BaoSteel Corporation Application Story

RTP 2200 system in BaoSteel chemical desulfurization control system revamp

Introduction

The desulfurization and sulfuric acid equipment previously used by BaoSteel Chemical Ltd. was imported from NKK Japan and based on Foxboro's Spectrum control system. BaoSteel was facing a Y2K problem with the Spectrum control system and maintenance costs were escalating. In order to optimize the process, decrease operations costs, and increase profits, in November 1999 it was decided to upgrade the control system. The new control system includes the latest generation RTP 2200 Hybrid Control System, which combines the advantages of both the PLC and DCS. This system includes redundant I/O cards, I/O buses, target node controllers, power supplies, network communication interfaces, Citect I/O servers, and Citect I/O operator stations.

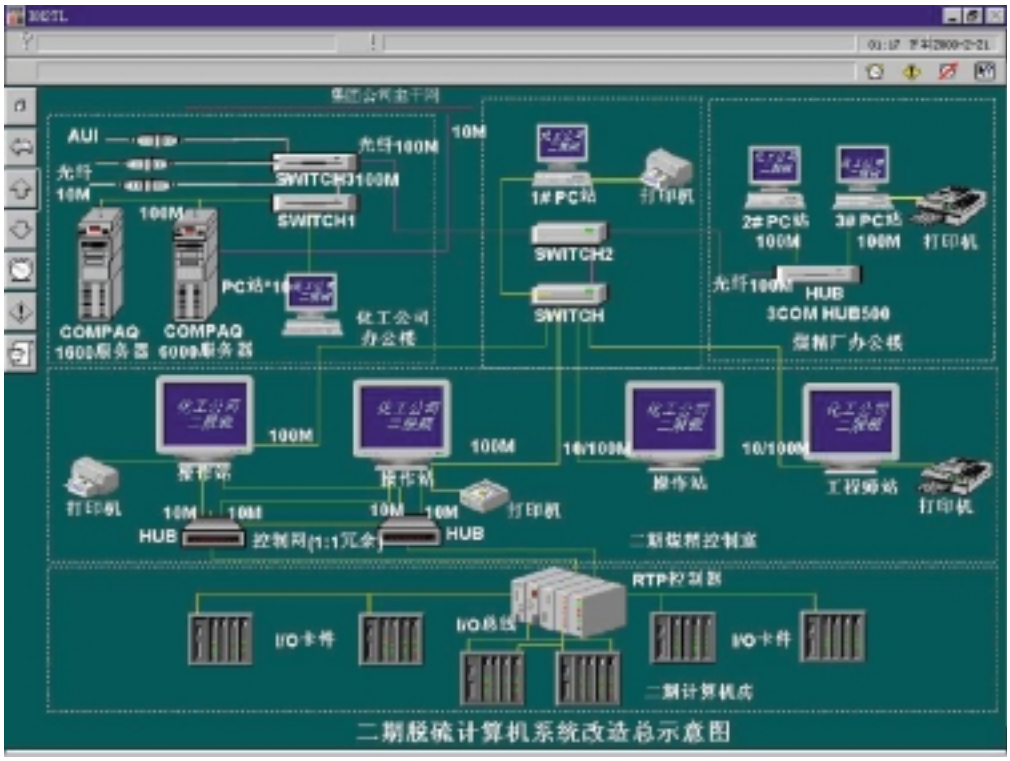

Figure 1 chemical desulfurization control system architecture

System Architecture

As shown in figure one above, the control layer is using a redundant RTP 2200 Hybrid Control System with five logical (7 physical) RTP I/O chassis. A redundant configuration is used for critical I/O points. Non- redundancy is configured for less critical I/O points. This mixture of I/O optimizes the system configuration and has saved considerable revamping costs. The RTP 2200 Hybrid Control System is responsible for detecting, displaying, recording, and data processing of process information to achieve automatic control of all the process equipment. Operator stations use Citect HMI software, which is based on Client/Server architecture. Configured for alarming, trending, and reporting, two operator stations are configured as redundant I/O servers. After optimization of system resources, operator screens update is now 500 milliseconds. For data communications between the Citect operator stations and the RTP 2200

Hybrid Control System, 10 Mbps Ethernet is used. One 3Com SuperStack 3300 FX switch (Switch-2) is located at the desulfurization office. It is connected to Switch-3 by fiber optic cable running at 100 Mbps. Another SuperStack 3300 TX switch is stacked on Switch-2 to communicate with the operator stations and the engineering workstation. At the sulfuric acid office, a 3Com hub connects operator stations #2 and #3 via a 100 Mbps Ethernet over fiber optic. At the BaoSteel Chemical LTD office building, a Compaq Proliant 6000 NetServer, and a Compaq 1600 are clustered. They communicate with switches-#3 and #2 via switch #1. The system is configured with 3Com network management software to set up virtual networking, manage network priority, and monitor the status of each network port to ensure network integrity.

