Cobot Welding Offers the Spark to Overcome Labor Shortages

BY JOE CAMPBELL
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To perform various welds, MT Solar started to use cobot welding, as shown above. In return, the company has seen quick changeovers and optimized production.

A manufacturer achieved reliable repeatability and product quality by implementing this method

MT Solar, a solar mounting equipment manufacturer based in Charlo, Mont., designs and manufactures mounting structures for solar modules of all sizes. A Vectis Automation Cobot Welding Tool, powered by Universal Robots (UR), now handles a wide range of MT Solar's welds (see lead photo). This move has not only enabled quick changeovers but also optimized production.

To discover even more key details, including how the company conquered labor shortages and freed current staff from repetitive welding tasks, while successfully handling a 300% surge in demand, continue reading this case study.

Unveiling the Unit

On the morning MT Solar's new, do-it-yourself (DIY) Cobot Welding Tool arrived at the company's Charlo facility in rural Montana, anticipation had been building for some time.

"It made for a very interesting first few moments with the robot," said Travis Jordan, owner and president, MT Solar. "The robot shows up on the truck, and of course, I'm all excited about it. I walk out of the office, and I've got employees already cutting shrink wrap off the robot and getting ready to set something up. I was like, 'Hang on! I want to play!' We had production parts running that same afternoon."

Those first production parts were the culmination of a process that had begun some months prior, as the company was scrambling to deal with seasonal labor shortages. Then one day, a welder handed Jordan a news article on welding robots.

"He said, 'I really think you should look into this. It would be a good solution for our team,'" Jordan recalled. "And I'm like, 'Well, if you got one of the operators saying you need to look into robotics, you've got a reason you should be doing something here.'"

His hiring woes reflect a national trend. The American Welding Society predicts a potential shortfall of 400,000 welders by 2025.

Demand Spikes and Labor Shortages Spur Automation Adoption

MT Solar experiences a 300% jump in demand for its solar mount products every summer. However, the company had been unable to find skilled welders workers to handle the seasonal uptick at its rural manufacturing plant.

Inspired by the welder's suggestion, Jordan researched conventional welding robots, but found them inflexible and best suited to huge batches of the same item. Finding a flexible automation solution was crucial because the company makes many different types of mounting parts, often in high mix/low volume batches.

Jordan explained the following: "We have many products that go together — think of us as a 'Solar IKEA,' if you will — where all the pieces have to be assembled in the field. If I don't have all the other parts that go with it, I can't ship anything."

The cost of conventional automation is compounded by the stress associated with programming and setup, he added.

"At first, it might look like a good idea to use traditional robots, but when you look at the time and resources to get them up and running and programmed, it was not the route we wanted to take," Jordan said.

He further noted the company preferred a solution that wouldn't require safety guarding and that existing operators could handle.

Collaborative Robot Takes Center Stage

The paradigm changed when UR was found. This provider of robot arms and cobots is headquartered in Denmark, with other offices located worldwide.

"The big difference is the 'collaborative robot approach' of being able to work with the robot, and it being so teachable and so easy to run," Jordan said.

While traditional welding robots require safety cages, cobots offer safe human-robot collaboration in close proximity without fences, Jordan noted. This helped to increase the appeal of cobot-powered welding solutions.

"When I zoomed in and discovered Vectis Automation's Cobot Welding Tool, it became obvious that this combination was the right way to go," Jordan said. "You can work right beside

