AUTOMATING
terminal operations

Vopak, like any terminal, stores, manages and handles multiple products owned by multiple customers. Physical terminal processes encompass (un)loading of trucks, barges, ships and trains, terminal internal transports and stock keeping. These physical processes must be conducted in compliance with a customer's requirements and according to planning that takes into account tight administrative processes such as pipeline administration, stock management, and scheduling. This results in strict requirements for the administrative processes and the need for automation. The challenge in this environment then becomes the linkage between physical and administrative processes and associated data in a way that safety, process integrity and efficiency are optimised.

Terminals today operate in one of the following modes:
- (Remote) manual – Operators manipulate field equipment remotely from the central control room (CCR) or locally, based on manual procedures and instructions
- Automated – The physical process execution is automated and the control system automatically controls field equipment for conducting product movements
- Integrated – The physical and administrative processes are tightly coupled, and information flows automatically between customers and operations in the field.

The (remote) manual operational mode in practice in today's terminal industry, but it is sensitive for operational errors when applied at larger terminals, potentially leading to safety and process integrity risks.

A transition to the automated operational mode removes execution activities from operations and allows the operators to focus more on administrative coordination processes. The automated operational mode expands an operator's span of control in terms of coordinating and administrating more concurrent product movements. In this mode the operator is more dependent on physical data from the process control system, which needs to be synchronised with the administrative data.

Manual synchronisation of the physical data from the process control systems and the administrative process may become too labour intensive by larger business volumes and/or increasing planning iterations.

A transition to the integrated operational mode minimises the process integrity risks and further improves the overall operational efficiency.

Ownership terminal automation

In the past, terminal automation was seen as a project matter, being dealt with by a project manager. This attitude has led to many terminals having a patchwork of terminal automation brands, which hampers an integrated approach for managing daily operations.

Under this arrangement operations were busy with manual data collection and reconciliation, while technicians were busy with technical explanations for the differences among the various data sources.

Vopak concluded that terminal automation is a business management matter, directly influencing the terminal operations. Based on the envisioned operational set-up, an automation strategy is defined. Operational ownership is of key importance. Any project on a terminal therefore should comply with this automation strategy.

Approach

At Vopak, automation roadmaps have been drafted for terminals. To allow a phased approach the company embraced the ISA95 split architecture concept in 2006. The ISA95 split architecture

distinguishes four layers:

4 – Enterprise Resource Planning (ERP)

3 – Manufacturing Execution Systems (MES)/Terminal Management Systems (TMS)

2 – Process Control Systems (PCS)

1 – Field equipment

The split architecture concept enables Vopak to apply layer specific sourcing strategies that create synergies across the terminals.

In 2007 Vopak developed a terminal automation blueprint for layers 2 and 3. The blueprint outlined and mapped standardised workflows and administrative processes to the level 2 and 3 systems. The company used solutions from terminal automation provider Emerson that were configured to meet the blueprint and piloted at selected terminals, resulting in the first go-live at a large marine terminal in 2011.

In parallel with the pilot projects, Vopak also conducted a shortlisting process for the TMS and PCS. This shortlisting process resulted in two preferred vendors for process control and two for terminal management systems. Depending on terminal characteristics and regional vendor presence, terminals can select solutions from the vendor list. Emerson has been shortlisted for both the Level 2 - PCS (DeltaV) and Level 3 - TMS (Syncade).

For terminal management, Emerson transformed the proven pilot solution into a standard off the shelf product, Syncade LMM. Today, Emerson is marketing both the DeltaV preconfigured process control library and the Syncade terminal management solution.

Vopak and Emerson have now reached a stage where projects are repeatable, without excessive configuration and programming work. In the yearly business planning cycle Emerson and Vopak are able to synchronise the budget forecasts without the need for engineering, based on the library and related cost structure. Terminal projects are now heavily standardised, starting with a gap analysis that compares the as-is state to the To-Be Vopak standard state.

Results

To date, the Vopak-Emerson collaboration has achieved the following results and benefits.

Marine terminals can gain significant efficiency improvements by making the transition from (remote) manual to an automated mode of operations. This transition and its improvement also has implications for the terminal infrastructure and status of field equipment. Apart from the efficiency gain, this step also brings an important improvement in operational robustness and safety performance.

The transition from automated to integrated will further improve the efficiency of the operational administrative process and will bring further improvement of process integrity.

Project implementation is becoming more repeatable and thus predictable. Before final project contract, less is spent on pre-engineering, lead time of projects has been reduced considerably and cost savings on execution are managed by KPIs in the partner agreement.

For truck handling, automation of the physical process and integration with the administrative process enabled a driver-operated loading concept. Involving the carrier company in the truck handling process led to higher efficiencies and less complaints under safe conditions. ☁

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