



Giddings & Lewis 410-102 Mill Control Retrofit

Customer: The Harrison Steel Casting Company - Attica, IN
System Integrator: MasterControls Inc., L.L.C. (MCI) - Pendleton, IN

The Harrison Steel Casting Company was formed in 1906. Harrison is known as being one of the world's largest producers of top quality carbon and low alloy steel and ductile iron castings. The company has been family owned and operated since its inception. The facility is approximately 650,000 square feet and employs more than 800 people. They serve the mining, construction and power transmission industries.

Harrison continuously seeks to add machining capacity for their customers. By retrofitting new controls onto existing equipment, they are able to increase reliability and productivity. This means more parts out the door to meet their customers' needs. The new control also gives them the ability to produce higher quality parts.

The G & L 410-102 Mill was originally a four axis manual mill. In the early 1980's, the machine was converted to CNC control using a GE 2000 CNC Control. The GE 2000 was a good control when it was added, but was becoming difficult to service and maintain. The control finally failed altogether, so Harrison had to look for a quick solution. They started looking for a new control and an integrator to perform the retrofit.

Harrison was familiar with **MACHINEMATE** CNC products. They have many Giddings & Lewis machines in their facility. Their used machinery dealer is a **MACHINEMATE** distributor and has a long relationship with **MACHINEMATE** and Giddings & Lewis. Harrison looked at a few control options but decided to pursue a **MACHINEMATE** solution. Upon deciding which control they were going to use, Harrison contacted MCI and started the retrofit process.

After the initial contact from Harrison, Jeff Petry from MCI made a visit to the customer's site. During this site visit, he performed a thorough evaluation of the control requirements. All control requirements were discussed with the engineers and operators. It was important to understand the expectations before the project could be quoted properly. Copies of machine manuals and schematics were collected for further study.

The goal of the retrofit was to reuse as much machine hardware as possible. With this in mind, MCI was able to keep both retrofit costs and installation time to a minimum. The customer wanted to keep the existing axis and spindle drives and motors. MCI also wanted to keep the magnetics cabinet in place to minimize any required rewiring on the machine. By doing this, MCI could build an operators pendant and CNC control panel off-site and bring the panels to the site for a quick installation.

All of the control engineering and panel building was performed off-site. When the retrofit package was completed, a time convenient for the installation was set. The retrofit package was delivered to the customer site and the installation began. Installing the control and operator pendant and doing the wiring in the magnetics cabinet took two to three days. As soon as the installation was powered up and tested, the operator



started preparing a part for machining. By the end of the week, the operator was trained and comfortably running parts.

Most of the part programming is done by the machine operator at the machine. More complex parts require the use of a CAD/CAM system (GibbsCAM). Parts created at the machine as well as those created with the CAD/CAM system can be graphically checked on the machine control. Programs created using the CAD/CAM system are copied onto a USB memory stick and then taken to the machine and loaded into the control. This is another advantage of using a modern CNC. Many standard USB devices can be hooked directly to the CNC. All part programs, tool offsets and machine parameters can be stored to the CNC or saved from the CNC using many external USB devices.

The **MACHINEMATE** CNC Block Execution speed is incredibly fast. This is a very important feature when processing complex parts. You never see transitions or pauses during the execution of the part program. This yields extremely accurate parts with very smooth contours and surfaces. Smooth transitions from block to block reduce wear and tear on the machine mechanical parts. Less mechanical wear means many more years of service out of machines retrofitted with **MACHINEMATE** CNC controls.

Harrison is now planning to standardize on **MACHINEMATE** CNC controls. In the future, when they look at used machinery, they plan to add the cost of a control retrofit into their justification for the machine purchase. Planning to add the control right away helps them with standardization. Their operators and maintenance personnel will already be familiar with the control and they can stock parts for a standard control.

See the following pages for photos of the installation and a quick overview of the project scope.

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G & L 410-102 Mill

Large 4 Axis Horizontal Mill used to rough machine castings. Very large parts can be accurately machined on this mill with the new **MACHINEMATE** LW CNC control. The new Hoffman pendant arm gives the Operator Panel a wide range of motion and stable mounting platform.