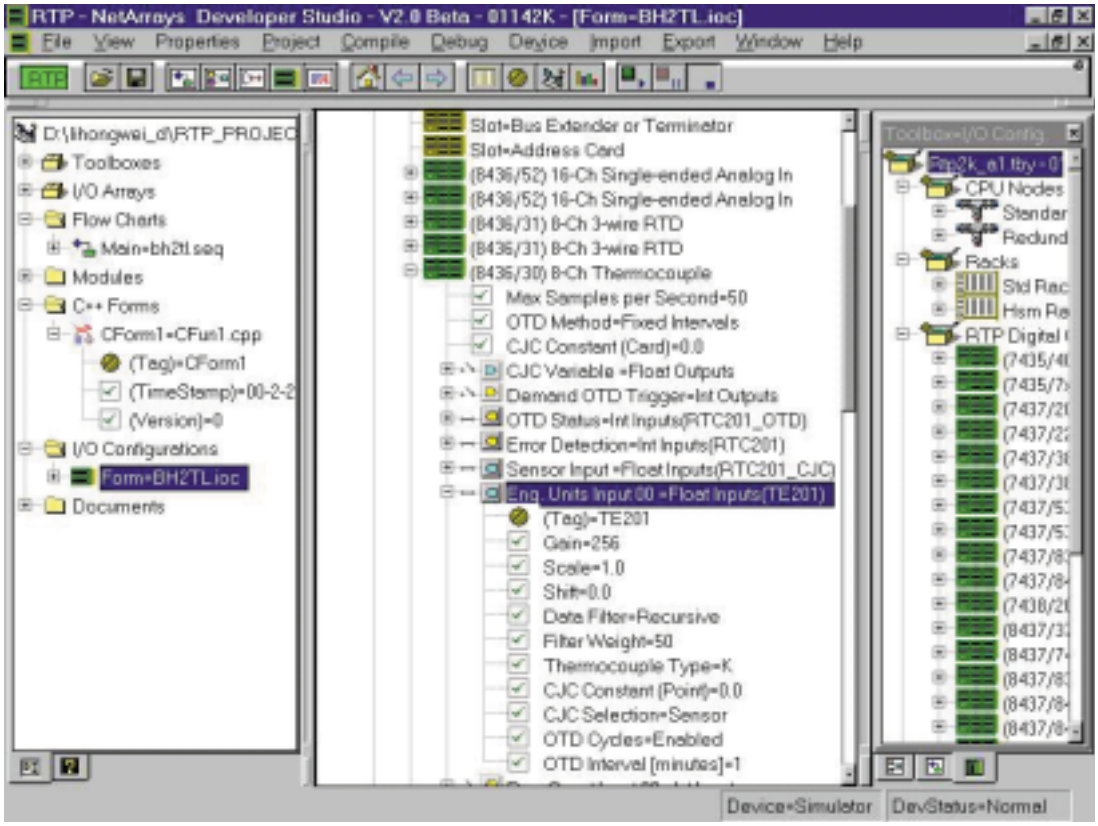

Figure 2 NetArrays graphical configuration

Based on the data communication network as described above, Citect's network functions are as follows:

- Any computer in the company can open an on-line graphic display to monitor the process.
- When measurements of the 20 most important parameters of the system, such as temperature, pressure, flow, and level are out of limits the SQL server will send the tag name, time, and value to the NetServer.
- All information from the SOE (Sequence Of Events) recorder is sent to the NetServer for on-demand report generation.

RTP's NetArrays software provides process data, such as water, steam, gas, and electricity usage to the NetServer for Citect energy accumulation shift reports. These types of data are not allowed to be changed by the operators. Only the network manager has the access rights to reset of modify them.

