Mitsubishi Heavy Industries slashes development costs by 30% for their new DCS/Control System (DIASYS Netmation) and dramatically improves their time to market

Using Rockwell Automation components and technology for its control systems, MHI's Power Systems Headquarters was able to reduce its hardware and engineering costs and significantly cut system development time. Rockwell Automation's solution also helped to meet end users' increasingly sophisticated needs for RIUP capability, remote monitoring, and global support.

Background

A Japanese industrial pioneer, Mitsubishi Heavy Industries (MHI) manufactures more than 700 products. Its broad range of products and services include shipbuilding, steel structures, power systems, air-conditioners, machinery for industrial and general use, and aerospace systems. MHI's Power Systems Headquarters has a strong reputation for quality and a large market share in the global market - a total power plant manufacturer who produces steam turbines, gas turbines, and boilers.

MHI began developing microprocessor-based control systems for power plants in the 1970s. DIASYS (Digital Intelligent Automation System) is MHI's total plant control and information system. It has supplied 1,900 systems to more than 250 power plants in 33 countries around the world.

Challenge

For over twenty years, MHI has developed control system technology internally. However, recent technological innovation has driven the cost of control system engineering down to one tenth of what it cost twenty years ago. To remain competitive, MHI needed to find a way to reduce its engineering and hardware costs. MHI also wanted to reduce development time, so new solutions needed to adhere to the schedule closely.

"It was impossible for us to reduce costs by continuing to develop all hardware and software on our own," says Kazuyuki Misawa, control systems engineering manager, Power Systems Headquarters. "We needed to look for new ways to develop hardware and software, including purchasing some of the hardware from an outside company."

MHI's end users, thermal power plants, posed even further challenges. Power plant systems cannot be stopped once they have begun running. Customers demand RIUP (Removal and Insertion Point Under Power) maintenance, but this was not permitted by some part of existing MHI systems.

In addition, the information technology needs of thermal power plants have become increasingly sophisticated in recent years, as more and more plant manufacturers are demanding remote monitoring and data management capabilities using the Internet or e-mail and data integration with ERP. Plus, each plant has different requirements and control algorithms for HMI (human machine interface) design. In the past, MHI developed a customized control system software for each customer using engineering software prepared for HMI building and control algorithms development that didn't share a common architecture. This is very costly in terms of manpower for engineering, support, and maintenance.

To reduce engineering costs, MHI decided to outsource control system engineering, choosing Rockwell Automation to develop the control technology for their I/O system. To keep engineering costs down, MHI worked with Rockwell Automation to develop a user-friendly engineering software that uses a common architecture, employing an open communication protocol (ControlNet). This reduces engineering, support, maintenance and system management costs, and the number of updates required. Rockwell Automation's global support capability is especially important for MHI as they do not have so many supporting centers.

Solution

DIASYS Netmation's total system solution was developed jointly by MHI and Rockwell Automation. MHI provided system integration and worked closely with Rockwell Automation to develop the new software, hardware, and network interface. Rockwell Automation provided MHI with the necessary hardware and technical information to develop key system components:

- ControlNet communication software and hardware driver, which allows other MHI components to communicate with the ControlNet system.
- A FLEX I/O board designed for power plant applications.

Rockwell Automation also furnished technical support and post-sales support for both Rockwell and MHI systems. Because many of MHI's customers reside outside Japan, global support is key to the success of the solution.

In June 1999, project teams were formed to develop the ControlNet communication interface for DIASYS Netmation and to develop the FLEX I/O for power plant applications. Each team comprised MHI and Rockwell Automation engineers as well as a Rockwell Automation account manager and product marketing manager.

The solution provides a greater degree of flexibility and expandability to end users. The cost-effective control system allows end users to easily increase the number of controllers and I/Os connected to ControlNet or change the system configuration at low cost. FLEX I/O hardware is compact in size and flexible in its physical configuration.

Up to 8 I/O modules can be plugged into a FLEX I/O assembly, for a maximum of 256 I/O per assembly. Its compact design also fits into limited panel space.

The state-of-the-art ControlNet network is simple to install and integrates Fieldbus devices, DeviceNet devices, PLC, and DIASYS Netmation seamlessly.

The open architecture of Rockwell Automation products is important to MHI. "We are committed to using open or standard architecture, software, or products, so DIASYS Netmation we developed needed to be open," explains Mr. Misawa. "Using ControlNet and Rockwell Automation components greatly reduces our development costs."

DIASYS Netmation is also easier to maintain. Rockwell Automation FLEX I/O technology allows users to replace failed modules while keeping the rest of the system running. This RIUP maintenance capability is very important to a power plant, which cannot be stopped once they start running. The new control systems are also easier to maintain. Rockwell Automation FLEX I/O technology allows users to replace failed modules while keeping the rest of the system running. This RIUP maintenance capability is very important to a power plant, which cannot be stopped once they start running.

Results

The project was a complete success. Outsourcing control system engineering helped MHI achieve its goal of reducing engineering and hardware costs. Using Rockwell Automation's components and technology, MHI was able to reduce the cost of manufacturing power plant systems by 30%.

