

EAGLE MANUFACTURING – Autom

The Automotive Industry in the United States has been challenged by increasing raw material prices and skyrocketing labor costs. This and the fact that Americans' overall automotive spending has decreased, leads to the requirement of more efficient machinery to make vendor parts more effective thus reducing overall production costs. A Highly Respected Tier One Automotive Supplier therefore decided to search out and purchase a machine that could guarantee higher throughput while at the same time reducing excess product scrap. This same Tier One Supplier sought out and presented all of their "wish list" requirements to Eagle Manufacturing Corporation. Eagle Manufacturing was given and met the challenge to develop an In-Line innovative notch & cut to length fabrication system that the profile fabrication industry was desperately waiting for.

Eagle Manufacturing Corporation, located in Shelby Township (USA, MI) is a recognized leader in the design and fabrication of a series of punching, sawing and notching systems for the Automotive, Home Building, Medical, Aerospace and Appliance Industry along with many other plastic, rubber, aluminum extrusion and roll forming industries.

After incorporating a mix of technologies from different manufacturers in the past the timing was right for Eagle Manufacturing Corporation to look for a new controller supplier who could offer an alternative solution for a new system requiring 22 servo axes. Eagle broke new ground with the application, since it had never used that many axes on a single machine before.

This newly developed Eaglematic™ notch & cut to length fabrication system designed and built for their Tier One Automotive Customer fabricates multi-diameter extrusions for automotive window trim components. This system incorporates four independent fabrication stations any of which can be automatically placed "In-Line" (within 5 seconds) to match the car model's two door coupe and four door sedan production run requirements. This instant tool change does not require the line's shut down or even the pausing of the other upstream stations feeding the Eaglematic™. This system is currently the largest ETHERNET Powerlink developed machine running in the US market.

B&R's USA Partner, Majority Controls who introduced Eagle Manufacturing to their partnership with B&R and to B&R's complete automation product range had to meet several specific design requirements including the need to link every single motion axis as precisely as possible to a high resolution encoder. In

addition, the end-user customer originally requested an Allen Bradley controller and HMI; however, the servo controllers were open for bid. Working with a tight space requirement, the complete controls solution had to fit a 2-door 72" enclosure. Later in the project the need for small local remote panels arose due to the huge dimensions of the machine and the proximity of the main control panel in relation to the operator interface requirements. Finally, the job had already been quoted and approved so the budget was tight and fixed.

At this point a meeting was held to introduce Eagle's customer to B&R. Eagle's customer wanted to review in detail the system design and inspect the proposed new hardware. After seeing the equipment and realizing the capabilities and level of integration of the Eaglematic™ functionality coupled with the B&R Power Panel including Touch Screen, Serial, Ethernet, and Compact Flash, the customer was quickly swayed into reconsidering and ultimately removing their original Allen Bradley requirement, turning the complete machine over to B&R controls.

The control solution B&R successfully provided to Eagle used ETHERNET Powerlink for communications between the main controller, a 10.4" B&R Power Panel PP200 and the 22 ACOPOS servo drives. One of the most critical process parameters of the system is the part length accuracy. On every single die head the part length becomes a function of the machine's ability to use encoder information to

accurately track a position on the material as it moves through the system. Eagle Manufacturing's design mandated that the machine be capable to cut parts to length with a precision tolerance of no less than 0.04 inches running at a line speed of 50 Feet per minute (FPM).

This was realized by feeding the encoder signal into one drive and subsequently from this drive the signal is broadcast to all of the other drives over ETHERNET Powerlink. Each drive then calculates its own slave position out of the master in real-time following a signal from the Upstream caterpillar drive. Both the drive position control loop and ETHERNET Powerlink cycle are completely synchronized in order to provide "jitter free" operation. As a result a cycle time of 800 micro seconds was achieved and a position update is made every 0.008 inch of fed material at a throughput speed of 50 FPM, ensuring so far previously never reached process accuracy even with the number of total axes.

Additionally, the Power Panel 200 as the main CPU uses one single processor



otive Components cut to perfection.

to perform logic control, visualization and motion control tasks. This provides the customer optimum value since the cost for additional processors and communication in between these processors can be eliminated. The on board standard Ethernet port provides connectivity to a line host and enables remote diagnosis of the system.

The B&R solution also provided a size benefit over any other competitor. Because of the unique design of the B&R ACOPOS, Majority Controls was able to fit all 22 servo drives within the specified 2-door enclosure along with the entire control system and supporting electrical components. Only the B&R ACOPOS solution allows servo controllers to mount directly side by side with no air-gap spacing.

Within the remote panel functionality in the B&R programming environment Automation Studio was used to link a 4x20 character remote display on each of the four stations to the main CPU in a very short application development time. The remote panel enables the operator to set up machine parameters in a close proximity to the processing, saving time and facilitating the precise preparation of a new job, simultaneous to the ongoing production of parts in the other station(s).

The main CPU and the remote panel both access one single transparent variable database. Changes from any one of the panels or the main control panel re-



“This single machine combines six different tools into a single operating set-up that automatically moves the required tool into place when called upon to do so via the controller. The tools are all changed utilizing a combination of 22 different servo mechanisms “In-Line & On-the-Fly” without interrupting the flow of the upstream extruded material.”

Brent Short
President of Eagle Manufacturing Corp.

sult in an immediate change of the display on all of the other stations.

Last but not least, safety and security were overriding factors in the software design. Because the machine’s primary function is cutting and punching, personal safety drove much of the software design. Light curtains and other safety devices specified by Eagle Manufacturing, when tripped, instantly shut down the operation of the machine. The software allows for a quick restart once the safety violation has been remedied.

“We’d like to think that the success of the program logic is a combination of our proven design functionality along with Majority Control’s knowledge and experience combined with B&R hardware and software,” summarizes Brent Short the designer and manufacturer of this extraordinary In-Line fabrication machine. [a](#)

