

Case Study

Total Performs Stepwise Migration of Legacy DCS to Experion® PKS



“Thanks to a comprehensive control system migration strategy, including hot cutover to a new automation platform, Total’s Port Arthur refinery is successfully upgrading its legacy DCS to the latest Experion PKS technology.”

- Randy Conley, Supervisor DCS/SIS/APC Implementation, Total

Background

Total S.A. is a multinational integrated oil and gas company. Its businesses cover the entire oil and gas chain, from crude oil and natural gas exploration and production to power generation, transportation, refining, and petroleum product marketing and trading. Total is also a large-scale chemicals manufacturer.

Headquartered in Houston, Texas, Total Petrochemicals & Refining USA, Inc. is a major producer of polypropylene, polystyrene, styrene, base chemicals and polyethylene.

Total’s Port Arthur Refinery began life in the early 1900s as an oil terminal for Spindletop. It’s been a refinery since 1936 and now has a capacity of 174,000 barrels per day (174 MBPD) of transportation fuels. The refinery processes a mixture of crudes with conversion capabilities centering on coking, fluid catalytic cracking unit (FCCU) and reforming technologies. It is capable of exchanging feedstock and utilities with an adjacent naphtha steam cracker—a joint venture between Total and BASF.



Total Petrochemicals & Refining’s Port Arthur, Texas, refinery.

Benefits

Thanks to a comprehensive strategy for distributed control system (DCS) migration, Total has been able to extend its existing automaton assets while upgrading legacy TDC 2000 control systems to Honeywell’s Experion® Process Knowledge System (PKS) technology. Experion is an open system designed to enable improved plant operations, increased incident avoidance, better decision-making, and enhanced workflows.

The new open automation architecture at the Port Arthur refinery allows multiple Experion systems, installed on different operating units, to communicate, exchange data and work together seamlessly. Plant personnel can connect directly to information and control networks, providing full and immediate access to critical data. Experion systems are easily integrated with human-machine interfaces (HMIs) throughout the facility, and communicate with all process-connected controllers and network modules.

Challenges

Like other petroleum refiners, Total faces increased global competition—requiring continual improvement of its process automation technology. The company has been modernizing the TDC 2000 systems in Port Arthur since 2005. The systems originally installed between 1982 and 1992 were at over-capacity; 18,000 active I/O were on eight data Hiways and unit segregation had been lost.

However, before starting its modernization effort, the project execution team was faced with obtaining corporate approval for the DCS migration. This involved talking to high-level

management and making the case for how updated control solutions would benefit the refinery's bottom line.

During periods of normal operation, process industry facilities are reluctant to schedule shutdowns for non-critical maintenance or replacement of automation equipment. For this reason, it is often necessary to execute control system migrations via a "hot cutover," which involves moving one control loop at a time to the new system, while the unit operates on stream, in order to eliminate production losses.

Solution

Total management undertook a major refinery expansion, known as the Deep Conversion Project (DCP), which added 12,000 I/O and two new operator consoles in Greenfield units. The expansion also included nine latest-generation DCS controllers throughout Brownfield process areas.

Total worked with Honeywell Process Solutions to provide console operators with the ability to transparently interact with different generations of DCS systems. A total of 45 legacy consoles were replaced in the refinery's central control and local control rooms, and approximately 400 existing operator graphics were migrated to the current DCS. The facility's two legacy control communication networks were divided into four networks, and a fault-tolerant Ethernet backbone was installed refinery-wide.

For the DCS migration, the project execution team was divided into three full-time roles: project architect, and DCS and SIS project managers. Other team members were temporarily reassigned from their regular jobs as needed. The refinery also enlisted a configuration/graphics specialist to round out the participants. Plant personnel were intimately involved in designing and implementing the system they would later use.

For More Information

To learn more about how Honeywell's solutions support operational excellence, visit our website www.honeywellprocess.com/software or contact your Honeywell account manager.

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Total's stepwise DCS migration involved eight steps, one per data Hiway, prioritized according to capacity, equipment age and maintenance history. The original schedule was to begin a new step every 12 months to distribute capital commitments and comply with product end-of-support dates.

Since refinery outage dates could not be guaranteed, the project execution team adopted a philosophy of hot cutover at the junction box. Done one loop at a time, this approach minimized the risk of upset, eased operator transition, and decoupled the project from operations.

The guidelines for determining cutover order included going from the back to the front of the unit and from simple to complex loops. If the next step included an HMI upgrade, engineers tried to cut over all points on a graphic before moving to the next one.

Total used two outside hot cutover (HCO) teams—one doing the current cutover, and one planning the next—each with a systems hardware specialist, as well as two contract and one Total instrument technician. A construction coordinator directed outside activities and a DCS systems administrator directed the control room team, which included an extra console operator, two contract configuration specialists, and two automation contractor engineers. The teams were scheduled for four 10-hour days each week and achieved approximately 35 points per day.

Total found that its operations staff had a key role in the project's success. From cable tray routing and enclosure locations to cutover order and risk analysis, they were essential to everything around the hot cutover.

Project team members logged all discrepancies (e.g., loop sheet errors, range changes, questionable configurations, graphic errors), addressed high-priority issues immediately using an expedited management of change (MOC) process, and handed off other issues to process support engineering for follow-up.

The Port Arthur refinery will use discoveries from its ongoing migration work to improve performance on subsequent steps so previous lessons don't have to be relearned.

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