

The Advantages of SMEs Adopting Collaborative Robotic Welding

BY TIM PATON



Small and medium-sized enterprises are looking to cobots to provide relief and support for manual welders

Collaborative robot welding packages are a viable solution for smaller job shops as well as small and medium-sized enterprises. They are easy to implement and operate without prior robotic experience and require a lower overall investment. (Photo courtesy of The Lincoln Electric Co.)

It's no secret there is a major shortage of welding professionals in the United States. According to the AWS Welding Workforce Data website (weldingworkforcedata.com), the shortfall estimated by 2027 approaches 360,000, and with more than 155,000 welders approaching retirement, it is clearly a longer-term trend.

It is affecting companies of all sizes. Many small and medium-sized enterprises (SMEs) with higher volumes and ample resources long ago adopted robotic welding with great success. Industrial robotic original equipment manufacturers (OEMs) made the implementation process easier by developing pre-engineered welding cells that come with all the components necessary to get started with robotic welding. A variety of modular packages are available to allow the end user to specify the robot, welding torch, guarding, and power source that suit their needs. The turnkey systems streamline commissioning and initial programming, providing metal fabricators an industrial-grade system that is ready to weld in minimal time.

Despite the widespread availability and relative simplicity in operating these pre-engineered cells, job shops and SMEs on the smaller end of the spectrum were left out. Many simply did not have the capacity or the steady flow of larger weldments to make these heavier-duty systems viable.

The Emergence of Collaborative Robotic Welding

The advent of collaborative robots (cobots) more than a decade ago was not expected to have an impact on the automated welding segment. Cobots provided an innovative robotic option that could work safely alongside humans but were suitable for only the lightest duties, while restricted to working in relatively clean production environments. Light assembly, material handling, and product testing were among the common early applications.

Despite their rather modest beginnings, cobots gained a good deal of notoriety, and robotic OEMs invested heavily in research and development. Over the last few years, cobots have become faster, stronger, easier to program, and better able to withstand the rigors of industrial settings. As their path repeatability also improved, rumors about the possibility of collaborative robotic welding slowly emerged, and one-by-one, cobot welding systems from the leading robotic equipment brands hit the market.

The technology has evolved to the point that cobot welding packages are a viable solution for the multitude of smaller job shops and SMEs looking to expand their capabilities and overcome the tight labor market. Companies that cannot justify the larger, pre-engineered industrial robotic welding cells find that cobot systems are easy to implement and operate without prior robotic experience and require a lower overall investment.

The Ideal Cobot Welding Adopter

The end user for whom collaborative robotic welding is ideally suited is a first-time or newer adopter of automation who has found that their production demands have surpassed



Easy programming methods like lead-through programming allow users to tack and weld parts by physically moving the robot arm through the desired weld paths, essentially teaching the cobot the necessary weld motion, which it can then replicate with the push of a button. (Photo courtesy of ABB Robotics.)

the output of their existing capabilities. The profile of their welding output is more in the high-mix, low-volume, batch-job range, and they have at least one experienced welder or welding process associate on staff.

Although the available payload and reach of some cobots has grown to 12 kg (26 lb) and 1300 mm (51 in.), respectively, cobot welding is best for companies that handle smaller, less-complex parts that don't require a positioner. Those with a need for flexibility can also benefit as the lighter, smaller cobots occupy limited floor space and are easy to move around a facility, providing the portability needed to serve different production areas. Their inherent safety features also allow them to be deployed without the extensive fencing and guarding required by traditional industrial robots.

Lower All-in Costs, Better Weld Quality, Increased Productivity

One of the initial advantages of collaborative robotic welding systems that SMEs appreciate is the lower all-in cost compared to traditional robotic welding cells. Not only does the cobot typically cost less than a heavier-duty six-axis robot, the elimination of safeguarding equipment, positioners, and space allocation renovations also provide additional savings. The ability to install and operate the cobot systems without hiring additional staff is another investment savings.

Cobots can significantly improve weld quality by providing precise, continuous, and steady weld motion for smoother, stronger seams. They also improve quality by producing longer welds without the need for multiple stops and starts inherent to manual welding.

Smaller shops relying on one or two manual welders who are often stressed and fatigued find that welding cobots are well received. Repetitive, monotonous, and time-consuming welds can be handled by the cobot, freeing welders to focus on more custom, complex welds.

Cobots can detect external forces and stop safely when making contact with a person or object, allowing man and machine to work simultaneously on different aspects of a

welding application, which significantly increases welding throughput and overall process productivity.