Performance of control system

BaoSteel Corporation system size:

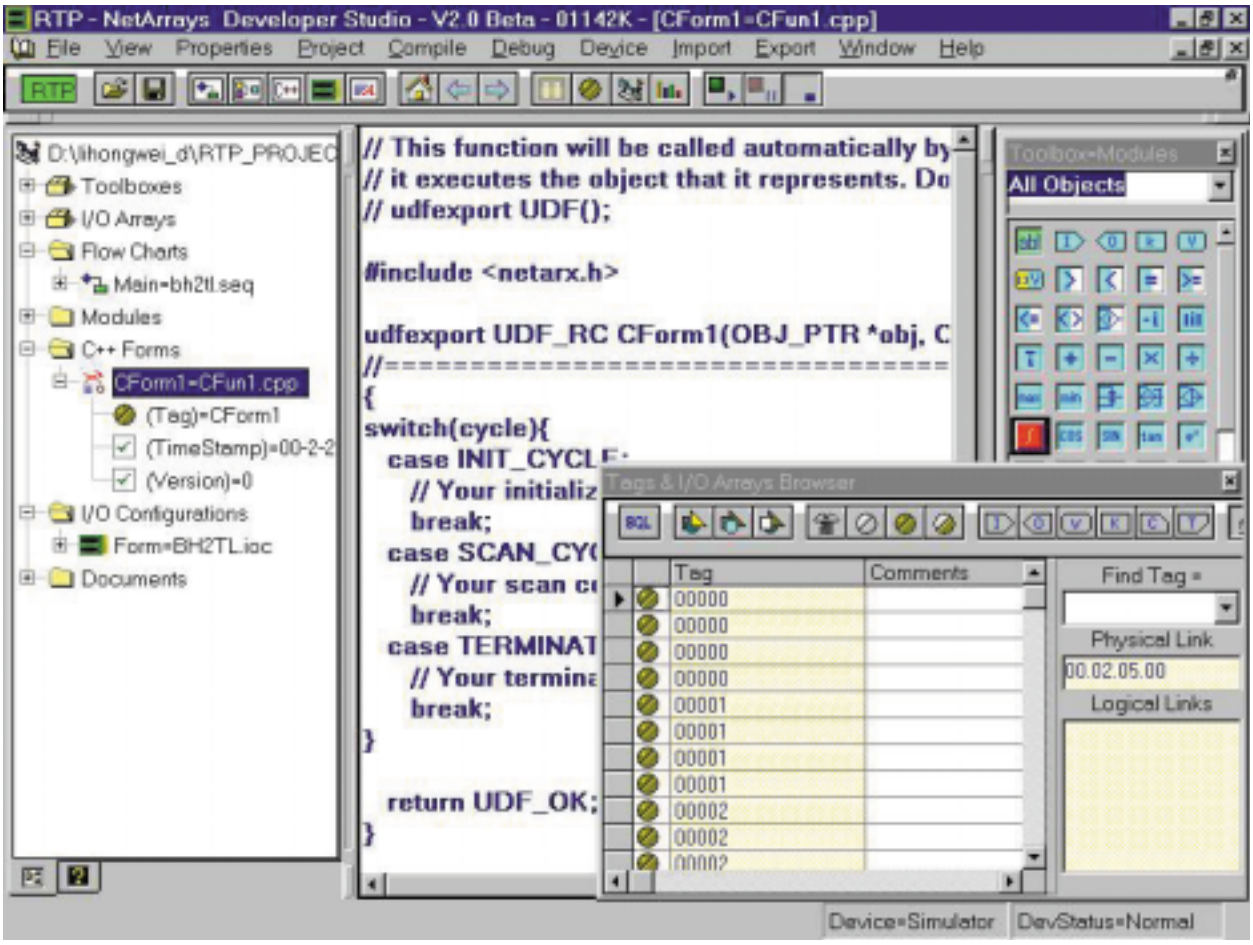

Figure 3 NetArrays C programming form

Analog Input Cards	12
Analog Output Cards	12
Thermocouple Cards	5
RTD Cards	8
Digital Input Cards	20
Digital Output Cards	8
Pulse Input Cards	1
Total I/O Points	500

With the exception of the Pulse Input cards, all of the I/O cards listed above are configured with hardware redundancy. In the event that an I/O card fails, the system will perform a bumpless switchover without affecting normal system operation. BaoSteel was quite satisfied that all of the RTP I/O successfully passed testing prior to system start-up. The performance of the control system benefits from the 16-bit converters, transformer isolation, optical isolation, advanced software filters, and high Common Mode Rejection Ratio (CMRR) technology used by RTP.

The RTP 2200 Hybrid Control System is based on the 586 microprocessor, combining the PLC's fast scan

and the DCS's fixed scan capabilities, which is 4 to 10 times faster than a normal DCS and PLC. Configured with 60 PID loops and 3500 floating point calculations, the BaoSteel control system runs at the rate of 50 passes per second. During each 20 millisecond pass, the RTP 2200 scans all I/O, performs all Boolean equations, completes all analog calculations, transfers all global variables via peer-to-peer communications, and provides updates to the operator stations.

