Shell Pernis modernises truck-loading facility with the help of Vopak Logistics

Significant improvement in terminal efficiency claimed

In order to meet its own stringent environmental and safety goals, Shell Pernis – one of the largest and most modern refinery and chemical complexes in Western Europe -decided to replace one of its existing, elderly tanker loading facilities with a state-of-the-art gantry type loading system.

The new loading facility was constructed by Royal Vopak's Logistics Services arm. The independent terminal operator's logistics services group has become well known for e-commerce and supply chain management initiatives.

In turn, Vopak chose Emerson Process Management to provide the advanced automation and controls for the new facility, a critical aspect of the design and also for ongoing maintenance of the plant's automation system. The contract with Emerson carries penalties, which kick in if the availability of the equipment falls below 99.7%.

To support the long term optimisation of this new asset, Emerson provided a blend of technology, expertise and work processes. These include the application of PlantWeb digital plant architecture along with a SmartProcess® terminal management solution (TMS) and PlantWeb services, including preventive maintenance.

The new solution has virtually eliminated the release of hydrocarbon solvent vapour into the environment and has dramatically reduced energy costs. It has also enabled efficiencies to be made in tanker loading by shortening truck turnaround times and decreasing operational costs by about 20%.

> "We gave ownership to vendors, all of whom were selected with regard to their recognised leadership positions in particular fields"
>
> **Gert Jan Krispijn, site manager for Vopak Logistic Services at Shell-Pernis**

Business model

Vopak was given the freedom to re-engineer all aspects of the loading process to minimise truck waits and assure loading equipment reliability. One of the company's main strategies for the plant was to sign a build-own-operate-maintain contract, which meant employing key suppliers to design, building and maintain the facility.

"We gave ownership to vendors, all of whom were selected with regard to their recognised leadership positions in particular fields," commented Gert Jan Krispijn, site manager for Vopak Logistic Services at Shell-Pernis. "We're convinced it's better to make a single provider responsible for automation and controls; we have only one point of contact and only one platform to deal with. No finger pointing between different suppliers can occur.

"Emerson was chosen because it specialises in process automation, is well regarded worldwide, and offers in-depth local knowledge of gantry loading systems." Krispijn continued. "We expect Emerson to view the Vopak facility as if it were their own. We don't have a maintenance crew on site as it's more cost effective to assign Emerson responsibility for all maintenance and support."

Emerson provided a total solution, including design, development, configuration, acceptance testing, delivery, installation, operator training, calibration, tuning, startup, ongoing maintenance/ repair/replacement, asset management tracking and safety procedures.

Turnaround times

Previously, Shell guaranteed a three-hour truck turnaround time at the refinery, which included site access and the preparation of documents. Vopak now guarantees a turnaround time of less than two hours, excluding the time taken for the driver to report in advance.

There were several key elements which enabled these improvements to be made – slot planning to reduce waiting time before entering the gantry; the location of the gantry outside of the Shell facility to eliminate manual site access procedures; pre-processing of load plans to reduce unproductive delays; and finally a guarantee of 99.7% terminal availability to minimise unexpected delays.

Emerson was able to guarantee this high availability as it was made responsible for the total automation solution and could take full advantage of the predictive and on-line diagnostics capabilities of the PlantWeb architecture.

The company's SmartProcess TMS (terminal management solution) with the Autoload application was chosen to manage terminal operations. It has been fully

Site location of the new loading facilities

integrated into Shell's existing automation and business system. Sales orders, product quality and availability information is imported from Shell's SAP R/3 enterprise resource planning (ERP) system, as well as from the tank farm distributed control system.

Customers place their orders electronically to the Shell SAP system, which downloads the order to the gantry automation system and sends a transportation request to the haulier. Following the request, the haulier's route planners are able to define a pick-up date and time for the orders via the internet by using a slot booking facility within the gantry automation system. They also process the preliminary load plan, which has to be acknowledged by the truck drivers upon arrival. When the truck is loaded, the results are automatically uploaded to GSAP and the loading documents are issued to the truck driver.