Easy Commissioning and Programming

Perhaps the most distinguishing features of a welding cobot are the intuitive human-machine interfaces and programming methods that enable people with little or no previous robotic experience to successfully deploy and program robots.

One of the easiest programming methods is lead-through programming, where users can tack and weld small parts by physically moving the robot arm through the desired weld paths, essentially teaching the cobot the necessary weld motion, which it can then replicate with the push of a button.

Another method available with several leading robotic OEMs utilizes a tablet interface that programs a weldment through a graphical interface with interlocking drag-and-drop blocks. A user can see the program develop as they drag and drop the blocks on the tablet, making any necessary adjustments along the way.

For those more experienced with robots, the option still exists to use standard programming language for higher-level welding applications.

Cobot Welding Packages

There are several cobot packages that balance the goal of simplified programming with the ability to offer advanced application capabilities.

One is an arc welding package that includes ABB's GoFa™ cobot and an easy teach device. The device is installed between the robot flange and the welding torch bracket and is equipped with two buttons to teach the welding path

positions along with a ring nut to scroll through various programming instructions. The selected instruction is shown to the operator on two screens mounted on either side of the device, ensuring full usability from every angle. This enables high-quality welds on more complex parts while maintaining the requisite programming simplicity.

A second package with the GoFa cobot, developed in conjunction with The Lincoln Electric Co., includes a proprietary programming software that features a tablet interface with a built-in welding library. A user simply inputs the material type and material thickness and then moves the robot to the beginning and end of the weld. The welding parameters and travel speed of the robot are then set, and upon pushing a button, the robot is ready to weld.

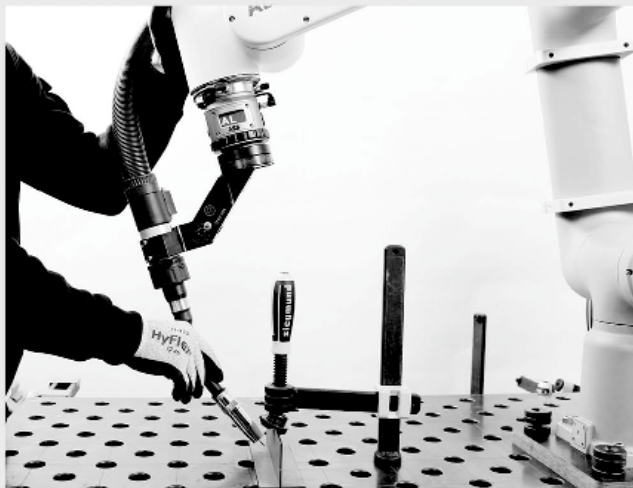
Safety Always

It is suggested that welding operators still take reasonable safety measures when working with cobots, such as wearing protective gear when close to a live arc. Flash curtains are mandatory to protect people from the brightness of the welding arc. Fume extraction is also needed for some applications.

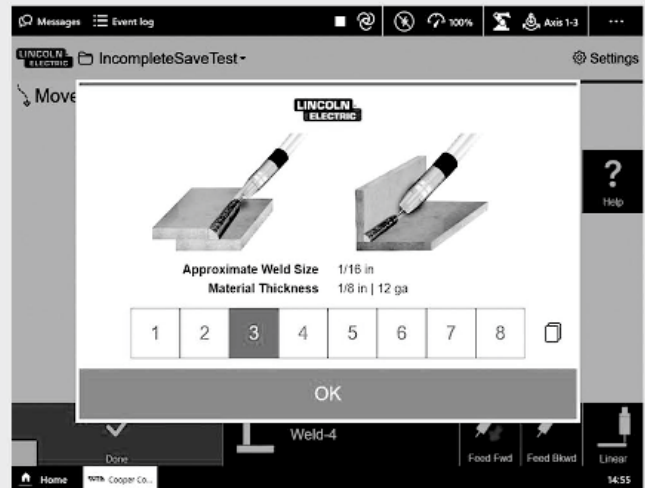
Conclusion

The advantages for SMEs adopting collaborative robotic welding are many, providing a highly user-friendly and economical means to keep up with production demand and increase weld quality while providing relief and support for manual welders. [WJ](#)

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The easy teach device takes lead-through programming to the next level, enabling high-quality welds on more complex parts. (Photo courtesy of ABB Robotics.)



The Lincoln Electric GoFa welding package features a tablet interface with a built-in welding library to simplify programming. (Photo courtesy of The Lincoln Electric Co.)