RTP's NetArrays software, an object oriented graphical configuration tool, is used to configure the RTP 2200 with analog control, digital logic, ladder logic, and sequence control. ByboCon software is used to for process optimization and interfaces with the RTP 2200 Hybrid Control System via Citect.

Interlocks are used by the Desulfurization Control System for startup and shutdown. To trace and analyze any failures, the RTP 2200 Hybrid Control System employs SOE (Sequence of Events) processing with a 1-millisecond resolution. When a digital input changes state, hardware on the input card will generate an interrupt to the RTP 2200 target node controller. The event is time-stamped and the status variable is recorded. Citect SCADA software retrieves and records all SOE information for analysis by the customer to determine when and what occurred.

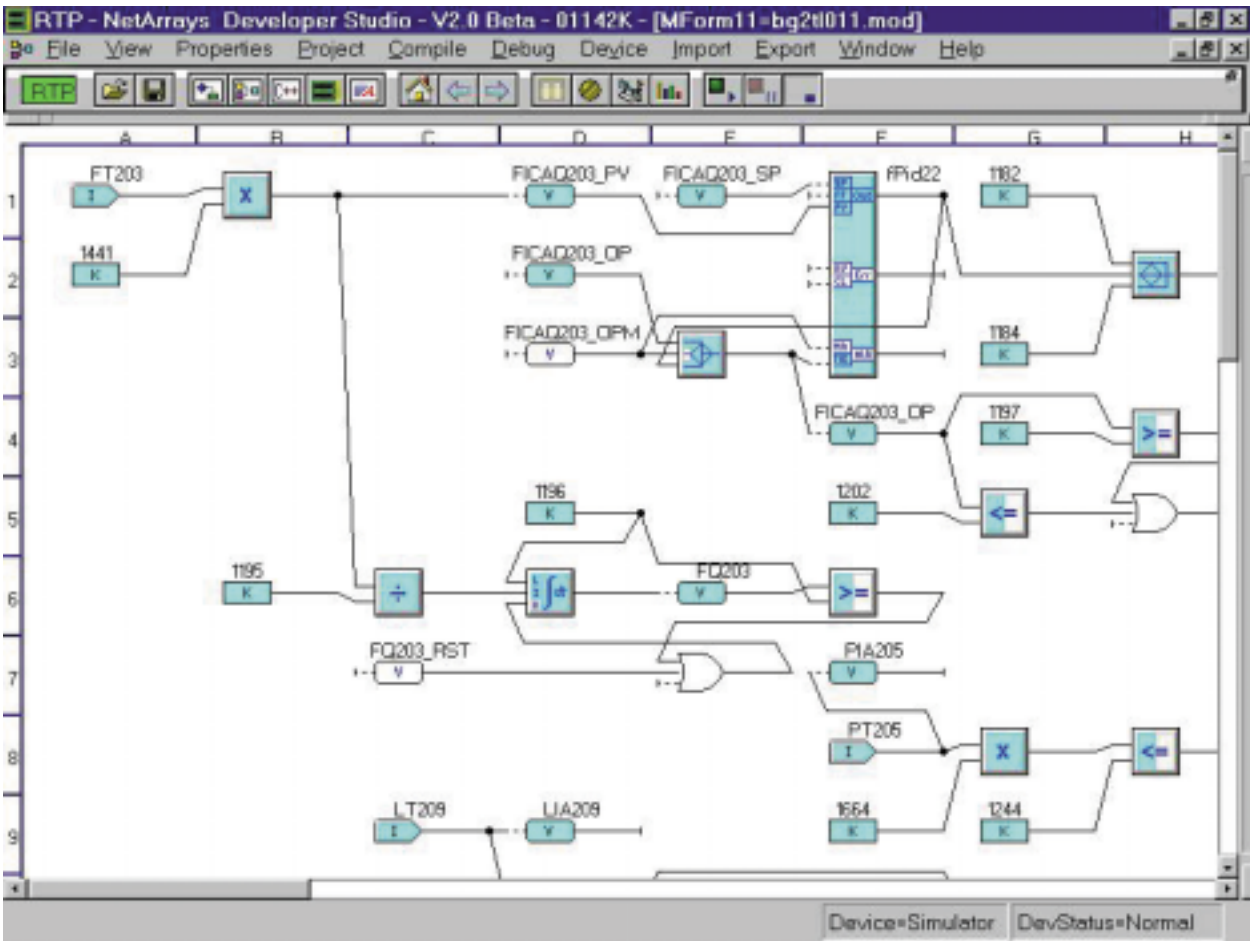

Figure 4 NetArrays object-oriented logic configuration