Using Rockwell Automation products also helps MHI reduce the time required for developing DIASYS Netmation. Effective communication between MHI and Rockwell Automation ensured that MHI got what it needed to keep development on schedule. "We could always depend on Rockwell Automation to provide the hardware and technical support we need when we need it," says Mr. Misawa.
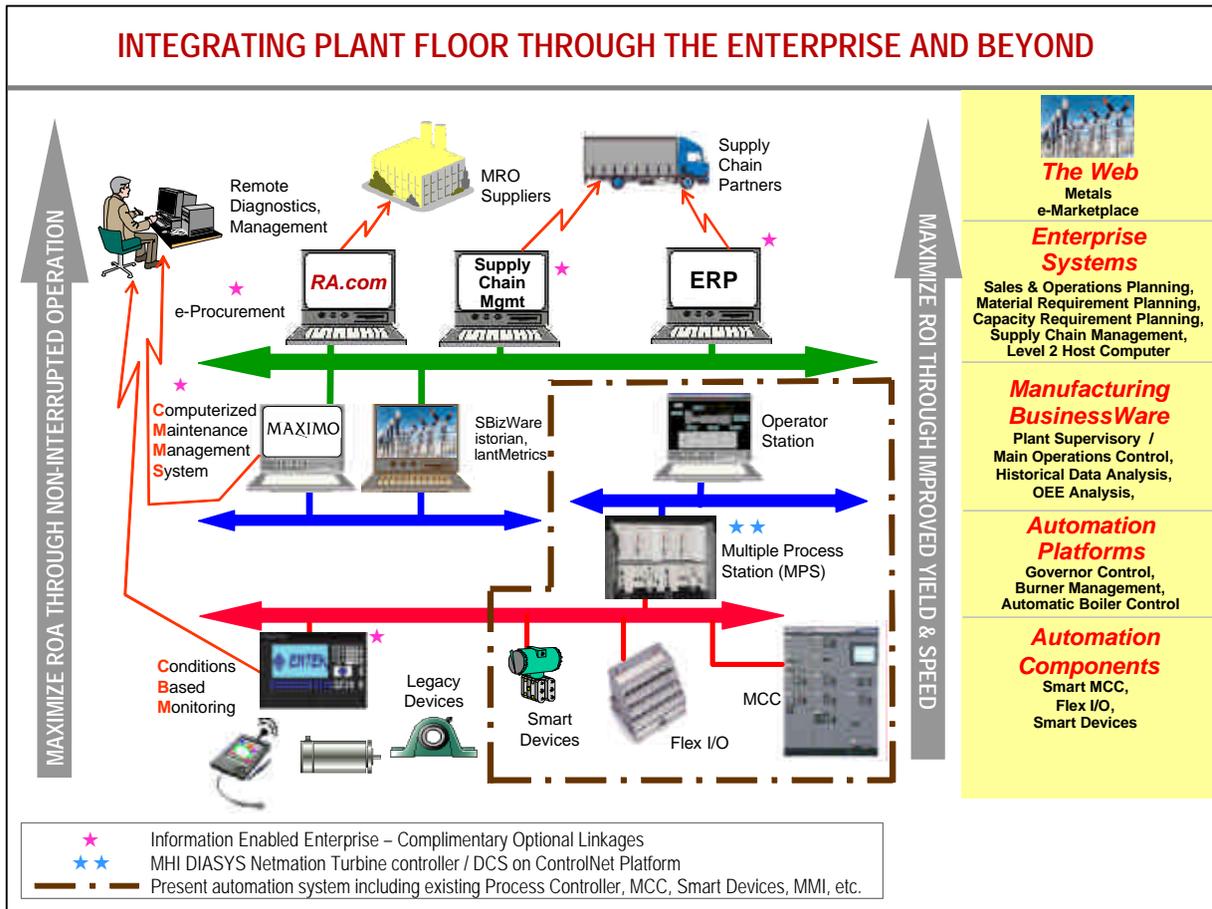
For end users, Rockwell Automation's solution provides a state-of-the-art control system that meets the demands of power plant operators. It gives them a high level of connectivity and a cost-effective, flexible means of transferring and managing I/O data, while providing the RIUP capability, remote monitoring, and importantly, global support they require. Rockwell Automation's solution will also provide interface between control system and enterprise information system or condition monitoring system.

The architecture on the following page depicts Rockwell Automation's concept of an Information Enabled Enterprise. The area outlined with a brown dash line represents the present automation level in the facility under discussion in this document. The remaining portion illustrates a host of solutions that Rockwell Automation can provide today to integrate the plant to the entire enterprise and beyond.

INTEGRATING PLANT FLOOR THROUGH THE ENTERPRISE AND BEYOND

MAXIMIZE ROA THROUGH NON-INTERRUPTED OPERATION

MAXIMIZE ROI THROUGH IMPROVED YIELD & SPEED

Remote Diagnostics, Management

MRO Suppliers

Supply Chain Partners

e-Procurement

RA.com

Supply Chain Mgmt

ERP

Computerized **M**aintenance **M**anagement **S**ystem

MAXIMO

SBizWare istorian, lantMetrics

Operator Station

Multiple Process Station (MPS)

Conditions **B**ased **M**onitoring

Legacy Devices

Smart Devices

Flex I/O

MCC

The Web
Metals e-Marketplace

Enterprise Systems
Sales & Operations Planning, Material Requirement Planning, Capacity Requirement Planning, Supply Chain Management, Level 2 Host Computer

Manufacturing BusinessWare
Plant Supervisory / Main Operations Control, Historical Data Analysis, OEE Analysis,

Automation Platforms
Governor Control, Burner Management, Automatic Boiler Control

Automation Components
Smart MCC, Flex I/O, Smart Devices

★ Information Enabled Enterprise – Complimentary Optional Linkages
★★ MHI DIASYS Netmation Turbine controller / DCS on ControlNet Platform
— · — Present automation system including existing Process Controller, MCC, Smart Devices, MMI, etc.

Flex™ I/O is a trademark of Rockwell Automation. DeviceNet is a trademark of the Open DeviceNet Vendor Association.

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