process Library standard; and
- Install and configure the system with certified PCS 7 engineers.

"Our first steps, once the plant was shut down, were to remove all the existing servers and install Siemens Simatic Virtualization as a Service (SiVaas) virtual machines (VM), label all third-party Ethernet products, and reconfigure the process and energy control rooms."

Implementation Hours

Describing the implementation, Hurst said the initial 10 hours of the project were focused on the server room. "Our first steps, once the plant was shut down, were to remove all the existing servers and install Siemens Simatic Virtualization as a Service (SiVaas) virtual machines (VM), label all third-party Ethernet products, and reconfigure the process and energy control rooms."

As this process got underway, other members of the Trident Automation team focused on upgrading the motor control centers (MCCs) for the processing, fermentation, energy and water treatment operations, which were located all around the facility. "This process was completed by hour 25 of the upgrade process even though it involved going through all the control cabinets around the facility and rewiring some 3,700 analog I/O points[RC1][TA(PPAM2)]," said Hurst.

By hour 55, Trident Automation finished loop checks of the analog I/O and had completed initial training of the operators. Hurst noted that Trident Automation remained on site for several days after startup to provide ongoing support.

Trident Automation was able to handle this massive amount of I/O rewiring because "we had labeled every wire and built rails in advance for the analog I/O conversion," said Hurst. "With this upfront work, the wires just needed to be strung in on site."

He added that, for the digital I/O, Trident Automation saved about 90 hours of time on site by making the facility's DO and DI cables in advance.

Another four hours of time were saved from on-site working time by using Siemens SiVaaS VM to configure the DCS network in advance. "With the advance work done on SiVaaS, we were able to configure all the thin clients and servers on site in one day," said Hurst. "The full SiVaaS package comes with two VM host servers that are pre-configured, so you only have to load in your information."

Using SiVaaS VMs allows for the control of both plants from any thin client, explained Hurst.

In total, Trident Automation performed 12 weeks of work in advance to complete the rip-and-replace project in less than 60 hours on site. "Trident teams rewrote code, reconfigured logic, created new graphics, pre-assembled and tested thousands of connections, cables and components offsite at our headquarters," said Hurst. "Pre-labeling of I/O, organizing connections and utilizing our innovative cabling solution helped the teams eliminate days of downtime."

Trident's custom cabling was a major factor in the speed in the upgrade, Hurst said, because they were built around the facility's existing field terminations—meaning that no adaptations had to be made in the field.

Process Trends

Because Marquis Energy had long used Wonderware historian trends and HMI to guide operations, Trident Automation adapted the Siemens Simatic PCS 7 APACS+ OS HMI interface to be "very Wonderware-like in appearance" to ease operators' transition to the new system. "The new trend interface shows current selected trends and time at the LL (lower limit) and UL (upper limit)," said Hurst. "Dropdown menus allow operators to quickly adjust the time, change to any trend or select a different trend. In the new system, operators can also configure HMI trends. We also inserted a keypad to input numbers on HMI interface based on Marquis operator preferences."

This process of maintaining a familiar interface but eliminating a legacy system, enabled Trident Automation to remove an entire server rack— a critical aspect of the project considering that the facility's server room was, as Hurst put it "not particularly large or well-designed for housing many servers."

The resulting upgrades provided significantly more efficient operation for the facility and operators are able to easily and quickly identify the key parameters to run the facility effectively. Marquis Energy management says they installed a system that was easy to use but scalable to provide for long-term capacity and growth with a partner who could be trusted for responsive service on-demand.