

Crusher Control

The controls for the primary crusher system in a taconite mine were aging. I was tasked with developing and designing a control system to improve reliability and relieve burden from the operator.

A week was spent at the facility to gather data. During that time I researched the electrical schematics of the existing system, comparing the drawings to the as-is condition of the equipment. By interfacing with the electrical maintenance staff I was able to have access to various marked-up drawings that gave insight into modifications that never made it to the formal drawings, clearing up many inconsistencies in the drawings. Also during this visit I spent significant time with the operators of the equipment in the crusher facility. The time with the operators allowed me to acquire a sound understanding of the system's operation in both normal and abnormal modes.

I prepared a conceptual overview of the crusher control system and reviewed that overview with plant management. Upon their approval, I prepared detail drawings for the procurement of components and system installation. The drawings included:

- Schematic diagrams for each motor control circuit and process control loop. These diagrams are prepared with the intent of providing a clear understanding of the circuit operation by arranging the components on the drawing in a manner that clearly depicts signal flow. All terminal locations are identified to facilitate troubleshooting by plant staff.
- Facility diagrams identifying the locations of all control boxes, junction boxes, and routes for cable, conduit, and cable tray.
- Cable schedule listing all cables that needed to be pulled for the project. This schedule included types of cables, system identification number for each cable, origin and destination, and length for each cable run.
- Panel diagrams depicting the internal arrangement for each electrical panel including internal wiring, shielding, and grounding. These diagrams were used as the primary technical specification for procuring the electrical panels, including the main control panel, a floor standing panel that housed a programmable logic controller (PLC) and associated support equipment.
- Wiring diagrams for each electrical panel showing the terminations of the external cables. These diagrams are prepared as a tool for electricians during system installation.
- Programming document that defined the programming for the PLC.

The project was presented to plant management and the electrical maintenance department who received it well. The electrical maintenance

department agreed that the drawing package provided clear guidance for them to proceed with procurement of equipment and installation.

Unfortunately, after the orders for the equipment were placed, this facility was shut down for economic reasons. Although the final success of this project will never be known, it was a good example of coordinating with plant management and operating personnel at an industrial facility and developing a system design package that was thorough and complete and well received by those who would perform the installation.