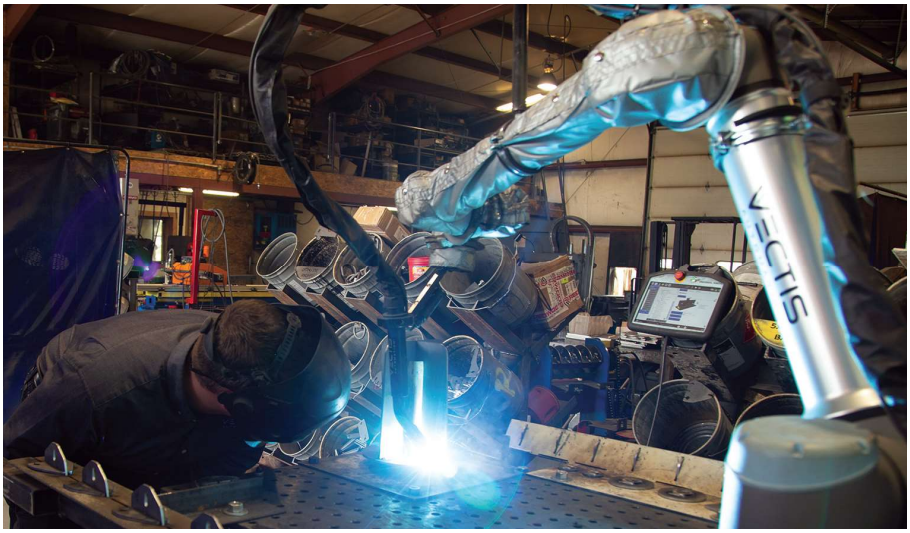

Fig. 1 — "You can work right beside the cobot as it is moving and welding," said Travis Jordan, owner and president, MT Solar.

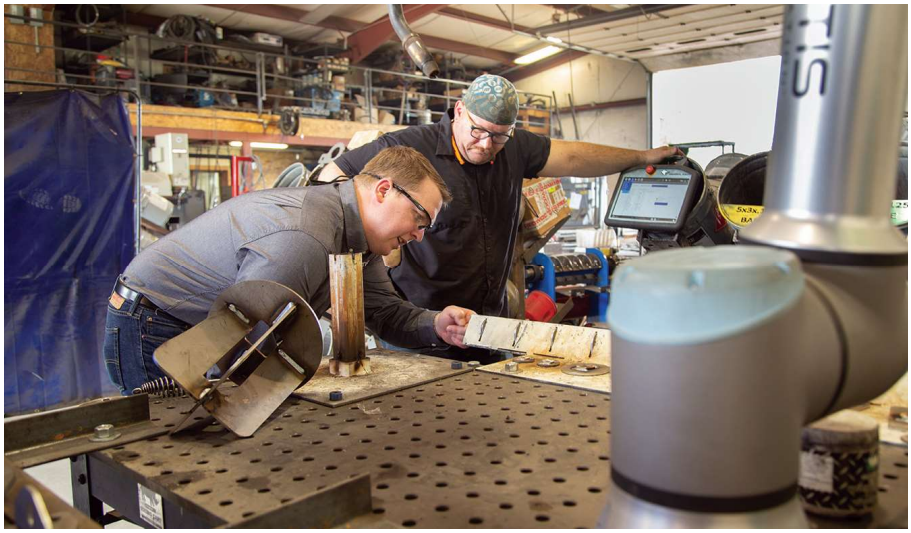

Fig. 2 — "There's been a stigma that cobots can't go into heavy industrial environments, but what our customers are saying and seeing is that that's not true," said Josh Pawley (left), cofounder of Vectis Automation.

