ARCNET's Real-Time Performance Critical for Gas Turbines

Many control systems for gas turbines depend on ARCNET® technology. When one company that manufacturers gas turbine control systems wanted increased fault tolerance in the system's triple modular redundant architecture, they depended on ARCNET.

Triple modular redundancy uses two-out-three voting to allow for high reliability. The objective of triple modular redundancy is increased fault tolerance, enabling any single-point failure to be diagnosed and repaired while the system is online. In order to attain increased fault tolerance, the engineers realized that the system called for a higher bandwidth—nearly 2 Mbaud.

"ARCNET can't be beat for its speed and bandwidth in this application," said one engineer. "Although the default ARCNET speed is 2.5 Mbps, ARCNET can operate as high as 10 Mbps. ARCNET's token-passing protocol technology is of particular significance for this system since timely responses and coordinated motion are required. This deterministic protocol enables the synchronization of all the system's controls in a predictable fashion. ARCNET's high-speed 2.5 data rate responds quickly to short messages which provides faster downloads."

To interface the system's three controllers to the ARCNET local area network (LAN), an adapter would be inserted in each Human-Machine Interface (HMI) system. The engineers said the HMI unites all the displays and functions needed for real-time control and monitoring of turbo machinery methods, auxiliary apparatus, driven devices and process alarms associated with power plant control.

The engineers chose Contemporary Controls, a leader in ARCNET technology, to develop an adapter that had the PCI interface the HMI system required.

Contemporary Controls enhanced the PCI20U, which uses the 33 MHz PCI bus to reduce message handling time and improve data throughput. The engineers said the adapted PCI20U provided overall system efficiency. It incorporated the newer COM20020 ARCNET controller chip. New performance and integration enhancements included command chaining operation and an internal 2K x 8 RAM buffer.

Connection of the HMI PC to the control system's panel(s) was through Contemporary Controls' MODHUB-16 modular active hub via coaxial cable. This link ties all the control system's controllers and PCs together. In this application, copper grounding was essential because it reduced noise and improves control. Turbine generators can produce more than 20,000 Amp at high voltage, making noise immunity critical.

Multimode fiber optic cabling and repeaters were implemented to accommodate longer distances between the operator-interface computer and the turbine control panel. Because of the hub design, the MODHUB-16 could have a coaxial or fiber interface to provide the most flexibility in cabling within a power plant. These 4-slot chassis hubs offered worry-free operation using low-power, low-heat CMOS components: high-efficiency LED lights; plus a special cooling system inherent in the design; and network diagnostic capability utilizing LED indicators. A universal power supply accommodates world-wide voltages and frequencies.

The MODHUB-16 is UL 60950 Listed, Safety of Information Technology Equipment.

Contemporary Controls delivered "superior service, rock-solid delivery and consistent product supply," the engineers said. "With Contemporary Controls, we don't have to worry - we know it will happen on time without a hiccup."