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Pulsed GMAW

Automation

Valley Industries

Valley Industries, of Lodi, California, has produced trailer hitches and towing accessories for 57 years.

- CHALLENGE -

Valley Industries was looking to increase welding productivity and improve product quality.

- SOLUTION -

- A pulsed GMAW (MIG) process using Lincoln Power Wave[®] 455M power sources embedded with Nextweld[®] technologies with FANUC[®] 120iLB six-axis robot cells.
- A Lincoln System 40 robotic workcell with a FANUC[®] 100iB six-axis robot.
- Lincoln SuperArc[®] L-50 MIG wire supplied on 1000 lb. Accu-Trak[®] drums.

- RESULTS -

Valley experienced a 60 percent increase in productivity, improved process control and higher quality parts resulting from the move to automation with a Pulsed GMAW process.

Valley also improved manufacturing delivery times and reduced inventories.



As the manufacturer and distributor of 400 different trailer hitches and accompanying towing accessory components, Valley Industries, LLC of Lodi, California, was looking for a way to increase welding productivity and improve product quality. To do this, the company made the switch from a semiautomatic GMAW (MIG) welding process to robotic GMAW-P (Pulsed MIG) welding systems from The Lincoln Electric Company. The move to automation has resulted in a 60 percent increase in productivity, improved process control and higher quality parts – adding up to a competitive advantage for Valley Industries among its OEM and aftermarket customers.

In addition, the robotic systems, which combine Lincoln's Power Wave[®] 455M power sources with FANUC[®] robots, allowed Valley Industries to improve order delivery time on popular products like receiver style, fifth wheel, and gooseneck hitches. This, in turn,

reduced inventories for work-in-process and finished goods.

Brad Ownbey, Manager of Manufacturing, Maintenance and Special Projects for Valley Industries, indicated that half of the company's products involve some type of welding. Therefore, efficient welding practices are extremely critical to the 57-year-old company's success. "Welding, and especially automated welding, have been key elements in addressing sales, operating cost, new products, quality, and efficiency," said Ownbey. "Valley is also very much about people. You cannot be successful without them. Sustained business growth, year over year, has afforded us the ability to maintain employment levels while integrating automation into the operation."

The Move To Robotics

When management decided that automation was a viable option for Valley Industries, the company set out to evaluate several robotic

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welding systems. According to Ownbey, Valley chose Lincoln's system because it was reliable, easy to use and had proven success in numerous other manufacturing applications across the country. "Another factor that helped make our decision was our ongoing relationship with Lincoln Electric. We trust their people and enjoy good experiences with the Lincoln semi-automatic products already in our shop," noted Ownbey.

Installation of the robot work cells was a joint effort between Lincoln Electric and Valley Industries personnel. "Since the work cells are preassembled as three major components at Lincoln's Automation Division, on-site installation and set up goes quickly," noted Ownbey. "In our application, the robotic arm, controller, and welding equipment make up one component of the work cell. Two headstock/tailstock fixture components are then mounted in a symmetrically-opposed fashion in relation to the robot arm to position our product for welding. Electrical power, welding gas, compressed air, and several digital communication and power cables are hooked up. The Lincoln technician then ensures that the set up is correct and programs the system operating functions and welding programs." He indicated that installation and set up are

"Because these power sources create such high quality welds, we are able to go directly to the paint stage of our processing, without having to do any grinding or finish work on the welds."

accomplished in as little as four days per cell.

Initially, Valley Industries purchased one robot. However, over the last three years, they added eight custom-designed robotic cells as the advantages of automation became apparent. Currently, 140 Valley products are welded using automation.

It's easy to see the efficiencies robots brought to the production floor at Valley Industries. Each of the seven FANUC ArcMate 120 iLB six-axis robot cells on the hitch line has two welding stations that can be programmed to weld the same part or entirely different parts, adding tremendous production flexibility to Valley's operations.

As indicated, each robotic cell is equipped with a dual headstock/tailstock fixture used to position and rotate the production parts. Coordinated Motion software is used to synchronize the motions of the robot arm and the rotation of the fixturing, allowing welding and part rotation at the same time.