Thanks to the advanced SmartProcess TMS slot booking system, dispensing lines for a particular solvent can be taken out of service for routine maintenance work. Despite this, it was still necessary to find a way to minimise any unexpected maintenance work to guarantee the two-hour turnaround.

Emerson needed to install an architecture that detected problems before a failure occurred. The PlantWeb digital plant architecture has predictive intelligence that boosts availability because it detects conditions that could lead to problems and it also delivers the relevant information to people who can plan for the situation to be rectified. Furthermore, when a problem does occur, it can be quickly resolved from a distance, using the remote diagnostic tools.

The PlantWeb architecture installed at Pernis included more than 100 FOUNDATION fieldbus enabled instruments from Emerson, including Rosemount differential pressure and temperature transmitters, Micro Motion mass flowmeters, Fisher digital control valves and El-O-Matic on-off valves. Emerson also installed its DeltaV digital automation system to provide the control. This system offers multi-layered redundancy for in-depth protection from system failures. In addition, control was further distributed by utilising the control-in-the-field functionality of the fieldbus instruments.

Maintenance personnel can be notified when human intervention is required to correct problems before they cause unexpected downtime. This capability, called PlantWeb Alerts, relies on powerful software in Emerson field devices and the AMS Suite software application, embedded in DeltaV. It immediately analyses the incoming information, categorises it by who should be told, prioritises it by severity and time-criticality and then not only tells the recipients what's wrong, but also advises what to do about it. The devices' health is monitored through the AMS Suite application within DeltaV. The appropriate remedy actions are communicated to the

