

## ***Emerson Discovers Flexible & Lean Manufacturing***

**E**merson Network Power's Liebert business is a leading supplier of data center infrastructure solutions including precision air conditioning, critical power, and infrastructure monitoring systems. Its primary market is data centers that need to maintain precise temperatures for reliable IT equipment performance. Liebert HVAC and system cooling solutions protect mission-critical applications from variations in temperature and humidity, ensuring business continuity for Emerson customers.

In 1997, manufacturing managers at the Liebert Precision Cooling facility in Columbus, Ohio decided to replace their existing legacy mechanical turret punch presses. Instead of merely replacing the mechanical machines with hydraulic models, the company invested in Shear Genius flexible manufacturing cells from Finn-Power.



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*The EBe servo electric Express Bender is a bending solution that is designed specifically for each fabricator's production requirements to achieve maximum productivity, quality, and repeatability. The bending operation is fully automated, from the loading of flat punched parts to unloading of the finished product.*

### **Shear Genius flexibility**

With the Shear Genius integrated punch/right angle shear combination concept, the objective is to provide one machine capable of transforming a full-sized sheet into punched parts. These parts can be moved to secondary operations utilizing the sorting and stacking automation and on to bending operations without

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being touched by human hands. As loading, punching, and shearing of parts become automated, the result is finished parts with a dramatic reduction in scrap and manual labor while increasing profitability.

The Shear Genius functions with sophisticated simplicity, able to perform the most demanding jobs with minimal set-up times and "lights out" operation. The Shear Genius increases material productivity through efficient and versatile nesting programs. The level of automation can be customized through Finn-Power's flexible modular solutions for raw material storage, loading, unloading, sorting and stacking. These features can be added later as budgets allow and production demands increase.

*"There is a savings of 30% in labor when running the EBe over the manual brake."*

The Shear Genius eliminates wasteful skeletons and costly secondary operations such as deburring. Nibbled edges on the part exteriors are eliminated through the use of the integrated right angle shear. In fact, the same clamps that hold the sheet for punching also hold it for shearing. In essence, the Shear Genius allows the automated process to begin with a full-sized sheet of material and end with a punched part after automated loading, punching, forming, shearing, stacking and unloading – all in one operation. This allows true single-piece flow to be synchronized with a customer's takt time.



Jack Somerville, manufacturing engineering manager (right) and Fred Crumb, production line manager, inspect a part formed on the EBe. The EBe has increased Emerson's precision and reduced variation, cutting the company's weld time in half.

According to Jack Somerville, manufacturing engineering manager at the Emerson Columbus Ohio facility, the Finn-Power Shear Genius has made its mark at Emerson. "The integrated shear is a feature that originally sold us on the Shear Genius," explains Somerville. "Other features we really like include the large turret with a Multi-Tool, the automatic sheet feeder for raw stock, the conveyance system to dispose of scrap, and the machine's overall robustness and durability. There is a lot of uptime with the Shear Genius."

*"In terms of volume, we can now make a panel every 40-50 seconds. We make approximately 300 parts per shift, running three shifts during the week. To date, our cost savings with the EBe has totaled over \$750,000, consisting mostly of labor savings and setup time reduction."*

Through the years, the Emerson Columbus, OH facility has added new generations of Shear Genius equipment to its fabrication arsenal. Today, it has a total of five Shear Genius cells and one Laser Punch cell. Based on its success, other Emerson plants have added the Shear Genius (SG) to their machine equipment lists, including:

- Delaware, OH – two SGs
- Ironton, OH – five SGs
- Mexicali, Mexico – five SGs
- Reynosa, Mexico – six SGs

### **Punch/Shear/Bend/Weld Cell**

Supporting management's commitment to lean manufacturing, Emerson Network Power purchased an automated cell from Finn-Power in the spring of 2008. The cell includes the Shear Genius, a picking/stacking robot, and the EBe automated bender.

The EBe servo electric Express Bender is a bending solution that is designed specifically for each fabricator's production requirements to achieve maximum productivity, quality, and repeatability. The bending operation is fully automated, from the loading of flat punched parts to unloading of the finished product.

The EBe bender has a maximum bending length of 100.39" (2550 mm) and a maximum opening height of 8" (200 mm). The new construction features actuations of the bending blade movements (vertical and horizontal) by NC servo axes instead of hydraulic cylinders. The upper tool movements are also made by another NC servo axis.

Finn-Power EBe provides the high bending quality required in demanding applications. The quality is achieved through precise control of bending axes, fast

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and smooth bending motion, open programmability, and rigid construction that is immune to variation in thermal conditions.