To maximize system uptime, the operator unloads finished parts and re-loads components into one side of the cell while the robot welds on the other side. Part program changeovers are completed quickly and easily using hand-held robot teach pendant controls. According to Ownbey, the company's previous experience with CNC-type machines (plasma/punch, tubing bender, saws) helped to make an easy transition to operate the Lincoln automation systems.

In addition, with seven identical robotic systems on the shop floor, Valley gains more scheduling flexibility. At any time, the production team can call up previously set part welding programs to quickly duplicate part production on any number of robotic cells to meet changes in demand.

For the company's ball mount products, Valley selected a Lincoln System 40 robotic work cell. This system features a sizable 71 inch diameter turntable, allowing four parts to be completed at

the same time for optimum overall productivity. In this cell, a FANUC ArcMate 100iB six-axis robot is used.



Brad Ownbey

However, robots and fixturing are only part of the story at Valley

Industries. The heart of the welding systems is the Power Wave 455M power source with advanced Waveform Control Technology® capabilities, an element of Lincoln's Nextweld® series of innova-

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tions. Waveform Control Technology® is Lincoln's proprietary welding software platform that controls and shapes the welding output waveform. Since the waveform is shaped digitally using software with an inverter-based Power Wave® welder, optimized results are delivered accounting for a specific material type and thickness, electrode wire type and diameter, shielding gas mix and other variables.

In the case of Valley Industries, the material is typically mild steel ranging in thickness from 16 gauge to 1-inch. The Power Wave welding power source delivers conventional MIG welding procedures as well as Pulsed MIG welding procedures for more difficult joint configurations when controlling heat input to minimize distortion is especially critical.

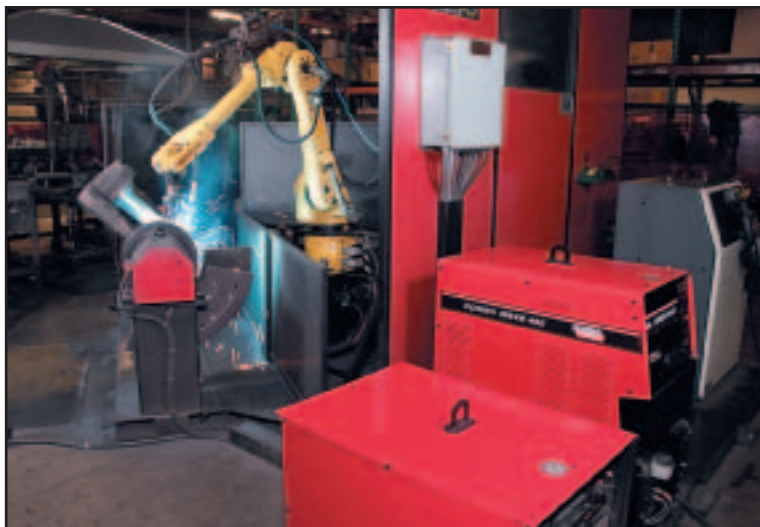
"The Power Waves produce a very consistent, stable arc and deliver improved deposition rates. With automation, faster travel speeds can be more easily accomplished than with manual or semiautomatic welding," said Ownbey. "We are able to manipulate arc characteristics, resulting in a weld bead that is more uniform in appearance. We also experience far less spatter. Because these power sources create high quality welds, we are able to go directly to the paint stage of our processing, without having to do any grinding or finish work on the welds."

Valley Industries also uses the real-time Production Monitoring™ capabilities of the Lincoln Power Wave power sources to monitor arc current, voltage and wire feed speed. Technicians and operators review the information to assist in refining weld programs and to identify and correct problems. As an added bonus, Ownbey reports the Power Wave 455M units are very durable in

an inherently dirty environment for electronics.

Hitch and Towing Components

Valley Industries' trailer hitches require an average of 16 welds per unit. Most of the components are plate and round or square tubing requiring single pass fillet joint welds that range from 1/2-inch to 12-inches in length. On average, nine component parts are loaded into the work cell fixturing to complete a typical hitch.



"The Power Waves produce a very consistent, stable arc and deliver improved deposition rates."

Demand and volume dictate which parts are welded robotically versus those completed by manual or semiautomatic welding. The robots at Valley Industries are currently running 24 hours a day, 6 days a week to keep up with the demand. Automation allows the 250-employee company to produce smaller batches of parts with greater speed.

