

Application Story:

EX-CELL-O RETROFITS HEALD GRINDER AT EATON

Eaton Corporation's facility in Roxboro, North Carolina is a major supplier of hydraulic lifters and associated components for the automotive market. A key machine tool in their operation is the Heald 1VL, an I.D. grinder utilized for the finish grinding operation on these critical engine components. This Heald grinder was originally equipped with an early generation Siemens 3G CNC, used to control the X/Z linear axes, high-speed grinding and dressing spindles (60,000 and 54,000 rpm, respectively) and an automatic load/unload device. Also, the original design of the machine incorporated size gauging and control.

The older CNC was built in the 1980s, specifically designed for the operational parameters of the grinder and had adequate power and flexibility for its time. With internal dressing and size control functionality, it had performed adequately at Eaton for many years. As with all controls, however, it eventually became more difficult to maintain and downtime became an issue for Eaton engineers. After careful examination of the available controls, as well as the main frame and other mechanical components onboard, the decision was made to retrofit for improved efficiency and on-pace production.

Eaton and EX-CELL-O (Sterling Heights, Michigan) collaborated on this retrofit project. They approached the task from a joint venture perspective, in the sense that EX-CELL-O would manage the controls integration, machine software, interface design, electrical design and implementation of the new system, while Eaton would manage the mechanical aspects of the project. Eaton would furnish most of the major new components that were already inventories, i.e., those not associated with the control system. These included relays, switches, terminals and other items that would be reused from the original design, where possible.

The original electrical cabinets would also be reused, it was decided.

Since Siemens, the CNC supplier in Elk Grove Village, Illinois, no longer made a dedicated control for the grinder, a suitable CNC was selected from the current standard line of Siemens product. The SINUMERIK 810D CNC was chosen for the following reasons, as determined by Eaton and EX-CELL-O engineers:

- Compact design-drives and controls are in the same package, resulting in a considerable space savings
- Digital axis drives-digital drives and absolute encoders minimized hardware and had definitive size advantages for the application
- HMI interface-compact design of the CNC control interface kept the control console in the same package
- Custom cycles-Siemens cycle programming eliminated some programming of grinding cycles.
- Imbedded PLC-powerful Siemens Step 7 imbedded PLC controller further enhanced the HMI protocol

The original Heald grinder controls console required some redesign, as the Siemens SINUMERIK 810D control panels are slightly wider than the original System 3. However, the redesign was achieved, with the capability of mounting to the existing pendant support arm on the machine.

The PLC interface was accomplished with Step 7 PLC logic with separate I/O Siemens hardware that provided a more compact design and easily interfaced with the existing I/O terminal connectors.

The SINUMERIK 810D is a compact, PC-based control that is used for simple to medium-range CNC applications. It features an integrated NC,

Above left: Old System 3G control onboard the Heald grinder at Eaton was still performing, but maintenance and downtime issues lobbied for a retrofit.

Above right: Part chuck drive motors and many mechanical components were used from Eaton inventory to affect the retrofit, again resulting in additional savings.

New Siemens SINUMERIK 810D CNC console, installed utilizing the same framework and on the same pendant swing arm, thus saving time and money for the customer.



PLC and is capable of handling up to six axes and two spindles. SIMATIC PLC consists of standard hardware and software components that can be individually tailored to the task at hand. It is the standard automation system for controlling the widest variety of machines and plants.

The existing program format was used to maintain the operator compatibility with the old programs. The old programs were approximately 75% transportable with modifications implemented to those areas that required new functionality. This minimized operator impact with new equipment since the operator controls and the program parameters were basically the same as the old equipment.

Special operator interface screens were designed to match the original parameter values, reducing the need for extensive training of the operator interface system.

Fault and Operator Messages were programmed to minimize downtime and give as much information as possible to the operator and maintenance personnel.

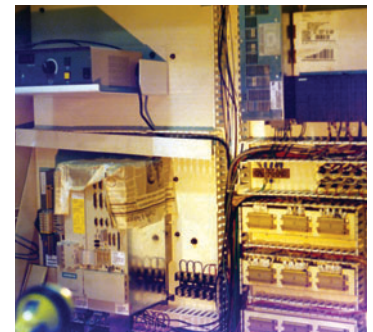
Eaton engineers Rick Gentry and Jim Guess have reported over 11% increases in the overall productivity of the Heald grinder, with the additional advantages of improved throughput and enhanced accuracy since the retrofit.

The retrofit project at Eaton required approximately six weeks to implement and obtain customer approval. ■



Above: The dresser and grinder spindles on the Heald machine run at High RPMs, controlled by the new CNC onboard. Eaton engineers report substantial improvements in the productivity of the machine, following the retrofit.

Below: I/O connections were utilized from the original equipment onboard the Heald I.D. grinder at Eaton in Roxboro, North Carolina.



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