MARATHON PETROLEUM AND HONEYWELL ELIMINATE OBSOLETE EQUIPMENT WHILE UPGRADING TO MODERN TECHNOLOGY

Case Study
**OVERVIEW**

Industrial organizations are under pressure to reduce costs, improve performance and address aging infrastructure, which threatens production uptime. They are also dealing with increasing control system support challenges. It is critical to avoid obsolescence by upgrading to the latest technology.

**BACKGROUND**

Today, plant operating companies need to maintain safe and reliable controls while modernizing and evolving with the most advanced technologies. They must keep established, reliable systems running longer, increase uptime and preserve investments in hardware and network infrastructure.

The specific challenges facing industrial companies include:

- Aging plant workforce
- Cost of maintaining and acquiring obsolete hardware
- Missed profit opportunity
- Uncertain economics
- Risk of change

Like other process industry firms, Marathon Petroleum is seeking to extend the life of its critical plant automation assets. Marathon operates the nation’s largest refining system. The company’s refineries are integrated with each other via pipelines, terminals and barges to maximize operating efficiency.

For Marathon, having a comprehensive plan to modernize control networks in a low-risk, reliable manner is key to achieving its business objectives and, in turn, protecting its legacy installed base. Coaxial communications in all industrial market sectors is being replaced with Ethernet. The Local Control Network (LCN) is no exception, and phase-out is planned for 2025.

**SOLUTION**

Marathon’s strategy for moving to the ELCN/EHPM solutions resulted from meetings with Honeywell migration specialists. Previously, Marathon had conducted a Distributed Control System (DCS) upgrade at one of its oil movements facilities. This facility had 55 LCN nodes and was seeking to install 13 additional nodes in its system without splitting the control network or implementing gateway devices.

**CHALLENGES**

Marathon Petroleum is taking a proactive approach to keep its process control systems and networks up to date. It realizes the risks associated with technology obsolescence and strives to ensure plant equipment is as current as economically feasible.

Cybersecurity is particularly important to Marathon’s refining operations. While a cyber incident on an Information Technology (IT) network can mean the loss of confidentiality and data, the same intrusion or attack on a process application can mean a loss of control, damage to assets and risks to the health of personnel or the community.

**IMPROVE LIFECYCLE MANAGEMENT**

Marathon recently undertook technology upgrades on a reformer and aromatics processing units of the 585,000 bpd Galveston Bay refinery in Texas City, Texas. One of its goals was to optimize overall automation lifecycle management capabilities. In particular, the company sought to replace existing coaxial cabling with modern Fault Tolerant Ethernet (FTE) technology as a first step in eliminating obsolete Operational Technology (OT) assets.

**TACKLE HARDWARE OBSOLESCENCE**

The modernization project also involved replacing legacy Logic Managers within two plant operating units. This provided an opportunity to upgrade the control architecture by implementing the Honeywell Enhanced High Performance Process Manager (EHPM) and Experion® Local Control Network (ELCN) solutions and installing C300 controllers. Refinery engineers wanted to move control information off the outdated Logic Managers to the EHPMs and C300s.
In this case, ELCN technology was seen as a low-risk, easily managed solution, which would allow site engineers to add nodes without having to extend or separate the LCN. The use of ELCN would also reduce the amount of troubleshooting needed with existing coaxial cabling while updating the installation to Ethernet.

**IMPLEMENT MODERN TECHNOLOGY**

From Marathon’s perspective, the robustness of an FTE network was a major incentive to move from coaxial cabling. FTE has a long track record of reliability in critical process industry environments. The solution does not require purpose-built network switches as it uses commercial, off-the-shelf technology. FTE is simpler to operate and manage since it allows seamless connection to non-FTE Ethernet nodes and online addition/removal of nodes.

At the same time, modernization would allow for the expanded use of virtualization, which can reduce system lifecycle management costs via non-disruptive computer hardware upgrades, simplified maintenance and provisioning of control system computer nodes, more efficient upgrades, greatly reduced physical node count, and increased system availability.

**ESTABLISH A COLLABORATIVE ENVIRONMENT**

Execution of the Marathon controls migration presented numerous challenges in terms of communication and coordination amongst Honeywell and Marathon project team members. One of the challenges to overcome after the project kick-off meeting was selecting an effective Honeywell project manager and lead engineer with the organizational skills and technical knowledge necessary to enable the group to overcome various scheduling and technical hurdles and achieve the desired outcome.

The joint Marathon and Honeywell team gained several valuable insights during their technology upgrade. For example, they discovered it was not necessary to perform the ELCN and EHPM implementations in tandem during the online migration process. The EHPM work could be completed upfront without the need to integrate the ELCN-related activities, such as replacing computers, ordering new hardware, installing software, etc.

The close cooperation that developed between the project team members also resulted in a host of shared learnings. For example, performing the Factory Acceptance Test (FAT) turned out to be extremely informative because it uncovered a surprising amount of pre-work tasks and licensing required prior to implementation. Information was also readily passed between the Honeywell specialists and Marathon technical resources during the migration stages. This approach provided significant opportunities for learning and resulted in improvement ideas to avoid migration problems as the work progressed.

Furthermore, there were regular reviews conducted between the teams and it was determined that having a front-end loading (FEL) study up front and key resource engagements as part of the planning process will help in preventing cost overruns in future projects.

**RESULTS**

Industry feedback has shown that a well-planned and executed control system modernization can not only improve plant asset availability and reliability but can also enhance business performance and flexibility.

For Marathon Petroleum, the move to a modern, FTE-based infrastructure eased the knowledge requirements for preventative maintenance of coaxial and LCNP technology. This was particularly important in view of the loss of institutional knowledge with today’s retiring workforce. Marathon was able to migrate its installation to up-to-date switching and Ethernet technology, which makes it easier to support the company’s OT networks without having to enlist proprietary expertise.

In addition, the ELCN software was already familiar to plant workers, and deployment of this solution made it possible to eliminate a significant amount of cabinetry and LCN extensions that were no longer needed with the new infrastructure. The use of compact NIMs with the ELCN reduced the demand for cabinet space, and further cost savings were realized by no longer having to acquire expensive LCNP4 boards.

Implementation of the EHPM solution minimized NIM loads on the control network from 1,200–1,300 parameters per second to approximately 400–500 parameters per second. Conversely, peer-to-peer communications between C300 controllers and the EHPMs reduced the reliance on servers for data transfer and minimized noise and interference on the network.

Marathon expects the streamlined migration approach with ELCN and EHPM to have an impact on its Operations Performance Management (OPM) and lifecycle costs in the future. The corresponding use of virtualization will have an even bigger effect on upgrade and maintenance costs for control equipment in the future.
SUMMARY
As Marathon Petroleum’s experience demonstrates, control technology migration offers key advantages when conceived and executed correctly. The tools available for migrating, the experience of the engineers, their strategy for the project, and the expertise of those involved will play a major role in determining how smoothly an online migration is implemented while minimizing risks to operations.

Detailed planning in the initial stages of a migration, along with the assurance of a dedicated and consistent team of technology experts, are crucial factors for success. It is important to ensure all project team members have adequate knowledge of existing and upgraded systems, and that the implementation of modern automation solutions is optimized for both cost and schedule.

Figure 4. FTE technology eliminates the knowledge requirements for preventative maintenance of coaxial cable installations.