“The decision to purchase this cell was the result of the reliability we had experienced from the Shear Genius equipment since 1997,” explains Somerville. “We wanted to achieve continuous part flow from the Shear Genius to the EBe bender. Finn-Power offered the seamless communications and parts handling required to flow parts from the Shear Genius to the picking/stacking robot (PSR), and through to the EBe. The high quality and all electric features of the EBe were very impressive. Two years ago, not all manufacturers had electric benders that were that flexible and had as good of a tool changeover method. With its automatic tool change, the EBe has the ability to run any part, any time, with very quick changeover. This feature was key for us. It allowed us to achieve our lean objective of flowing parts through the cell as well as providing the flexibility of running several part numbers at the same time.”

Three SGs feed material to the EBe, which runs

three shifts during the week. “The EBe cell runs 20% of our volume in the department,” adds Fred Crumb, production line manager. “We installed the cell in May 2008 and made production level quantities in August. It has reduced our setup times dramatically compared to the 18 minute changeover from our press brakes. Some tool changes on the EBe are done manually, yet only take about 3 minutes; however, 80-90% of the tool changes on the EBe are done automatically, and those average only 20-30 seconds. There is a savings of 30% in labor when running the EBe over the manual brake.”

“Many of our panels are so large that we needed to have two operators on one press brake. We now run these parts through the EBe because only one operator is required. That operator never has to lift the part to bend it. In terms of volume, we can now make a panel every 40-50 seconds. We make approximately 300 parts per shift, running three shifts during the week. To date, our cost savings with the EBe has totaled over \$750,000, consisting mostly of labor savings and setup time reduction.”



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### **Custom modification**

Finn-Power also worked with Emerson on designing a conveyor from the EBe to the next operation, welding. “During the runoff in Italy for the EBe, we asked Finn-Power to make a custom modification to the

unloader,” explains Somerville. “We needed the ability to flow our parts in a lean way and did not want to batch between the EBe and the welder. We wanted to do one-piece flow because the majority of our parts get welded with either a TIG or a spot welding process. In order to help us stay lean and run one-piece flow, Finn-Power modified the logic in the PLC and modified the unloader rails so the parts have two ways to exit. They can exit directly out of the machine down a conveyor to the welder or they can exit at a 90 degree angle for unloading. As a result, a part now flows from raw stock through punching, bending, and welding in six minutes compared to the two hours it took before we installed the cell. Finn-Power helped us achieve our goal of high quality, on-time delivery, and lean manufacturing.”

### High precision

Emerson is also impressed with the high precision of the EBe. “The EBe has increased our precision and reduced variation, cutting our weld time in half,” says Somerville. “Our typical tolerance is +/- 0.030”, however the EBe easily gives us +/- 0.010”. This increased capability has shown up in our welding. We weld the corners of our panels, but our product line is more than just panels with square corners. Approximately half of our panels have a “chiseled” look with 45 degree angles at the corner. It is unique to our product and gives our DS product line its personality. Welding these corners requires a higher level of precision than we could get day-to-day from the manual press brakes. Before the EBe, the welders had to spend time adjusting the corners prior to making their weld. With the EBe, the corners are much more precise, eliminating the adjustment time and allowing the welders to work more efficiently.”

According to Somerville, flexible Finn-Power SG and EBe cell equipment has provided the following benefits to Emerson’s Liebert business:

- Improved quality – reduced defects
- Reduced overproduction with one-piece flow



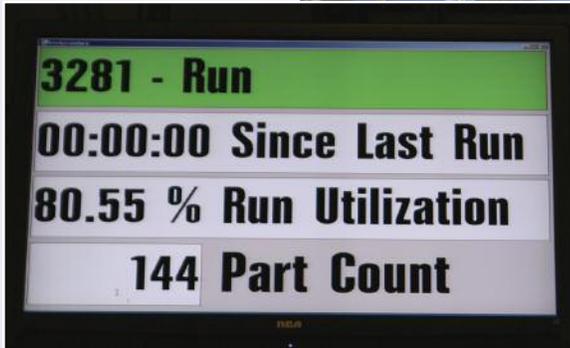
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- Eliminated fork lift moves between the punch and the brake operations
- Improved ergonomics by reducing the amount of manual loading, unloading, and flipping of parts
- Reduced changeover times
- Reduced the need for two-man jobs at the press brake
- Increased efficiency by running the Shear Genius, EBe, TIG welder and Spot welder with only three operators
- Reduced the amount of inventory
- Greatly improved on-time delivery

“Our products are combination air conditioning and humidifying units,” concludes Somerville. “They are more highly engineered than your average air conditioner sitting on a roof. Our products go into multi-million dollar computer centers throughout the world. Our customers demand units that are highly precise and have high quality components...with no leaks...no water on the floor. The quality of the sheet metal components is just as vital as the quality of any other component. Without the Finn-Power equipment, we would not be able to achieve the level of precision and still remain cost competitive in the market today. Finn-Power helps us meet our customer’s expectations for world-class products.”

