

Steel Mill Modernized with PLC[®]-Based Control System

PCS PROGRAMMABLE CONTROL SERVICES



- Industry:** Metals, steel
- Products:** PLC-5/60™ programmable controller, Bulletin 1771-DMCI control coprocessor
- Application:** Automated rolling mill control system, with automated material handling

When an aging steel mill in Utah closed in 1986, many experts in the steel industry believed the mill would never open again. Fortunately, a strategic maintenance program preserved the plant's equipment during the shutdown and averted mothballing.

The mill resumed operation in 1987 under new ownership and has since

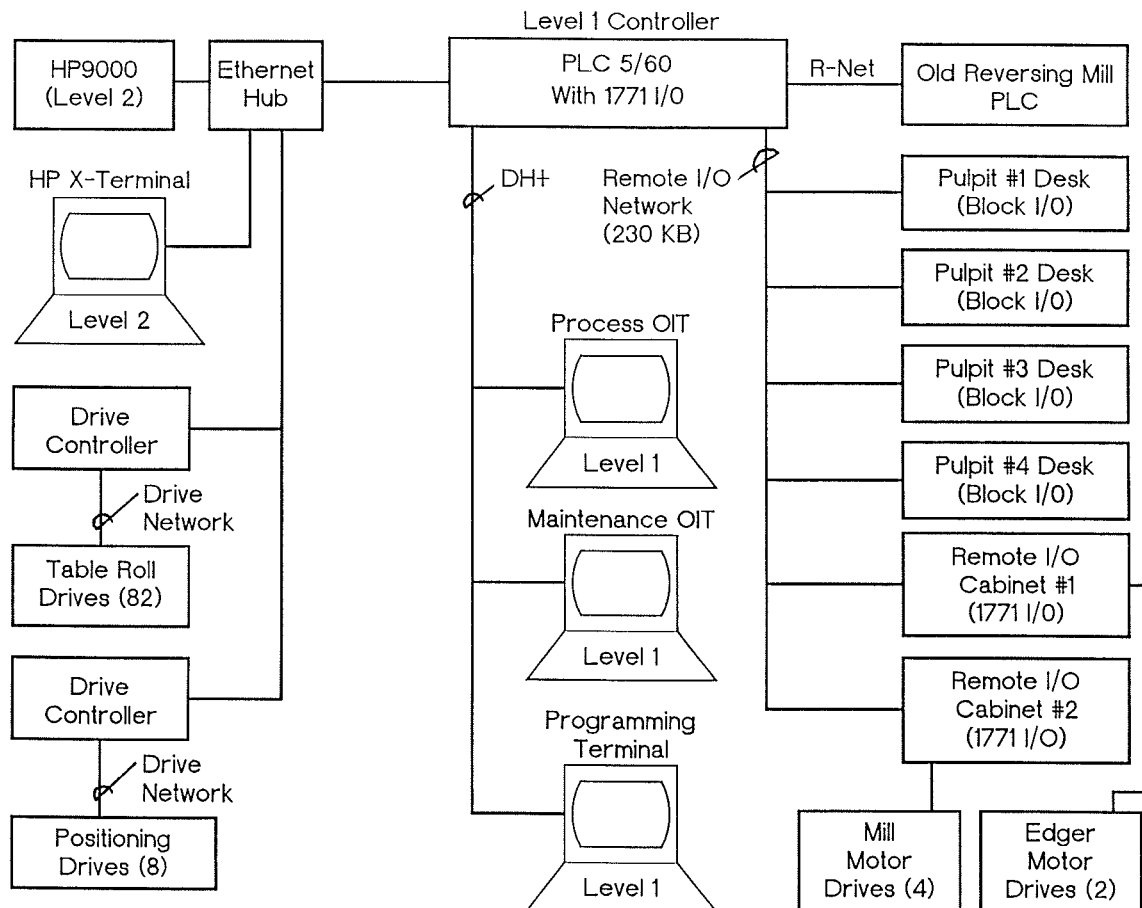
become a major supplier of steel plate, coil and pipe products. After reopening, the mill replaced its original open hearth furnaces with a Q-BOP process and just recently commissioned a new continuous caster.

To meet the long-term goals of fully utilizing the 124-inch-wide capacity of the continuous caster and producing

large coils of wide plate, the mill also modernized its rolling operations downstream, while the caster was under construction.

The original rolling equipment consisted of an under powered 132 inch broadsiding mill, followed by a reversing mill and then six finishing stands. In the past, wide plate was produced by rolling short bars in the broadside mill, rotating the bars 90 degrees, and completing the rolling process in the reversing mill. This limited the length of wide product because only very short bars could

NEW 132" REVERSING MILL CONTROL ARCHITECTURE



be rotated after one pass and still fit through the broadside mill. Now, bars up to 124 inches wide with starting lengths of up to 45 feet can be easily rolled entirely by the broadside mill in just a few passes before being sent to the finishing stands.

To achieve this new capability, the broadside mill was converted into a new reversing mill. Its main mill motors and drives were upgraded by the installation of four 5,500-HP motors and modern drives. Edger motors and drives were upgraded. Eighty two mill entry and delivery table section motor drives were replaced. Screwdown and sideguide position regulating drives were replaced.

Programmable Control Services, Inc. (PCS), entered the scene in mid-1993 as the steelmaker was searching for a qualified control systems integrator that had the resources and talent to handle all aspects of Level I control systems engineering for the broadside mill conversion project. The steelmaker selected PCS for the project because of the integrator's long involvement with the metals industry, its expertise with drives, and its expertise programming the Level I control platform and operator interface software. PCS's ability to take responsibility for the Level I control system electrical designs, its in-house

panel fabrication services, and its ability to design and supply custom-built, stainless steel operator desks were also attractive to the customer.

When PCS initiated the project, many control system architecture issues remained unresolved. One significant issue was related to the Level I control platform chosen by the customer. The platform had strengths in areas such as drive control and connectivity with the existing old technology controllers but was difficult to program, document and maintain.

Also, most of its program had to be compiled. This meant that on-line editing was not possible and that there would be a downtime whenever a program revision was downloaded. However, because connectivity was such a significant issue, the customer felt resigned to commit to the platform regardless of its shortcomings.

The connectivity issue was the most important concern because the new Level I control system had to communicate with the Level II computer to obtain rolling pass schedules and upload real-time process data. Level I also required Ethernet connections with the table roll and positioning drive controllers and a serial communications link with the old reversing mill PLC

controller, so rolling operations could be coordinated between the two mills.

Addressing the customer's concerns and preference for a more suitable but equally capable Level I control platform, PCS proposed an alternative architecture based on the Allen-Bradley PLC-5/60 programmable controller. The new architecture incorporated Allen-Bradley Bulletin 1771-DMC1 control co-processors for the Ethernet interface to Level II and drive controllers and also for the serial connection with the old reversing mill PLC controller.

The architecture recommended by PCS is now in place today because it satisfied all of the customer's most important needs. The operators have said how much they prefer working with the new control system and interfaces. Maintenance technicians find troubleshooting an easy task. Mill uptime has improved significantly, and the rolling mill is starting to break all-time production records. The old reversing mill is gradually being relegated to back-up service only.

Plant and mill modernization investments, large and small, can and do pay off, particularly when the best new control technologies, equipment and software are applied in well conceived and implemented design solutions.