

Introducing Training Facilities in the CAI (Computer Assisted Instruction) Room

The CAI room at JCCP Headquarters is outfitted with 15 computers for use by participants and seven for use by instructors. They can be used to run software applications that simulate refinery plant operations and provide training in operational methods, control methods, and economically optimal plant operations.

Training in the CAI room is highly popular among participants as a program that addresses practical issues. Training related to processes uses (1) a refinery production planning system (LP: linear programming); (2) the “JCCP Refinery” system for learning about the flow of oil refining; and (3) a refinery plant operation simulation program (dynamic simulator) for exercises in the startup (S/U) and shutdown (S/D) of the crude distillation unit (CDU), fluid catalytic cracker (FCC) and resid fluid catalytic cracker (RFCC). Training related to maintenance includes exercises in (4) the vibration diagnosis of rotary machinery, and training related to instrument control includes exercises in (5) controller tuning for refinery processes; (6) advanced process control (reactor temperature control, etc.); and (7) operational assistance systems based on automated control or navigation system.

Below, we introduce an overview of activities (1), (2) and (3) related to processes.

1. JCCP-LP

JCCP-LP is a refinery production planning system produced by JCCP in 2005. It is used to create optimal production plans in the refinery by adjusting product balance and calculating the throughput balance of refinery units to produce the greatest profit. It runs on Windows and provides an optimal solution using the linear programming (LP) method. Data can be entered by selecting a plant or blender in the refinery flow and displaying a data entry chart for each. A report-generating function can also be used to compare and display multiple analysis results.

Since 2006, the system has been used to analyze case studies of changes in demand for oil products, in an attempt to improve refinery models and enhance user interface. More specifically, it is used to analyze changes



JCCP-LP training

in profit that are brought about when changes in profit and plant operations occur due to a change from heavy oil to light oil, or a change in quality. Hands-on exercises have been previously offered under the titles, “Case study of increased production of premium gasoline,” “Case study of increased production of regular gasoline,” and “Case study of white oils.”

2. JCCP-Refinery (Virtual Refinery for Training Purposes)

JCCP-Refinery is a refinery flow learning system produced by JCCP in 2011, which provides a model for understanding the structure of refinery units that are used in the process of oil production, from crude oil to final product. Its operation is easy, as it is accessed using Excel



JCCP-Refinery training

running on Windows, and participants can calculate oil throughput to a device or blender by selecting a type of crude oil for processing in the topper, setting volume, and setting a volume or splitting ratio at the splitter along the refining flow.

Ultimately, production volume that would yield maximum profit is obtained based on the throughput to the blender and price of the product (gasoline, diesel fuel, heavy oil; optimization calculation is performed by LP for the blender only). The output result is analyzed against detailed solutions per case and a comparison chart of cases. Training using JCCP-Refinery focuses on analyzing changes in profit when refinery units are renewed in phases, and on seeking requirements for acquiring the greatest profit under a given set of conditions. This exercise is highly popular among all participants, from less-experienced employees to middle-level engineers, as being extremely easy to understand.

3. Operational Simulation Program (Dynamic Simulator)

JCCP has three programs for simulated operational training: (1) CDU, (2) FCC (introduced in 2008) and (3) RFCC (introduced in 2010). One parent unit for use by the instructor and two child units for use by participants comprise one training set. Such facilities are used in many refineries in Japan to provide employees



FCC startup training

simulated training in operations, control and particularly in emergency response, envisioning actual machines. As the operations and control of FCC and RFCC, in particular, are classified as advanced processes among actual refinery processes, the dynamic simulator is highly appreciated by many participants for facilitating understanding of refinery processes and providing effective training on startup operations in a short amount of time, even to participants with little experience in refinery operations (which comprises the majority of participants).

In the future, we hope to further develop the software program to reflect upgraded refinery plants and product configurations and offer courses that provide even greater knowledge to participants.

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