

Cotterman Company

Success Story



Lincoln Electric Robotic System 55 A Story of Collaborative Excellence

“Leaders who pursue disciplined collaboration never lose sight of this dictum: collaboration is a means to an end, and that end is great performance.”
Morten T. Hansen

In 2011, Cotterman Co. — with four U.S. manufacturing locations located in Croswell, MI; Bakersfield, CA; Dallas, TX and Atlanta, GA — was the recipient of the coveted W.W. Grainger, Inc. Partners in Performance Supplier of the Year Award. According to Nick Valore, Vice President of Cotterman, “Before winning the award, Cotterman was awarded the general performance award for four consecutive years.” Cotterman, a top-performing supplier for Grainger, won the award by delivering a higher quality-fabricated steel rolling ladder product within 48 hours or less.

Grainger recognizes suppliers who meet or exceed rigorous performance metrics with the Partners in Performance Award. Suppliers are rated throughout the year, and judged on their overall performance and improvement including excellence in several categories:

- On-time shipping
- Overall responsiveness
- Cost effectiveness
- Higher-quality finished product

Valore attributes Cotterman’s success and improvement as a company to the Grainger supplier scorecard measurements. Based on the scorecard, a key initiative for Cotterman was to reduce manufacturing turnaround time and fulfill orders rapidly. To do this, the company needed to change its manufacturing

habits. So, according to Valore, “We had to reduce finished good inventories and make small batches of product according to the orders received.” Cotterman went from large finished product inventory to zero inventory, creating a just-in-time manufacturing process. Such a change in manufacturing philosophy had both costs and benefits, but ultimately it compelled Valore to seek robotic automation in a unique and creative way.



Cotterman utilizes Lincoln Electric Automation’s System 55 robotic welding cell.

Collaboration

Cotterman’s product selection of rolling ladders is considerable, and variations of ladders may have two- to 18-tread configurations. The challenge for Valore was to create unique tooling with the ability to adjust for multiple

sized parts and weld positions. Valore had to combine the professional talents of his robotic staff with those of the Lincoln Electric Automation Division and AccuBilt, Inc., an integration house for robotic and automated welding, material handling and tooling for finished product. Ultimately, Valore had to manage and integrate each company’s set of technical information in a collaborative way to meet the goals of just-in-time manufacturing.

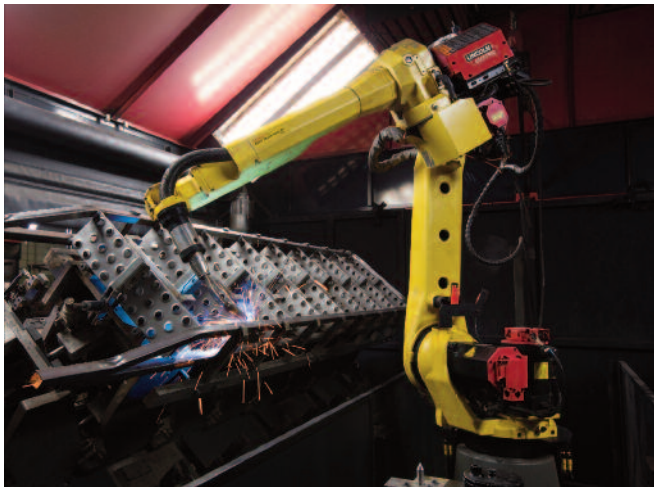
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In order to meet the requirements for fabricating rolling ladders of various sizes from small to large fabrication, Valore looked to the Lincoln Electric Automation Division’s knowledge of how to accommodate so many iterations of the rolling ladders in one robotic work cell. The goals for the robotic work cell included the need for flexible tooling capable of identifying the assembled parts when the tooling was loaded. This was no small task, but it appeared that AccuBilt, Inc. would be able to provide the required tooling.

Lincoln Electric Automation’s System 55 - Dual Headstock Robotic Welding System

Lincoln Electric Automation’s recommendation was the System 55, a pre-engineered dual headstock robotic welding cell designed for large sized parts that can be welded using the flexibility of reorientation. The cell layout can be customized to meet unique manufacturing needs. The dual headstock robotic system included the FANUC® ARC Mate® 120iC/10L hollow



Side A of Lincoln Electric Automation’s System 55 robotic welding cell utilized for welding of the entire rolling stair tread.

arm six axis robot with Dual FANUC® servo-driven head and tailstock positioners. The headstock and tailstock positioned 180 degrees apart is a standard configuration for the System 55. In addition to the ARC Mate® 120iC-10L, the cell also included the following items:

- FANUC® 30R-30iA (System R-30iA) Robot Controller.
- Lincoln Electric Power Wave® 455M Robotic power source for pulse or standard CV-type MIG GMAW.
- Lincoln Electric AutoDrive® Series wire drive for .035” (0.9 mm) diameter solid wire electrode.
- SuperArc® L-50 bulk welding wire.

AccuBilt, Inc. Special Tooling

Valore knew that in order to provide higher operator efficiencies, the flexible tooling and the ability to rotate parts in the system would be the most essential component of the System 55. Side A would be used for the complexity of the entire rolling stair tread welding. Side B would be used for production of common parts, multiple fixtures and smaller components. Utilizing both sides of the System 55, the operator can manufacture a number of ladder variations during a given shift.



Side B of Lincoln Electric Automation’s System 55 robotic welding cell utilized for welding common parts, multiple fixtures and smaller parts.