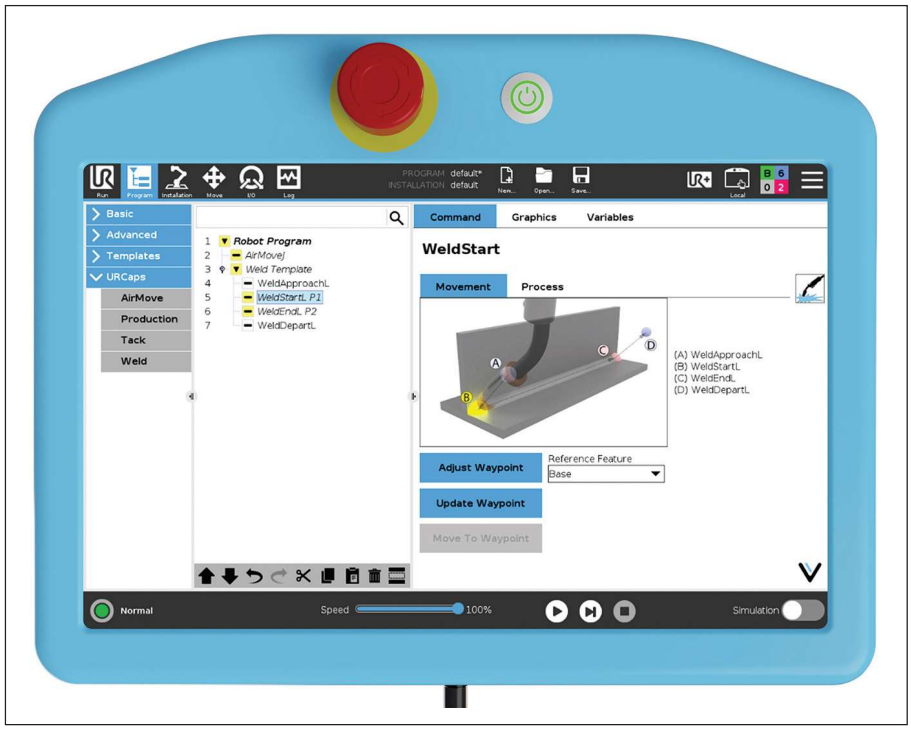

Fig. 3 — The Vectis Cobot Welding Tool is a ready-to-weld, UR+ certified application kit powered by Universal Robots' UR10e. It comes with an intuitive interface directly integrated to the cobot's teach pendant (pictured) that allows end users with no robotics experience to program the system.

the cobot as it is moving and welding. My guys can have their hood down and be right there, changing parts out with no safety guarding and no concerns about safety. They've been very, very comfortable working with it." See Fig. 1 as a reference.

Josh Pawley, cofounder of Vectis Automation, Loveland, Colo., mentioned his business initially faced some skepticism around cobots and welding.

"There's been a stigma that cobots can't go into heavy industrial environments, but what our customers are saying and seeing is that that's not true," he said — Fig. 2. "They are welding thin-gauge materials, all the way down to 16 gauge, all the way up to half-inch and thicker materials. Cobots are meant for industrial environments, and they can bring the benefits of DIY ease of use, flexibility, a smaller footprint, and a lower all-in cost to shops of all sizes."

Pawley pointed out the Cobot Welding Tool, when compared to traditional robotic welding cells, can be 25 to 40% less with freight, time to production, training, setup, installation, and commissioning factored in.

GMAW in 38 Min Takt Time

Implementing the tool was based on extensive human-robot collaboration.

Operators set up the cell with jigs, supply the parts, and program the system through an intuitive 3D interface directly integrated on the cobot's teach pendant through Vectis' URCap software plugin. The pendant includes a complete weld library developed by Vectis, providing standard settings for common weld jobs, including pattern and tack tools — Fig. 3.

"I am by no means a certified welder," Jordan said. "I'll just grab any of the guys out of the shop who are welders, and I'll say, 'Okay, I'll run the pendant. You go ahead and run the torch and put it where you want it. Where do you want the weld to start? Where do you want it to stop? What angle do you want it to do?' And we've thought through some very advanced welds."

DIY programming complete, the robot autonomously runs a full gas metal arc welding (GMAW) cycle. The UR10e collaborative industrial robot welds six to eight parts in each cycle. Typically, these are small parts, including lock collars, beam clamps, and weld nuts. The cobot welds these in a predefined order and completes 4–12 parts per run with no batching.

When welding tasks have been completed, operators can reload parts and restart the system, if required, or quickly program a new welding job with fresh parts. The cobot is responsible for welding specific lists of parts every 38-min takt time shift. This manufacturing term describes the required product assembly duration needed to match the demand (Ref. 1).

