

Keeping Big Blue's Research Safe and Productive

Another KCC Software Application Story

When IBM needed a control and delivery system for Silane gas at the T. J. Watson Research Facility in Yorktown Heights, NY, they turned to KCC Software. Silane gas is essential in the manufacturing of semiconductors as it is the ultra-pure method semiconductor and solar panel manufactures choose to apply silicon to their products. The SiH₄ compound, however, is extremely volatile and will combust if exposed to atmosphere. Thus, the storage and delivery of this gas to their many labs had to be handled very carefully.

In addition to the storage and on-demand delivery of the gas to dozens of production tools in multiple labs, the system also manages many automated purge routines to safely remove the dangerous gas from several points throughout the entire distribution network. Many of these purge routines require synchronized processing by multiple PLCs. Thus, networking and PLC-to-PLC communication was a central aspect of this system. The system incorporates an interface to IBM's facilities monitoring system. Dozens of feedback states keep IBM's central monitoring system aware of the system's health and safety status.

The Silane distribution system that KCC Software designed and developed is a network of six PLCs, remote bases, touch screens, and a supervisory PC. The main PLC is a DL-205 series PLC with a 260 CPU from AutomationDirect. This PLC has three Ethernet connections, multiple analog and thermocouple inputs cards, multiple discrete input cards, and multiple discrete output cards distributed through the main and remote bases. Each lab in the research center has a DL-06 PLC also from AutomationDirect. All PLCs are networked through 100 Mbit Ethernet connections using the Ecom100 cards.

Each PLC has a C-more touch screen from AutomationDirect with interactive graphics and password protected configuration and control of the system. Additional 15" touch screens are located in critical points throughout the facility allowing personnel to view the status of all PLCs, the central distribution system, each lab control system, and the status of each tool receiving gas from the system. The touch screens also include the operations manual on-screen allowing quick references to the system documentation at any point throughout the facility.

One of the features provided by the touch screens is that all pressure transducers and thermocouples are trended with key alarm setpoints included in the trend graphs. If a problem should occur at any time, IBM will be able to review the key system operating parameters looking for abnormal behavior.

The touch screens also track active alarms latching all alarms until IBM personnel have acknowledged the alarm. An alarm history is maintained showing the date and time and state/value of any process parameter when an alarm occurred and the date and time when the alarm was acknowledged and the date and time when the alarm condition cleared.

Alarms are color-coded based on the severity of the alarm and the acknowledged state of the alarm.

The system includes a supervisory PC that offers a central database for all process parameters and alarm for every component in the system. This supervisory application was developed using Think & Do with a Modbus interface to each PLC. The PC application includes interactive, color-graphic screens showing the active state of the entire distribution system with current valve states, active gas flow, and all pressure transducer readings. This system incorporates more than 130 valves and more than 85 transducers.

In addition to the control systems and supervisory system, key personnel at IBM have visualization into the systems through a web browser on their desktops. This allows immediate knowledge of and reaction to critical alarms and events. The dangerous nature of this gas and the central demand for it throughout the research facility requires continual and timely information from all of the monitored points. The design of this system insures that IBM will always remain informed and able to react quickly to any Silane gas event.

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