CURTISS-WRIGHT

Curtiss-Wright Expedites Digital Upgrade Project During COVID Shutdown

Remote monitoring, virtualization, and emulation technology streamline plant process computer (PPC) upgrade at large midwestern utility

Organization: A utility in the Midwestern United States

Challenge: A large Midwestern utility sought to upgrade its legacy plant process computer system to a modern, digital alternative. The project was scheduled to take place during the nationwide COVID-19 shutdown, which presented an unique set of challenges.

Solution: Curtiss-Wright utilized remote monitoring, virtualization, and emulation technology to support the utility throughout project implementation.

Results: The utility completed the PPC upgrade project successfully and on schedule while maintaining rigorous safety protocols.

When a large Midwestern utility decided to retire its legacy plant process computer (PPC) system in favor of a modern digital alternative, the project stakeholders at the plant turned to Curtiss-Wright for guidance. Due to rigorous safety protocols necessitated by the nationwide COVID-19 shutdown, completing the project required an extra measure of planning, project management, and ingenuity. Curtiss-Wright established robust processes and procedures to collaborate with the client, ensure safe interactions, and keep this important digital upgrade project on track.

Digital upgrades require substantial human interaction during planning, development, testing, and support. Despite social distancing parameters and restrictions on travel and site visits, the Curtiss-Wright team maintained high operational efficiency throughout the project—reducing paperwork for the utility's security department and minimizing the need for plant personnel to receive and escort visitors.

"We instituted many advanced protocols to configure the hardware and software, perform factory acceptance testing, and offer ongoing support for this client throughout the COVID lockdown period," says Tony Wade, a technical director with Curtiss-Wright's Plant Information, Monitoring, and Control group in Idaho Fall, Idaho. "Some of these methods will likely become best practices for similar PPC installations in the future."

For example, video conferencing procedures allowed the midwestern utility company to collaborate with Curtiss-Wright throughout the testing period, and to conduct many tests remotely. Control room simulators—full-scale replicas of the actual control rooms—allowed the team to mimic the plant's hardware and software systems.

"If the client ran into a problem with a particular component, setting, or configuration issue, we could often handle it remotely via video conferencing sessions," Wade continues. "These virtual meetings and shared software environments allowed us to monitor the overall health status of the system, as well as to quickly identify and resolve issues. That was a game changer for us, since it will determine how we undertake similar projects in the future."

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INSTALLING MODERN DIGITAL CONTROL SYSTEMS

Plant Process Computer systems play a vital role in sustaining the safe and reliable operation of nuclear power plants. PPC systems collect data from across the plant's operations, process the data into vital information, and display the information for plant personnel to continuously monitor and diagnose performance. Curtiss-Wright has over 35 years of experience supplying PPC systems with more than 60 installations worldwide.

Each PPC system consists of data acquisition and presentation layer components, with configurable, reusable software programs for monitoring plant performance. A typical installation includes four primary elements:

- An I/O system that collects data from up to 10,000 analog and 10,000 digital data points
- A redundant communication network and server environment (including cybersecurity components)
- A set of large-format displays, workstations, and peripheral devices
- Nuclear software applications that execute on the digital platform

Optional supporting systems include a simulator, annunciator, radiation monitoring system, and other digital gear, depending on the specific needs of each plant.

TIGHTER SOCIAL PROTOCOLS, SAFER WORK PRACTICES

All PPC components require hands-on development, integration, and testing throughout the implementation period, which became progressively more complicated during the pandemic as social interactions became more stringent. To provision and configure these components while maintaining COVID safety standards, Curtiss-Wright relied on web cameras, emulators, and remote viewing methods to maintain consistent communications with key members of the utility's onsite team.

Curtiss-Wright divided the workstream into sections so that people could maintain social distance by working at different tables. A carefully synchronized schedule allowed multiple tasks to proceed in parallel, keeping the project on track.

For example, vintage serial terminals, which periodically scrolled out information via rudimentary graphics, were replaced with modern Microsoft Windows 10 workstations.

The plant's engineering and operations team also developed a new graphical interface, in which real-time diagnostic data is displayed through multiple overhead monitors and workstations. Plant personnel communicate with external systems via a MODBUS TCP interface that allows them to examine data on the PPCs directly.

Meanwhile, another section worked on data acquisition components, a second focused on safety related isolators, while a third section configured new plant process computers. Another team established interfaces between the public side server (PSS), a transformer management system, and an OSIsoft PI data historian system. Remote monitoring and testing procedures simplified the configuration of all hardware, peripherals, and logic controllers.

"Curtiss-Wright made it easy for us to work with them during the COVID shutdown," reported a senior engineer in the plant's instrument and controls division, who has participated in multiple PPC system upgrades. "They followed all COVID safety protocols, yet we did not lose time because of the virus. When they could not be on-site, their remote support went well."

"Curtiss-Wright's testing methodology was excellent, especially in light of having to complete tasks in non-standard ways. They quickly adapted, evolved, and solved problems related to COVID to ensure we could complete the project on schedule."

REMOTE MONITORING AND TROUBLESHOOTING

Anchored by meetings conducted over the Microsoft Teams video conferencing service, engineers were able to remotely monitor and troubleshoot issues within each section. Whether there was an issue with a leading edge flow meter or a safety relief valve, the Curtiss-Wright team could remotely view the problem and guide onsite personnel to resolve the issue—clear down to where to click on a display screen and how to bring up related displays to gauge the status of links, programs, data acquisition procedures, and so forth. Using these remote procedures, Curtiss-Wright personnel could suggest which system messages to search on to trace an issue to a particular project or modification, such as to isolate an issue to a certain modification at a certain date and time.

For example, an issue arose during site acceptance testing that required the plant's IT team to isolate a communications problem within a key piece of computer networking gear. By interfacing with their onsite networking experts, Curtiss-Wright could determine which communications were getting through and which were being blocked, clear down to what type of data packets were traveling through these network links.

"At first we didn't know what the problem was," Wade recalls. "Was it related to a server configuration issue on the plant process computer, or did it concern a public-side server—or perhaps a data diode located between the two?"

Thanks to the remote testing and troubleshooting setup, Curtiss-Wright was able to easily interface with the plant's networking experts, see all the key variables, and advise them on what to look for to quickly resolve the problem.

"Curtiss-Wright's testing methodology was excellent, especially in light of having to complete tasks in non-standard ways," the plant engineer sums up. "They quickly adapted, evolved, and solved problems related to COVID to ensure we could complete the project on schedule."

EXTENDING BEST PRACTICES TO OTHER ENGAGEMENTS

These same procedures developed for factory acceptance testing were also helpful during staff training, and today are used to streamline ongoing support. These methods are now being promoted at other plants, giving rise to a new set of best practices for high-level oversight and interaction with remote teams. With or without the impetus of a pandemic or other lockdown, these remote communications and advanced safety procedures will help Curtiss-Wright expedite all types of complex projects, from resolving computer issues to calibrating temperature sensors.

"We're going to be traveling less and using a lot more of these technologies to guide remote development, testing, and support," Wade concludes. "Instead of jumping on a plane to visit a client location, we can connect online in a matter of minutes. This will allow us to reduce staff travel, which ultimately lowers costs for clients."

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