All new products are tested using the transportation industry standard SAE J-684 test (more commonly known as the

V-5 test) which simulates thousands of miles of towing under extreme conditions. "We take much care in the design stage to ensure the safety of our products, especially since most of them will be used to tow recreational and commercial trailers at highway speeds. The consistent performance and weld quality of automated welding are naturally an enhancement in this area," said Ownbey.

According to Ownbey, because the robotic weld sequence and weld joint locations are programmed, the same exact process is repeated time after time. This makes control of distortion within the welded assembly very manageable compared to hand welding. Engineering tolerances become less of a challenge, manufacturing costs are reduced, and more options are realized in product design.

In tandem with the Lincoln Automation system, Valley Industries is utilizing .045-inch diameter Lincoln

SuperArc® L-50 MIG wire with a 92% Argon / 8% CO₂ shielding gas blend. The wire is supplied in 1,000-pound Accu-Trak® drums, which according to Ownbey, are delivering consistent performance and are quick to set up. "The L-50 is the highest quality welding wire I have used in my 27 years in manufacturing. Lincoln wire has a distinct advantage in automation applications, because it is clean and very stiff. The copper coating doesn't flake, and it comes out of the container straight. Arc starts are more consistent and overall feeding problems are minimal."

Lincoln Service

"Our experience with Lincoln service has been excellent. Technicians in Cleveland, Ohio, are available by phone and often

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assist us remotely to solve problems," said Ownbey. "We also rely on our local Lincoln representatives. All are professional and quick to respond. Recently, when we developed a problem with a torch cooling unit, we called Lincoln. By the next morning we had a new unit in our shop."

As far as training, ten of the company's robotic cell operators attended Lincoln training in Cleveland for programming, maintenance and service of the systems.

Conclusion

According to Ownbey, the company is currently pursuing automation in a number of key areas within the plant. As to the future of welding automation, the company looks forward to performing their own off-line programming soon.



In the future, look for Valley Industries to introduce new products and enhance the size of current distribution facilities to meet the growing demand for their hitch products.

Featured Lincoln Products**Power Wave® 455M**

Superior Arc Performance. Revolutionary Communication. For welding thicker materials in robotics, hard automation and semi-automatic applications, choose the Power Wave® 455M. This model features Waveform Control Technology® for superior arc performance on a variety of materials, including steel, stainless steel, aluminum and nickel alloys, and delivers custom control of the arc for each wire type and size for consistent welds time after time. The Power Wave 455M is designed to be part of a modular, multi-process welding system in which power sources can be added or removed to create a series of highly integrated and flexible welding cells.

**SuperArc® L-50**

Our most popular MIG wire, SuperArc® L-50, premium copper coated wire, is an excellent choice for 50,000 psi (345 MPa) yield strength, carbon steel base materials. SuperArc L-50 has moderate levels of silicon and manganese for deoxidation and cleaning action. Designed for use on clean, oil-free, and rust-free base material. Will tolerate light millscale. SuperArc L-50 also has an excellent reputation for feedability and trouble-free performance. Shielding gases include argon/carbon dioxide blends, argon/oxygen blends, straight carbon dioxide, and three or four-part gas mixes.

WHAT IS NEXTWELD?

The challenges facing industrial fabricators today are growing in number and complexity. Rising labor, material and energy costs, intense domestic and global competition, a dwindling pool of skilled workers, more stringent and specific quality demands all contribute to a more difficult welding environment today.

Through our commitment to extensive research and investments in product development, Lincoln Electric has established an industry



benchmark for applying technology to improve the quality, lower the cost and enhance the performance of arc welding processes. Advancements in power electronics, digital communications and Waveform Control Technology™ are the foundation for many of the improvements.

NEXTWELD® brings you a series of Process, Technology, Application and Success Story documents like this one. NEXTWELD explains how technologies, products, processes and applications are linked together to answer the important questions that all businesses face:

- How can we work faster, smarter, more efficiently?
- How can we get equipment and people to perform in ways they've never had to before?
- How do we stay competitive?

NEXTWELD is the future of welding but its benefits are available to you today. Ask your Lincoln Electric representative how to improve the flexibility, efficiency and quality of your welding operations to reduce your cost of fabrication.



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