

For Improved Training Practicality (Part 3)

—Training using a New Simulator—

1. Introduction

A distributed control system (DCS) is a basic plant operation tool. Based on this understanding, JCCP installed a DCS-based training simulator immediately after its establishment and commenced training using an actual machine. Today, JCCP has two DCS models, on which participants can engage in training on process operational control and DCS engineering. They are systematically upgraded on a regular basis to reflect technological advancements and allow training on the latest facilities. JCCP previously had two DCS systems—Yamatake Honeywell's Advanced-PS and Yokogawa Electric Corporation's CENTUM CS-3000—and three independent miniature plants connected to each DCS, to provide training simulators (No. 6 Simulator and No. 5 Simulator) that closely matched actual onsite facilities. Two years ago, the Advanced-PS was replaced by Azbil Corporation's Harmonas-DEO, and recently,

the CENTUM CS-3000 was upgraded to a Centum-VP. Below is an overview of the new system and the training program that has been renewed based on the new system.

2. Configuration of the Simulators

(1) Miniature plants

Connecting a training DCS system to a plant allows training under conditions that closely match real operating conditions. JCCP thus introduced miniature plants at an early stage, and recently upgraded their instrumentation from a conventional type to one that is based on the world's most widely used HART Protocol. Considerations were also made to provide training on leading-edge instrumentation equipment by adopting a fieldbus in some of the instruments.

(2) System configuration

Fig. 1 shows the configuration of the DCS system at

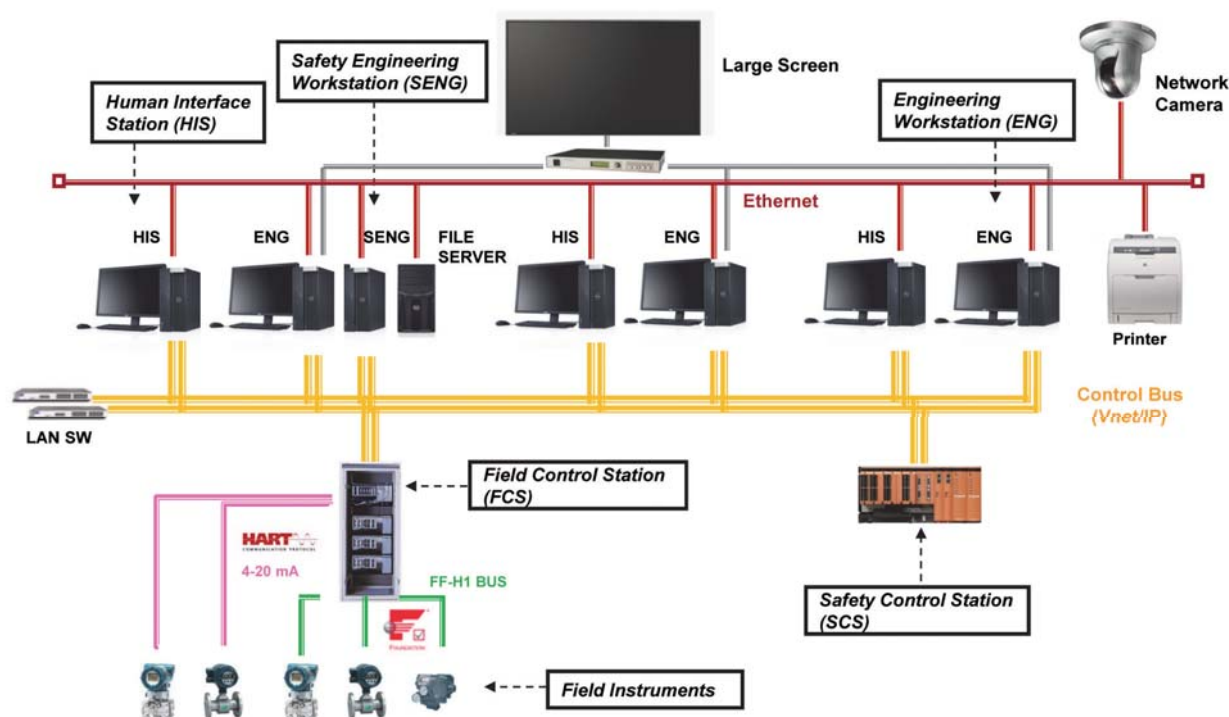


Fig. 1 System configuration

JCCP. Operations are performed via three sets of HMIs (human machine interfaces), with each set comprised of an operating terminal and engineering terminal. This setup allows simultaneous training by six to nine participants.

Additionally, changes were made to the layout of the miniature plants and DCS to improve the operating environment, which had become slightly confined in terms of space, and measures were taken to create an environment that closely matched an actual control room, such as by installing a large screen in front of the HMIs, setting up remote cameras, and projecting images from the camera onto a large screen.

3. Training Content

The simulators are connected to JCCP's existing and external facilities (PCs, etc.) to provide the following training.

(1) Process control practice using a miniature plant

Hands-on training in basic process control (PID control) is provided through actual operation of a miniature plant. This practice allows participants to learn about tuning methods for good controllability and methods for controlling disturbances, and is incorporated in all instrumentation courses, as it covers many aspects that are common to instrumentation-related engineering.

(2) DCS engineering practice

The main functions of DCS include process control and monitoring. In this practice, participants learn how process control and monitoring functions are implemented using DCS. In order to operate a plant using DCS, it is necessary to load data from various

instruments to the DCS, so participants first learn about methods for defining necessary data. Then, they practice control functions through a series of actions, from building control logic and downloading it to the DCS to confirming the control action, and also practice monitoring functions by creating a process-monitoring screen and actually monitoring processes on the screen they created.

(3) Practice using MPC (model predictive control)

Here, participants aim to solve an interference problem in the water level of two water tanks of a miniature plant using MPC, and learn about important procedures for building MPC, such as conducting a step test and identifying a model under conditions that closely resemble an actual system. The practice is performed by connecting to a PC in which MPC functions are installed.

(4) Practice using OSS (operational support system)

Participants practice building automated operating and guidance systems using OSS, which is frequently used today in Japanese refineries.

4. Future Issues

Fieldbus, safety instrumentation and wireless systems are some of the keywords in today's instrumentation field. They are not utilized on a full scale yet in Japan, but through the utilization of facilities available at JCCP Headquarters and the cooperation of member companies, JCCP strives to satisfy participants' expectations by creating an environment that is consistently conducive to learning about the world's leading-edge technologies.

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Training using the old No. 5 Simulator



Training using the new No. 5 Simulator