

## MAC Approach and Rich Engineering Expertise Are Key to Success of Modernization Project at Thai Refinery

### PTT AR

**Location:** Rayong, Thailand  
**Order date:** May 2007  
**Completion:** Phase 1 June 2008; phase 2 March 2011  
**Industry:** Refining



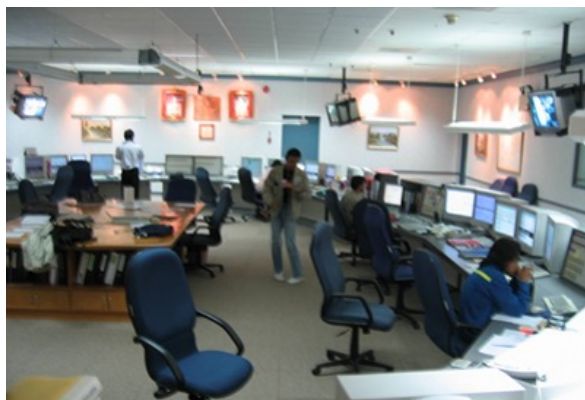
### Executive Summary

This project was conducted for PTT Aromatics and Refining Public Company Limited (PTTAR), which was established in September 2007 through the amalgamation of Aromatics (Thailand) Public Company Limited (ATC) and Rayong Refinery Public Company Limited (RRC) and was Thailand's no.1 integrated oil refiner and aromatics producer. In October 2011, PTTAR was amalgamated with PTT Chemical Public Company Limited to form the current PTT Global Chemical Public Company Limited.

PTTAR's AR1 crude oil refinery at the Map Ta Phut industrial estate in Rayong started operation in 1996 and was capable of converting 280,000 barrels per day. By 2006, after 10 years in use, the refinery's original Foxboro IA Series (v4.3) distributed control system (DCS) was beginning to show its age. To decrease downtime and maintenance costs, the decision was made to replace it with a more modern control system.

In this modernization project, PTTAR chose to go with a Yokogawa control system solution and work with Yokogawa Engineering Asia as its main automation contractor (MAC). The main reasons for this decision were:

- Star Petroleum Refining's refinery at the same industrial estate has had good results with a Yokogawa DCS that has been in operation there for 15 years.
- Yokogawa's proven MAC project execution capability
- Yokogawa's excellent local support
- Yokogawa's experience in plant revamps involving migrations from industrial automation systems such as the Foxboro IA Series DCS
- Yokogawa's knowledge of the process technologies that PTTAR had licensed from Shell



Pre-revamp central control room with legacy system



Post-revamp central control room with CENTUM CS 3000

## The Challenges and the Solutions

The main process facilities, utilities, oil movement system (OMS), and other facilities at this PTTAR refinery involved a total of about 7,000 IO points. In addition to the DCS, Yokogawa was also responsible for the migration of numerous manufacturing execution system (MES) applications and provision of interfaces for 25 subsystems. To undertake all this work and abide by a tight shutdown schedule that sought to reduce production losses, Yokogawa undertook this project in the following two phases:

Phase 1: OMS replacement by June 2008

Phase 2: Process and utility replacement  
by February 2011

### 1. Replacement of the entire control system

In addition to the DCS system revamp, the migration of advanced process control (APC) packages, OMS, operation training system (OTS), alarm management system, and analyzer system all fell within the scope of this project. Yokogawa was also in charge of modifying the PI database and the subsystem interface to ensure that the new systems all worked together properly. The modifications to the PI database involved a detailed site survey and the collection of information on the existing PI server configuration, which helped in determining the specifications for the generation of the PI database.

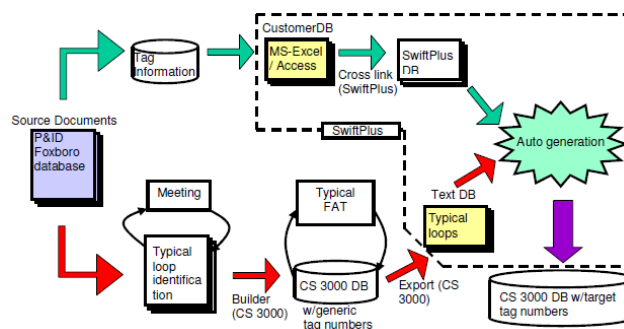
The migration to Yokogawa's CENTUM CS 3000 DCS involved the replacement of about 40 PCs as well as Foxboro IA controllers in a total of 39 system cabinets. To reduce costs, it was jointly decided with the customer during the design phase that existing equipment such as the CCTV controllers and the LAN would be reused.

### 2. Foxboro IA migration

For this undertaking, Yokogawa Engineering Asia had full access to the expertise and knowhow that Yokogawa has acquired in Foxboro IA system migration projects, covering everything from IO modules to function blocks and the interface with Foxboro IA subsystems.

The following figure provides an overview of the database migration procedure for the Foxboro IA system. As described below, there were two paths for converting from the Foxboro IA database to the CENTUM CS 3000 database.

- Discussion with the customer to identify the typical loops that were to be generated using Yokogawa's yGet engineering tool
- The generation of MS Excel-based tag information from the Foxboro IA database and piping & instrumentation diagrams (P&ID). Integration of the typical loops with the tag information enabled the automatic creation of the CENTUM database.



Foxboro (A database migration procedure)

### 3. Phased project execution and hybrid cutover (cold cutover & hot cutover)

In Phase 1, the OMS was replaced with a Yokogawa system. As much of the OMS information such as tags and graphics was linked to the refinery's process and utility units, we paid careful attention to disabling this information in the Foxboro IA system. We also posted a message on the existing Foxboro IA and prompted operators to handle the OMS operations using the Yokogawa OMS.

To ensure that normal plant operations could continue unhindered, Yokogawa employed a hybrid system cutover procedure that involved the installation of a temporary mini-DCS to control certain loops that needed to continue operating during the cutover process.

Yokogawa chose to keep the existing marshalling cabinets in their current position and connect the field signals to the new DCS system boards inside. When this was complete, the old termination boards and system cables were removed from the cabinets.

## Customer Satisfaction

Our customer said: "No amount of detailed planning and extensive work should be considered as too much when embarking into an upgrade project of this nature. Instead of treating vendors as "vendors," take them as "partners," like the way we did with Yokogawa and their subcontractors, and build close relationships between the team members. If you do that you will then be better prepared to expect the unexpected and your road to success will be guaranteed."



Working with our customer as a team



Enjoying off-time with our customer

## Key Project Achievements

- Replacement of Foxboro IA system functions (7,000 IO)
- Close "One Team" cooperation between PPTAR and Yokogawa Engineering Asia, Yokogawa Software Engineering (WuXi), and Yokogawa Philippines.
- Smooth and safe cutover from Foxboro IA to Yokogawa CENTUM system
- Perfect integration with existing subsystems
- Complete migration of existing APCs to Yokogawa's Exasmoc and Exarqe
- Successful modification of PI server database
- Replacement of existing analyzer system and OTS system with Yokogawa systems

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