

CPO Seminar on Power Plant Instrumentation and Control for Refinery and Petrochemical Plant Engineers

1. Background

In Vietnam, total demand for electricity is growing at an annual rate of more than 15%. To support this growing demand, Petrovietnam and its subsidiaries are building or are planning to build a number of new power plants. At the same time, existing power plants have strong needs for technical training for efficiency improvement and increased capacity. At the Dung Quat Refinery, as well, there are plans to strengthen its capacity, and thus a request has been made for training related to power facilities in refineries and petrochemical plants.

In response to Petrovietnam's request, JCCP has already implemented a customized program on boilers and turbines last year. As a second initiative, a Customized Program-Overseas (CPO) on the operations of utilities in power plants, refineries and petrochemical plants was recently organized and held at the headquarters of Petrovietnam Fertilizer and Chemicals Corporation (PVFCCo) in Ho Chi Minh City.

2. Overview

The seminar began with an opening message from Mr. Dang Quoc Hung, Deputy General Manager of the Human Resources & Training Division at PVFCCo, followed by self-introductions by all members and a brief introduction of JCCP prior to commencing the first day's lectures.

(1) Overview of Instrumentation and Control in a Power Plant

(Lecturer: Mr. Norinao Sato, Yokogawa Electric Corporation)

This lecture introduced Yokogawa Electric's electric power applications, instrumentation and control systems, field devices, and described and discussed instrumentation technologies for in-house power generation based on the participants' responses to a preliminary questionnaire. The participants had many questions particularly about field devices, as a local

employee of Yokogawa Electric gave a brief lecture on field devices in Vietnamese.

Responses to the preliminary questionnaire from the Dung Quat Refinery revealed a variety of issues the participants currently face, such as difficulties in excessive airflow control (O₂ control) accompanying the switch between mono fuel and mixed-fuel (gas and oil) combustion; the surge in burner pressure when using fuel gas; and problems arising from the instability of grid frequency. A further hearing was held to better understand each issue, and the best current answers and proposals were given by Mr. Sato and Mr. Seiji Kuniyoshi, another lecturer who provided his support.



Mr. Sato, Yokogawa Electric Corporation

(2) Safety Instrumentation System in a Power Plant

(Lecturer: Mr. Yoichiro Inoue, Invensys Process Systems)

In the first half of the lecture, Mr. Bernard Kwek, who rushed over from Singapore, introduced an overview of safety instrumentation and the basic functions of the company's safety instrumentation system (SIS). Then, Mr. Inoue introduced various solutions and case examples related to power plants.

In his lecture, Mr. Bernard discussed the background to why an SIS became necessary, and introduced SIS functions, the differences between duplex redundancy and triplex redundancy, and representative examples of

their application. He also emphasized the necessity of separating SIS and DCS (distributed instrumentation system). During Mr. Inoue's lecture, a participant asked about countermeasures to specific problems related to bearing temperature, to which not only Mr. Inoue, but the other participants as well, proposed various ideas that provided useful reference.



Mr. Inoue, Invensys Process Systems

(3) Optimization of Utilities

(Lecturer: Mr. Junichi Watanabe, Invensys Process Systems)

Generally when building a process optimization system, it is divided into three stages: the data reconciliation stage, optimization stage, and advanced control stage. In describing data reconciliation, the importance of recognizing errors was emphasized. With respect to APC, process identification, prediction and control in model predictive control were described in detail. In regard to optimization, he gave a careful description of the relationship between processes and utilities by drawing diagrams, followed by an explanation of optimization functions. Mr. Watanabe also introduced specific examples of utility optimization in Japanese refineries and optimization in Thailand.



Mr. Watanabe, Invensys Process Systems

When a participant asked about loss management solutions, Mr. Watanabe drew a diagram of an entire refinery to facilitate understanding of an example of loss management using data reconciliation technology.

(4) Controller Tuning

(Lecturer: Kazuhiro Suzuki, JCCP)

Knowledge of controller tuning was provided through lectures and practical training as an important and useful technology to instrumentation and control engineers. After introducing control theories using a video and reviewing their important points, practical training in CAI provided a visual understanding of the differences in controller behavior according to different tuning parameters. It is well known that the greater the time constant, the more difficult tuning becomes. To illustrate this principle, an example was introduced that showed how an attempt to control viscosity failed to deliver the intended control performance.



Practical training using CAI

3. Summary

A number of programs on power facilities have been implemented to date, mainly with a focus on the mechanical aspects of boilers and turbines. This time, therefore, a seminar was planned with a focus on in-house power facilities in refineries and petrochemical plants. By implementing a preliminary questionnaire, programs pertaining directly to power facilities were organized so that specific issues could be discussed. A program on utility optimization and management was also prepared from the perspective that utility facilities are an integral part of refinery and petrochemical plant facilities.

In the post-seminar evaluation, many participants noted their desire for even deeper knowledge in regard to each of the programs, as well as their wishes to receive training in Japan. As a regular course related to electric power will be offered beginning in fiscal 2013, the participants' feedback of this seminar will be taken into consideration when implementing the course and also when designing other customized seminars in Vietnam as well as in other countries.

<by Kazuhiro Suzuki, Training Dept.>



Members and participants after completion of the seminar