Operators work collaboratively with the cobot, loading and unloading during cycles, maximizing the 51-in. reach of the UR10e cobot arm to cover multiple different fixtures.

Learn about the Low Barriers to Entry

The system's benefits continue, from offering ease of use to a return on investment (ROI).

You don't have to be a rocket scientist to use it, which is a factor liked by MT Solar's Operations Manager Mike Gillin, a certified welder at the company — Fig. 4.

"I'm a welder by trade, but I didn't know anything about robots, and I'm not very computer savvy. Curiosity attracted me to the robot, and I was really surprised at how easy it was to figure it out," Gillin said.

Meanwhile, flexible financing and rent-to-own options enabled the company to test the system without financial commitment from the outset.

"This is a system that I can rent or lease for a very short period. I can afford that. If it doesn't work, I'm not saddled with the thing. That made it really easy for us to get started," Jordan said.

The tangible ROI of the system is recognized because it adds another welder to the team, Jordan specified. In addition, it provides "a real clean one-and-a-half, two-year ROI, just on hard number labor savings."

Fig. 4 — "Most of our shop probably wouldn't consider themselves a programmer of any sort," said Mike Gillin, operations manager and certified welder, MT Solar. However, just about everybody, out of curiosity, has taken a turn with the cobot.

The intangible ROI is "probably even more valuable," Jordan said. This is due to the cobot's net improvement of the shop and a "far-reaching impact on both customers and employee morale."

Repeatability, Quality, and More Enhanced by the System

Human welding can accommodate

Fig. 5 — The system has become a recruitment tool, according to Jordan. Notice the welds it makes, which can be seen here.

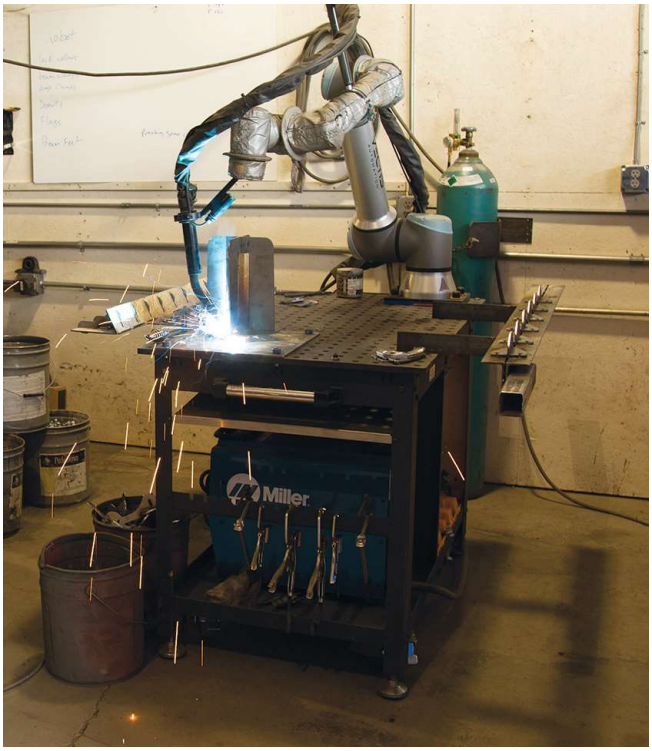

Fig. 6 — "We plan to run six cobots eventually," Jordan said. They will help out in various ways, including new tasks.

and introduce a lot of variance, noted Gillin, especially when it comes to monotonous work as well as relying on the calibrated thumb.

"We've built up to 7500 small parts over a winter. For an operator to sit and do that, you can tell where they've gotten sick of it, and some of those parts end up being scrapped," Gillin said.

The cobot currently performs that repetitive work.

Additionally, for Jordan, the system offers repeatability manufacturers crave and helps the company maintain consistent product quality.