Cotterman’s group of Valore, Jeff Kinnee, Welding Lead, and Jack Boyd, Manufacturing Engineering Manager, decided that the tooling for the rolling stair and tread fabrication had to be able to identify the particular rolling stair assembly (two treads through 9 stairs) using proximity sensors and error free communication, and send that information to the robot controller. The robot controller would then identify the pretested welding procedures and program used for fabricating the rolling stair unit. Assigned personnel would be responsible for loading and unloading the tooling, eliminating human intervention of programming the robots motion or welding procedure. Further, the assembled components had to fit with each rolling stair assembly. Therefore, any inconsistencies with component fit-up and tolerances had to be addressed quickly.

Between Cotterman’s robotic group, AccuBilt’s tooling specialists, and Lincoln Electric’s Automation robotic engineering team, a system was born.

Proximity sensors connected to the tooling provided part identification, based upon a scan count of the number of treads for the particular rolling stair assembly in the fixture. Pneumatic clamping addresses the presence of parts and distinguishes between the correct sized part for the particular rolling stair assembly and an incorrect part. An Allen-Bradley programmable logic controller equipped with a PanelView Plus™ 1000 Terminal communicates with the robot operator. If an incorrect part is supplied to the tooling, then the human machine interface (HMI) denotes that the assembled stair is not ready. If a component is missing, then the HMI communicates



Cotterman personnel loading the System 55 robotic welding cell with smaller common parts.

that error. Matt Attwood, Sales Manager, of AccuBilt, Inc. states that his staff assisted with the programming for the error free tooling and HMI, covering approximately 33% of the parts with Cotterman's robotic group. Cotterman robotic personnel then handled the remainder of the assemblies for the final System 55 integration and they continue to do so.

The concept of just-in-time construction using smaller batch parts for rolling stair product using the error free tooling with the System 55 fulfilled the made-to-order requirements for Grainger and other Cotterman customers. Because of the error free tooling concept, the finished quality and the welding cycle times improved, eliminating the need to repeat weld and robot motion programming. All orders now ship within 48 hours.

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With the robot cell made operational, inventories of finished goods dropped, delivery to customers accelerated, and the Grainger scorecard requirements were more fully satisfied. An additional positive for Cotterman, was that reduced inventory increased the usable manufacturing space

Robotic Team Selection

Valore and his welding robot group confirm that the use of FANUC® and Lincoln Electric is fundamentally sound. The service and knowledge of the customer service group, Chris Joseph, Lincoln Electric Automation Service Technician, and the robotic system-engineering group at Lincoln Electric have been absolutely the best, he says. States Valore: “I have been in the business of using welding robots for many years and I

used several competitive systems. To date, the use of FANUC® Robots integrated with Lincoln Electric arc welding components has been the very best. The service from Lincoln Electric is the best in the business. Todd Stoughton, Technical Sales Representative at Lincoln Electric has been as helpful and responsive as possible. If we have a problem, then he is there to offer his assistance. Teaming with Lincoln Electric is a no brainer.”

Tooling Integrator Selection

AccuBilt is a full integration house for robotic and automated welding, material handling and tooling for finished product quality testing. Located in Jackson, Michigan, AccuBilt was called upon to suggest a means for addressing the Cotterman tooling requirements. AccuBilt joined hands and worked well with Lincoln Electric and Cotterman to meet and exceed the required tooling components. In the end, the collaborative relationship provided the automated solution Cotterman sought.



Cotterman personnel evaluates the robotic welding cell system controller.

Finished Product Quality

Vice President Valore indicates that his competition manufactures their rolling ladder systems offshore. He adds, “We use four welds per tread on the rolling ladder systems. The competition uses two. We feel that our product will provide a better return on investment because it will last much longer. It is simply a tougher, more durable finished product.”



Finished ladders ready for shipment.

“To date, the use of FANUC® Robots integrated with Lincoln Electric arc welding components has been the very best. The service from Lincoln Electric is the best in the business.”

Whenever part fit-up issues are encountered, then the problem is identified and addressed immediately. The successful welding robot application requires consistent fit and Cotterman is able to do just that.

The welding—depending upon the weld joint—uses either Lincoln Electric’s Power Mode® for the short-circuit mode of metal transfer (GMAW-S) or the RapidArc® pulsed spray mode of metal transfer (GMAW-P). Both are effective, low in spatter, and provide lower weld fume generation and excellent fusion. The welding consumable electrode of choice is .035” (0.9 mm) diameter SuperArc® L-50, AWS ER70S-3, packaged in 500 lb. Accu-Pak® Drums. The shielding gas employed is 90% Argon + 10% Carbon Dioxide.

After welding and assembling each rolling stair, the ladder is cleaned and sent to the powder paint system. From that point the ladder is allocated to an order, then sent to shipping. It all has to ship within 48 hours.

Collaboration – A Step above the Rest

The effective relationship established between Cotterman’s robotic group, Lincoln Electric Automation robotic engineering team, and AccuBilt’s tooling specialists represents the merging of three technical companies to create one solution. It was a difficult management task to accomplish, but Valore was able to bring the three companies together to meet the component requirements for the robotic work cell. In the end he was able to deliver an operator efficient system with higher productivity, while providing lower inventory costs and exceeding the Grainger supplier scorecard measurements. At present there are two System 55 robot cells with the error free tooling concept installed at Cotterman. The collaboration between these three technically savvy companies provided a distinguished “means to an end, and that end is great performance.” ■

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