

PEI has served as I&C and Integrator of Record subcontractor to various process facilities throughout Oregon. One water treatment plant support utilizes a control architecture that includes redundant PLC5 ControlNet processors, five (5) remote ControlNet adapters, a fiber-optic network, local networks for valves (using an EIM modified Modbus protocol) and motor controls (DeviceNet), a telemetry system for remote transmitters, two stand-alone PLC 5 Ethernet processors, six (6) vendor-furnished PLCs, and a Wonderware based Operator Interface (OI) system, an Industrial SQL data acquisition system with a complete report generation function. The facility has a capacity from 15 MGD up to 70 MGD and the I/O for this system is fairly complex including several thousand data points and sophisticated instrumentation.

During the construction of this facility, PEI was responsible for complete system integration and instrumentation procurement. PEI used the initial design and functional descriptions of the plant control system as a basis to develop the detailed design and the ultimate implementation of these control strategies. During the proposal phase of the project, PEI analyzed the control architecture and provided numerous suggestions and alternatives with an analysis of the pros and cons of each to provide a basis for determining the final structure of the plant I&C. PEI identified areas where the design could be altered to save the project money and other suggestions that would provide a more reliable system.

Based on our previous experience, PEI recommended using a NAD (network application development) configuration with one master SCADA program with the graphics on all other nodes being automatically updated from this one application. This included suggesting the use of redundant I/O servers, with each gathering field data for display or logging on the SCADA system. This approach minimized the network traffic when compared with completely stand-alone operator interfaces while preventing the failure of a single PC from disabling control of the plant. PEI played a critical role in the detailed control strategies employed by the plant.

Many of the plant operations, such as the filter operations and backwash cycles, required significant fine tuning and needed to be customized to the specific reactions of the installed equipment. These functions necessarily had to be field determined through trial and error and PEI supported these procedures.

In other systems, unforeseen issues arose during the installation that required reconfiguration. One example of this was inspired in part by a faulty pressure regulating valve on the main supply to the city. The plant had to remain in production before the valve could be repaired.

PEI developed a control scheme that would regulate the high service pumps not only to the operator selectable flow setpoints, but also dynamically limited the pump speed to control within pressure limits so that the distribution system would not be over-pressurized. PEI also added a feature that would allow the operator to change the flow setting at will without damaging the distribution system.

The operators could set the set-point at a very high level at any point that they needed to increase production, and the new set-point would gradually increase until it reached the maximum amount allowed by the pressure regulating control circuit without any additional operator interactions. Following the commissioning of the plant, PEI integrated Wonderware's SCADAalarm system under a separate contract.

During the end stages of the installation, there were a variety of factors that lead to rapidly changing start-up and checkout schedules. It was quite common for the schedule I&C commissioning to change between the morning meeting and that same afternoon. This is to be expected in a large and complex system. PEI was prepared for this eventuality and had all the required basic programming tested and in place well ahead of schedule. We were consistently checking out the installed wiring terminations as quickly as possible, so that when a system was required to go on-line, PEI was able to support the process without delay.