"Furthermore, the consistency and flexibility of the system enables MT Solar to compete with large corporations," Jordan said. "Having a robot that can quickly be transitioned to different jobs and different tasks is paramount to our success. It allows us to combine industrial quality and scalability with the innovation and the nimbleness of a small company, which we think is an extremely powerful combination."

Appealing to the Next Generation

The cobot stands out to adolescents as well — Fig. 5.

"Attracting younger quality talent is a challenge in rural environments," Jordan said. "So, it's really important to have things to bring to the table as an employer, and we find that there's a real sparkle in people's eyes when we tell them we have a robot on the crew."

What's Next?

MT Solar plans to acquire more cobots soon for new tasks, such as manipulation of heavy and larger parts, which will also alleviate some of the lifting performed by employees — Fig. 6.

"Having a system that's easy to program, very flexible, and doesn't have to have guarding and safety restrictions around it is tantamount to being able to replace, add to, and work together with employees," Jordan concluded. WJ

Reference

1. Wikipedia. 2020. Takt time. *en.wikipedia.org/wiki/Takt_time*

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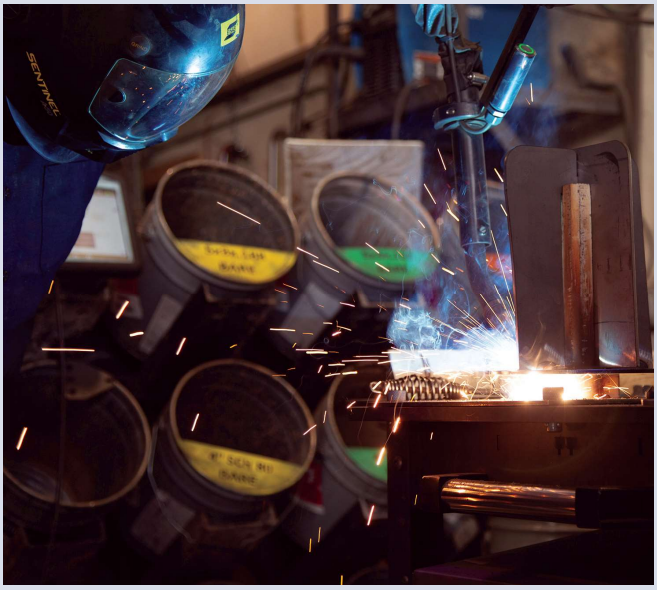
How Does a Cobot Welding System Work?

The team at Vectis Automation (*vectisautomation.com*) brings more than 85 years of combined experience in the robotic welding industry. The company's mission is to "provide the lowest-risk and easiest-to-use automation solutions at an accessible price."

Its Cobot Welding Tool arrives as a ready-to-weld package, including a UR10e cobot from Universal Robots (*universal-robots.com*) and an intuitive programming pendant with weld libraries and tools. A freedrive jog enable button allows instruction of the cobot by physically moving it to program points. The DIY system comes with a starter fixturing set, and can be outfitted with an air-cooled, water-cooled, or push-pull welding package. The unit is mounted on a 3 × 6 ft mobile Rhino Cart. A 120-V wall outlet is needed for the cobot, while the welding power supply can run on outlets between 208 and 575 V, including 240-V single phase. It's available as a mobile UR+ Application Kit powered by the UR10e; these kits provide hardware, software, and components to streamline deployment of popular cobot applications.

To learn about the company's upcoming events, recently posted videos, and more, follow them on LinkedIn.



An observer witnesses cobot welding taking place.

Watch Cobot Welding

To see sweeping aerial shots of MT Solar (*mtsolar.us*), including external and interior points of view from scenic mountains to inside its job shop, hear Owner and President Travis Jordan speak along with Operations Manager Mike Gillin, get up-close takes of cobot welding in action, and listen to Cofounder of Vectis Automation Josh Pawley, watch the nearly 5-min reel at *youtu.be/RdSBUR7xMmQ*.