



A Rockwell Automation Company

## Hibbing Taconite Company Plant Wide Control Upgrade

### The Client:

Hibbing Taconite Company (HTC) is producer of iron ore pellets. HTC operates an open pit mine and processing facilities near Hibbing, MN. HTC is owned by Bethlehem Steel Corporation (70.3%), Stelco Inc.

(14.7%), and Cliffs Mining Company (15%). HTC produces 8.3 million tons of high grade iron ore pellets annually.

### The Requirement:

The crude ore is conveyed into one of nine 36 foot diameter autogenous grinding mills, each equipped with two 6,000 HP motor. Water is added and as the ore tumbles it reduces itself to a powder fineness. Following two stages of magnetic separation, which extracts high grade magnetite particles, a concentrate averaging 66% iron is delivered to the agglomeration plant.

In the pellet plant, the concentrate is thickened and all but 9% of the water is removed by vacuum filters. The moist concentrate is mixed with bentonite and conveyed to large rotating drums where it is rolled into "green balls".

The "green balls" are next conveyed into one of three traveling grate furnaces and heat hardened at 2450°F.

The hardness permits the pellets to be transported by rail and shipped with minimum breakage. The pellets have physical characteristic that make them ideally suited for a blast furnace. Iron ore pellets make up the largest percentage of the blast furnace charge. Pellet quality has considerable impact on blast furnace efficiency.

The existing control system is a relay based system. The current system provides no information on the cause of a shutdown. Considerable manpower is spent trouble shooting equipment problems resulting in loss production. A control system in each of the process areas that provide a view of the process and the cause of equipment shutdown was required.

### The Design Solution:

Hinz assisted Hibbing Taconite Co. in the development of a plant control system that integrated the existing PROVOX DCS system and existing PLCs.

Hinz reviewed approximately 1400 motors and pieces of equipment, operating documents, and current operating practices. It was determined that 1100 motors and pieces of equipment along with 500 process instruments required monitoring and/or control. This review also allowed the development of standardized motor and equipment control schematics. This allow the use of automated drawing generation techniques. These techniques reduced the engineering effort and provided HTC maintenance personnel with construction drawings to meet the shutdown windows in a timely manner. It also provided a standard control design basis for future equipment.

This standardize control scheme was implemented across all the various makes of motor control centers within the facility. This allowed for all motor control alarms to be monitored along with equipment protective devices. Each alarm and protective device would be monitored and "first out" alarming provided. This allows the operators to

provide the maintenance personnel with the cause of the shutdown and a rapid resolution of the problem.

The new control system required 19 new Allen-Bradley (AB) 5 PLCs and the integration of 15 existing PLCs. The PLCs communicate to the DCS system through AB's ControlNet Data Highway. In addition, all the PLCs are interconnected with AB's Data Highway + for PLC to PLC data transfer and programming. Existing push-button control panels on the plant floor have been replaced with AB Panel View operating panels.

The structured design was carried to the PLC program with tightly defined file and code structure. This well defined program structure allowed for automatic code generation based on the type of motor. The automatic code generation greatly reduced generation times and keypunching errors.

Hinz personnel commissioned the PLC portion of the control system while the PROVOX upgrade was controlled by HTC personnel.