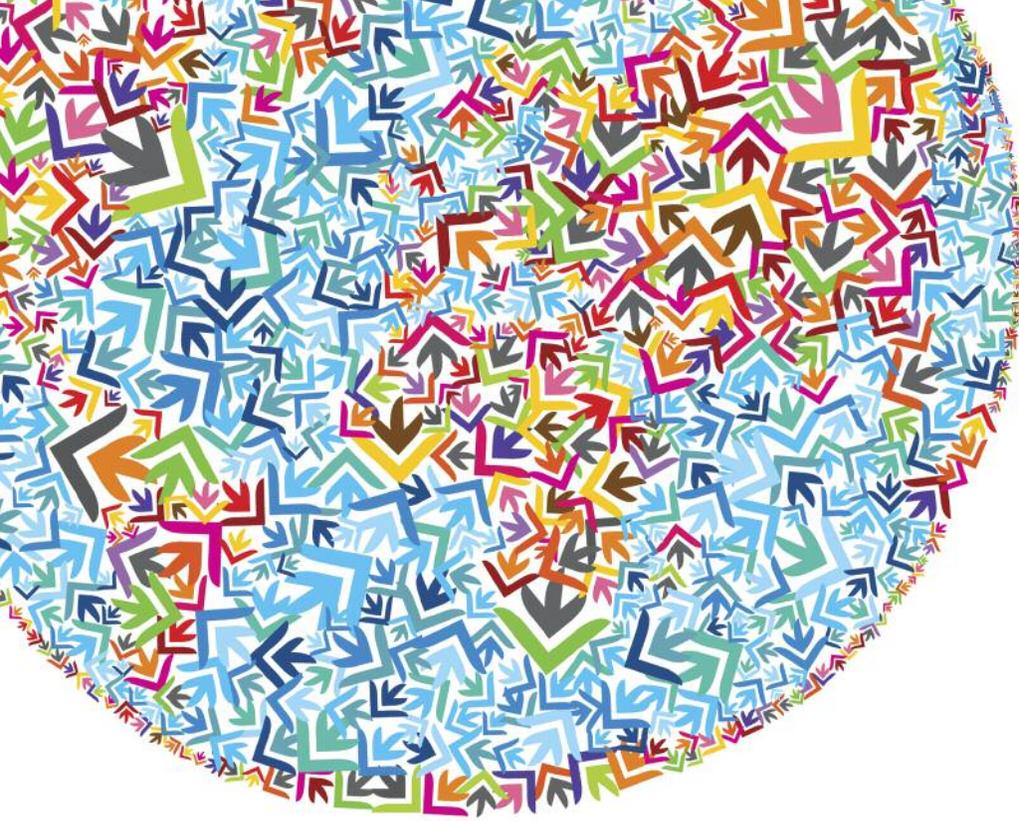
### Lean Modification / Behavioral Tool

Emerson Network Power's Liebert business and Finn-Power worked together to connect Emerson's machine monitoring system to the new automated cell. The system communicates from the machine's PLC to Emerson's monitoring computer. It tracks accurate runtime, downtime, and piece count data from both the Shear Genius and the EBe. Emerson management decided to place 40" LCD monitors overhead each machine so the operators could also view the machine's performance real-time. Once the monitors were in place, the operators began using the real-time feedback to drive up the run-time. They intensified their efforts to reduce their changeover times so they could keep the machines running. The production numbers started rising instantly resulting in a 10-15% improvement in run-time. According to Jack Somerville, Finn-Power's willingness to customize its PLC outputs was a critical part of the project. "Finn-Power put one of its most proficient technicians on this project," explains Somerville. "He worked as a team with our programmer to develop the right output signals between the PLC and our computers. We now know when the machine is running, when it is blocked, or when it is waiting for the next part. This information goes to our database and it is reviewed by management on a daily, weekly, and monthly basis."



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Prima Power North America, Inc.  
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