Success Story

800 MW Supercritical Coal-fired Power Plant Achieves Smooth and Rapid Plant Commissioning Using a Full-replica Plant Simulator

YOKOGAWA
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Korea South East Power Co., Ltd.

Location: Yonghung, Korea
Order date: 2001
Completion: 2004
Industry: Power

Executive Summary

Faster, smoother plant commissioning

The customer has successfully brought online a greenfield 800 MW supercritical power plant using a Yokogawa full-replica plant simulator to ensure a fast and smooth plant commissioning process.

The full replica plant simulator was used for:

- Control system validation prior to DCS commissioning
- Operator training

Background

In Korea, steadily growing demand for electricity together with limited indigenous energy resources and a heightened environmental awareness have required additional power generation facilities with improved efficiency and environmental performance. Korea South East Power Co., Ltd. (KOSEP), a wholly owned subsidiary of the government-owned Korean Electric Power Company, constructed two new 800 MW supercritical coal-fired units in Yonghung, Korea to generate highly-efficient, environmentally-friendly electricity.

The Challenges and the Results

To ensure that the commissioning process for its new plant went smoothly, KOSEP turned to Yokogawa and its TechComm Simulation subsidiary for a full-replica training simulator solution.

The purpose of this full-replica training simulator was twofold:

- To conduct a thorough, off-line test and validation of the DCS configuration prior to the control system's actual loading and commissioning at the plant.
- To aid in the initial/refresher training of plant operators, which was conducted in parallel with the plant commissioning.

To achieve these objectives, the simulator was required to fully stimulate DCS functions and emulate turbine, generator, and electrical control functions. Yokogawa's full-replica simulator met the customer's requirements with high accuracy (> 99% steady state; >95% dynamic state), calculation of models at less than 250msec per cycle, and the ability to perform performance tests and a wide variety of simulations including startups, shutdowns, and load changes under normal, abnormal, and emergency operating conditions.

Thorough Off-Line Control Validation

The simulator was delivered on-schedule to the site in September 2002, twelve months before the boiler was to be fired up for the first time. In collaboration with the DCS manufacturer and TechComm, the customer proceeded to test and validate the DCS configuration on the simulator, conducting an I/O checkout, drive checks, sequence checks, control module checks/tuning, alarm/trip setting, and DCS response checks as well as tests in which malfunctions and other abnormal situations were simulated. This enabled thorough validation of the control configuration prior to DCS installation at the site, thereby minimizing the final tuning work. A significant number of potential plant trips and incidents where there was potential for damage to the plant were identified and resolved before the initial plant startup, ensuring a safe and smooth plant commissioning process.

Custom-Made Operator Training

The thorough control system validation on the simulator also provided a suitable training environment for plant operators. The simulator aided in the initial training for plant operators and refresher training for experienced operators under a wide variety of normal, abnormal, and emergency operating conditions. In parallel with DCS commissioning, KOSEP plant operators were well trained under the new control environment, reproducing custom-made flexible operating scenarios on the simulator. This avoided mistakes that could have occurred if the operator had not been familiar with the new system, thereby ensuring safe and smooth plant operation. The simulator also has the flexibility and expandability to accommodate future improvements in plant performance. The simulator continues to be an effective tool for the customer to optimize operational procedures and the plant logic/system.

Central Control Room

Power Plant Simulator

<Yonghung Thermal Power Plant (Unit 1 and 2)>

Owner:	**Korea South East Power Co., Ltd. (KOSEP)**
Output:	**2 x 800 MW**
Plant efficiency:	**43.5%**
Operation mode:	**base load & cycle operation**
Fuel:	**bituminous coal**
Boiler type:	**supercritical pressure, once through, single reheat**
Turbine:	**tandem compound, HP, IP, and LP turbine, single stage reheat, condensing type**
Generator:	**cylindrical rotor, hydrogen and water cooled, three-phase synchronous generator**
Simulator system:	**TechComm full-replica plant simulator (Main computer + instructor system + DCS)**

Yokogawa Electric Corporation

YOKOGAWA ELECTRIC CORPORATION
World Headquarters
9-32 Nakacyo 2-chome, Musashino-shi, Tokyo 180-8750, Japan
http'//www.yokogawa.com/

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