Advancing Long-Selling Control Systems for IHI's Power Generation Plant

Control System of IHI (CSI) for aero-derivative gas turbine power plant pursues high-speed control and high reliability

The CSI gas turbine control system has been making integrated control of cogeneration plants possible for 26 years. We have been actively working to improve the operation monitoring and make remote monitoring of preventive maintenance possible.

CSI-III+ monitoring system

Gas turbines are used in a variety ways including as emergency generators for hospitals and office buildings during a power failure and as power generators in plants that consume a large quantity of electricity.

The gas turbines of conventional power generators used in plants are controlled separately from the plants. However, as cogeneration facilities in which gas turbines are used with heat recovery boilers to provide electricity and steam developed into combined cycle power generation facilities with steam turbines, it became necessary to control the power plants and gas turbines in an integrated way.

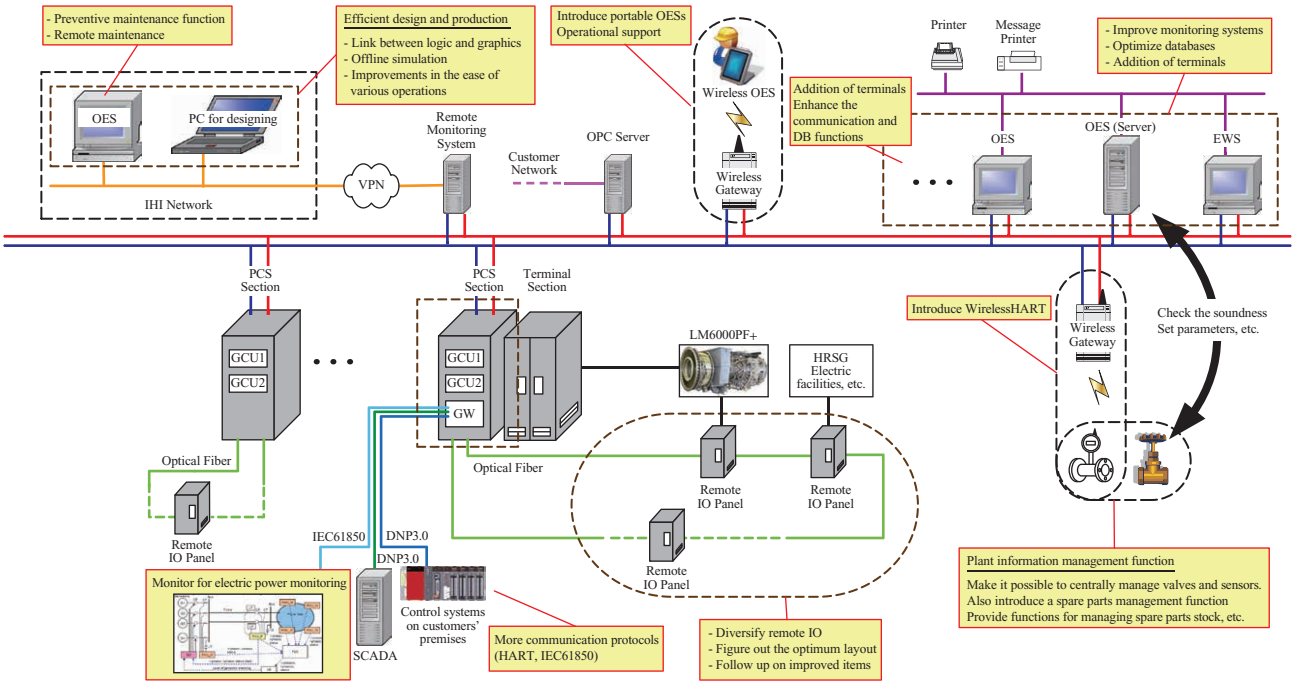
Therefore we advanced the gas turbine control system "Control System of IHI" (CSI) to develop systems that control entire plants.

CSI is a system for controlling aero-derivative Gas Turbines (GT) for power generation facilities that was originally developed by IHI.

Control systems need to be capable of high-speed processing in order to achieve the quick response that is a characteristic of aero-derivative gas turbines. Redundant systems and optical communications are used to secure high reliability as systems for power generation facilities. GE of the U.S. has approved the CSI as GE aero-derivative gas turbine control systems. Here is an introduction of the history and characteristics of the CSI and what have planned for its future.

History of the CSI

We developed the CSI7500 which had triple redundant systems as GT control systems for the IM5000 in 1988. After that in 1996, the CSI7500 evolved into the CSI7500-II for which fiber-optic cable communications and remote IO systems were used and the computing capability was



Future system configuration of the CSI

enhanced. In 2004, we developed the new redundant system CSI-III with real-time trend and remote monitoring functions.

As we were receiving more and more orders for the CSI for use in cogeneration facilities, the need for simultaneous control of other facilities such as exhaust gas boilers and auxiliary equipment along with GTs grew. The CSI-III+ released in 2008 adopted Distributed Control Systems (DCSs) that made it possible to control entire cogeneration plants. In addition, we developed the small and simplified microCSI as a control system for small and medium-sized gas turbines. This made it possible to select optimum control systems based on the items to be controlled: CSI-III+ for large equipment and microCSI for small and medium-sized equipment. The release of the CSI-III+ made it possible to control entire plants and to install power management functions such as constant power control and power transmission and distribution control after the grid connection is cut off.

Configuration and characteristics of the CSI

The main components of the CSI-III+ are described below.

(1) Plant Control Stations (PCSs)

A station with a redundant control unit is installed onto each GT plant to be controlled. Installing them onto steam turbines and commonly used auxiliary equipment makes it possible to control each plant. Data can be shared through communications between PCSs, which is used to control entire plants.

(2) Operator's and Engineer's Stations (OESs)

Operators use these stations to execute control commands and monitor the operating conditions of the plants. In addition, these stations have functions that allow engineers to create control logic programs and change system settings for maintenance and management.

(3) Remote IO panels

These panels are devices that connect the items to be controlled to PCSs with optical fibers to control the remote target items at high speed and with high reliability. New remote IO systems were introduced in 2013.

The future of CSI

Recent advancement in IT technologies has created the need for ① increase in reference data, ② control from portable terminals, ③ easier monitoring operations, ④ improved alarm management, and ⑤ better tools for building systems. In addition, in the future of preventive maintenance, (A) accumulation of detailed data, (B) high-speed analysis, and (C) support for stable operation based on forecasting techniques will be required. We started the development of the next-generation CSI-IV in 2013 as a solution for these tasks.

The CSI has 26-year history and is a long-seller product line. This was supported by our continued research and development and stable manufacturing systems. We will aim at providing excellent products by continuously pursuing the next step in their evolution and never backing down from new challenges.

Inquiries:
Power Systems Project Department,
Energy & Plant Operations,
IHI Corporation
Phone: +81-3-6204-7707
Website: www.ihi.co.jp/powersystems/english/