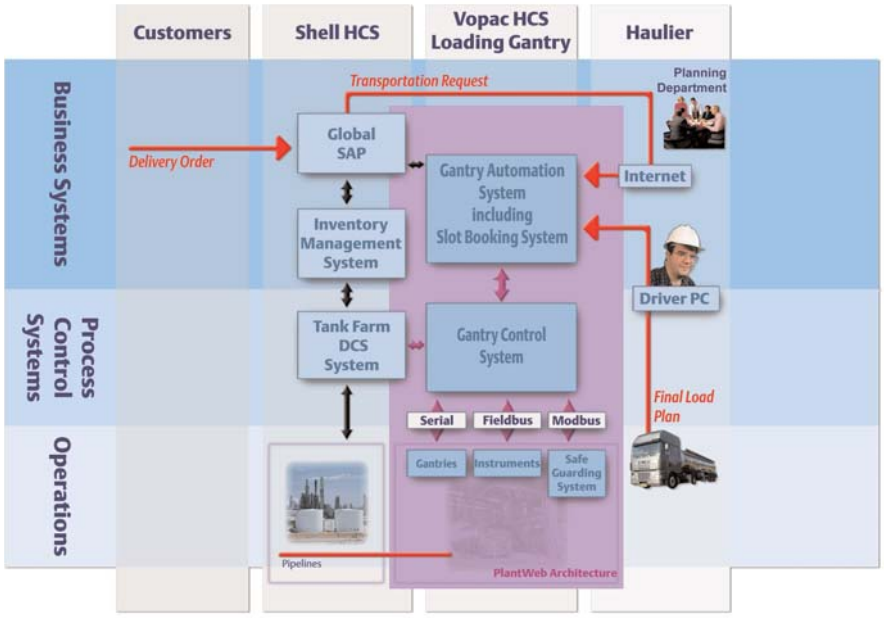
Continued on page 28

Continued from page 27

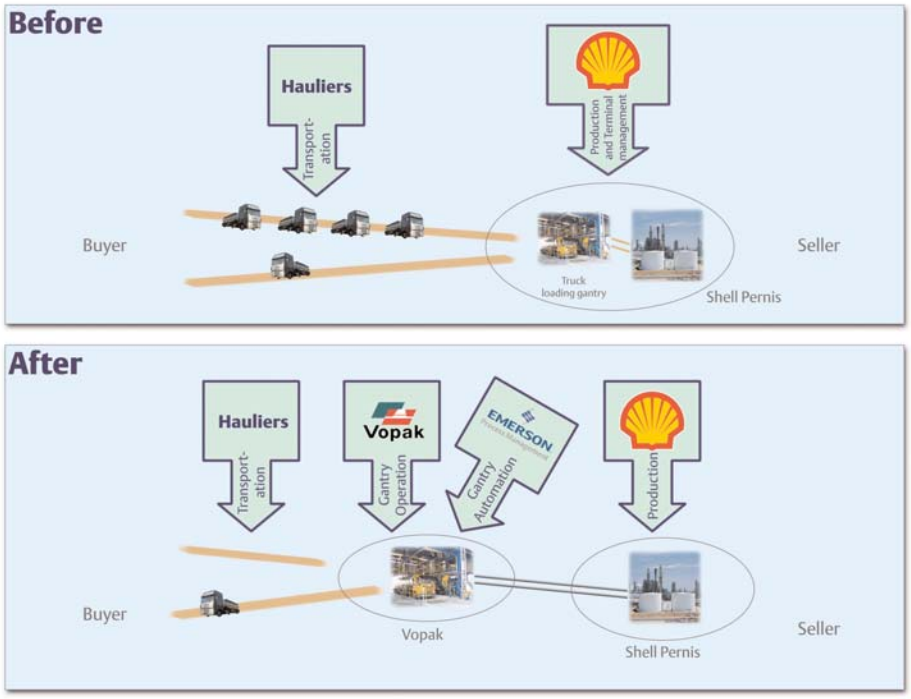
Emerson maintenance personnel.

Emerson's maintenance team routinely checks for the alerts from their offices. Information that is automatically monitored includes the number of on-off valve cycles, as well as the open and close times; from this information, an average travel time can be extrapolated. If these travel times exceed settings, then a PlantWeb alert is generated. If necessary, additional checks or diagnostic tests can be run using AMS Suite: Intelligent Device Manager and AMS ValveLink software. The maintenance team can then readily decide which valves or other devices need to be serviced, or repaired, and by next year, when the alerts settings will have been fine-tuned, additional alerts will be sent to the operators to provide them with instructions.

"The on-line diagnostics of PlantWeb also helps resolve problems faster," said Jerry Benjert, Emerson's lead engineer for the project. "If a failure occurs, Emerson maintenance personnel don't automatically have to visit the site. Instead, they can first access the control system or even the attached field devices. In most cases, this leads to a quick resolution." Vopak's Krispijn agrees, "When we have a problem, we call Emerson and a member of their maintenance team is online within two minutes. A few minutes later, the problem is usually resolved. This is a huge performance improvement over other Vopak facilities; it often takes other suppliers' maintenance technicians or engineers an hour to reach these plants, plus another half-hour to resolve problems."



Schematic of Shell Pernis loading operations



Before and After modernisation

Benefits

So far, the automation portion of the new facility is on track to maintain a projected annual maintenance cost of less than 3% RAV (Replacement Asset Value). This figure is well below the industry average of 6.7%.

"With the help of PlantWeb architecture and the other improvements, we actually load in less than two hours," Vopak's Krispijn said. "This gives us the flexibility to occasionally load a truck arriving early for its slot. We've had practically no demurrage claims from the hauliers since startup."

Shell also noted indirect benefits from the new automation, especially in terms of data capture, data processing and communications. According to Raimond Sanders, assistant manager for filling & dispatch, Shell Nederland Chemie, there is also less paperwork required. "About 20% fewer Shell administrative man-hours are required compared to the old truck loading facility. The savings are being applied to more important value-added work ". Sanders concluded. "We bought a solution that optimises the supply chain between Shell Pernis and our customers, while virtually eliminating volatile hydrocarbons exhaust and strongly increasing safety and energy efficiency. We are very satisfied with the automation solution."

Thanks to the operational efficiencies gained by Emerson's solution, only six operators are now needed. The old station employed up to 10.