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Mitsubishi Chemical Builds Safer and More Reliable Emergency Shutdown System Using DCS Integration

Kashima Plant (Tobu Zone), Mitsubishi Chemical Corporation, through EPC contract with Chiyoda Corporation

Project Background

To process a greater variety of materials and improve global competitiveness, Mitsubishi Chemical Corporation's Kashima Plant (Tobu Zone) and Mitsubishi Chemical Engineering Corporation contracted with Chiyoda Corporation in May 2004 to construct an additional fractioner for an ethylene plant. Yokogawa's CENTUM CS 3000 R3 was selected as the new control system. After carrying out an extensive study, the customers decided to employ ProSafe-RS as the emergency shutdown system instead of conventional relay-based systems in order to:

- Meet the IEC 61508/JIS C 0508 functional safety standards
- Proactively introduce leading edge technologies
- Accommodate the plant licensors' safety, reliability, and maintainability requirements
- Improve the monitoring and operation functions of the emergency shutdown system



The Challenges and the Solutions

By introducing the ProSafe-RS, the Kashima Plant improved safety, reliability, monitoring, and operation as follows:

- Dramatic improvement in plant safety through compliance with IEC 61508/JIS C 0508 SIL3
ProSafe-RS is certified to comply with the IEC 61508/JIS C 0508 (up to SIL3) international functional safety standards. This affirms that a plant will be securely shut down whenever a critical condition occurs, greatly improving plant safety.
- Achievement of high-level safety while minimizing erroneous trips
ProSafe-RS maintains plant safety at a high level while keeping to a minimum unnecessary trips triggered by a system's own abnormalities. Mitsubishi Chemical's system incorporates redundant CPU and I/O modules that can avoid almost all erroneous trips, contributing to increased reliability and plant availability.
- Improved centralized management of plant information through CENTUM CS 3000 R3 integration
Plant information can be centrally managed thanks to ProSafe-RS's capability to achieve true integration with the CENTUM CS 3000 R3, enabling ProSafe-RS inputs and outputs as well as system operation statuses to be monitored on CENTUM's human interface stations. Emergency operations can also be initiated on the CENTUM stations for better emergency preparedness.

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Customer Satisfaction

Takayuki Aoyama, Team Leader of the Instrumentation Group at the Maintenance Technology Center, commented:

“Usually introducing a new thing takes time: you must collect various kinds of information about it, then study actual records, reliability, and technological factors. This is even more so when you consider introducing a product that is used to guarantee safety.

This is where ProSafe-RS comes in. Safety instrumented systems can be evaluated according to international standards and certified by a registered certification body. This spares users the trouble of conducting a feasibility study. The safety standards cover a wide range of items and are thorough about maintaining safety during the detailed design phases. As the system design utilized probability theory, engineers are better able to give a logical explanation of it to third parties.

Introduction of the new safety system was a big decision for us as the existing interlock used hardware relays. As we understood the standards as well as the configured actual hardware and software, however, we were convinced that the new system took safety into much greater consideration than conventional systems and that we had made the right decision.

Interlock-related equipment is growing more complex as it is required to ensure safety against all types of failures, and the same was true when panel instruments were replaced by distributed control systems (DCS). For this reason we employed the ProSafe-RS safety instrumented system. We also believe that the time is approaching when all hardware relays will be replaced by CPU-based systems.”