G & L 410-102 Mill

Here is a front corner view of the machine. You are looking along the X-Axis. About midway up the picture, you can see the W-Axis Ballscrew and the headstock. The Z-Axis moves in and out of the headstock.



Old Operator Panel

The old Operator Panel was useable but had minimal functionality. Basic machine functions could be performed but any interaction with the part programs required being back in front of the old CNC control.



New Operator Panel

New Operator Panel with hand wheel and dual joysticks for axis jogging. Operators preferred using joysticks to jog the machine out of the way for part loading and for machine set-ups. Dual joysticks easily accommodate all four axes on the machine.



New MACHINEMATE LW CNC and I/O

This picture shows the new **MACHINEMATE** LW CNC and I/O. This new CNC really makes for a clean and compact installation. The CNC and I/O are easily accessible for maintenance and troubleshooting. All equipment is installed in a new enclosure with a heat exchanger.



New Op Panel and Control with Old Control Disconnected

In this picture, you can see the new Operator Panel and the enclosure containing the new **MACHINEMATE** LW CNC. On the right edge of the picture, you can see the old GE 2000 CNC sitting disconnected.



Quick Project Overview:

CNC

MCI replaced the existing CNC control with a new **MACHINEMATE** LW CNC control. This new control represents the state-of-the-art in modern CNC controls. The control has an intuitive, easy to use operator interface. This intuitive interface enables the operators to perform quick set-ups and adjustments. The operators love the ease of use.

The new control allows part-programs to be loaded via USB memory stick. The control also has a powerful part-program editor to allow for programming at the machine. Parts can be graphically checked right on the CNC. The customer does a large percentage of their part-programs right at the machine. When necessary to do the programming off-line, GibbsCAM CAD/CAM software is used and the resulting part-programs execute after being processed by the CAD/CAM system post processor. Again, these part-programs can be verified graphically at the CNC.

Another important feature of the new control was the ability to implement "AutoDrift Compensation". Older axis drives tend to have problems with motor drift. By setting up and enabling "AutoDrift Compensation", MCI was able to eliminate axis drift and optimize drive tuning at the same time.

Operator Panel

A new Operator Panel was mounted on the machine using a new Hoffman pendant arm. The new operator panel includes a 15" touch screen, hand wheel, dual joysticks, machine tool builder's panel with rugged keyboard and mouse.

Drives

The customer wanted to keep the original motors and drives. All Axis drives are AB 1391. These drives can be replaced later if necessary. The **MACHINEMATE** CNC is equipped to control a wide variety of Analog and SERCOS Servo Drives and many third party Spindle Drives.

Spindle Drive & Motor

Six months after the CNC Control retrofit, MCI was brought in to retrofit a new Spindle Drive and motor. The original AB 1392 Spindle Drive failed, so it was replaced with a Bardac Opti-Drive. A new 40HP Reliance Motor was also installed at the time of the drive replacement.

Position Feedback

The original Heidenhain scales were reused, but two of the converter boxes had to be replaced. The Z-Axis feedback device was a resolver, so we had to install a converter box between it and the CNC.

Note: Resolver feedback is not compatible with the new **MACHINEMATE** CNC control. If resolvers are used for feedback, a converter must be added in the feedback loop to convert resolver feedback to encoder feedback.

Magnetics

The magnetics cabinet remained in place and was largely unmodified. Some small wiring modifications were required by the retrofit.



Field Devices

All existing field devices remained in place for the retrofit. None of the limit switches, solenoid valves, lamps, etc. required replacement.

Installation Time

The new controls were installed in two to three days. This time included power-up, testing and machine checkout. Once the installation was completed, part set-up began. MCI was training the operators and running parts by the end of the week.

Integration Time

Integration time included producing machine schematics, creating a Bill of Material, ordering and receiving all the hardware, building the required panels for the CNC and the operator panel, writing all the machine logic and configuring all the machine parameters. This typically takes six to eight weeks from the time an order is placed to installation.