

NEW ROBOTIC PROCESS HELPS STRUCTURAL STEEL FABRICATOR CUT PRODUCTION TIME BY 83%



After a poor experience with a robotic welding cell in the early 90s, Russell Barngrover made a pledge to himself.

"I told myself, I'd never do it again unless something majorly changed with the technology," Barngrover recalled. "We got out of (robotics) because of how labor intensive it was to do anything, as far as the programming and touch sensing, to get to actually weld."

Now, 30 years later, he's praising the virtues of robotic welding.

That's because his company's latest capital expense – a Lincoln Electric Robotic Welding System incorporating the revolutionary HyperFill® process is cutting production time by such an incredible rate, people literally have to see it in operation to believe it, Barngrover says.

New Opportunities, Changing Mindsets

Barngrover is executive vice president for SteelFab, one of the nation's largest AISC-certified structural steel fabricators. His company manufactures critical structural support components, such as large frames and trusses, for buildings all across the country. For the vast majority of projects, the typical welding process includes a mix of manual and semi-automatic processes.

Like any manufacturer, Barngrover and his team continued to entertain new ideas to improve production efficiency. But it was not until a few major developments – primarily the growth and sophistication of robotic vision and positioning systems and a new twin-wire welding process – that drew him to seriously re-consider a robotic welding application.

"We actually had a (twin-wire) unit that we were hand welding with on the shop floor at the time," Barngrover said. "So when you think about adding that type of process to a robotic system, it was just a no-brainer at that point to try and get one in here."

"It was also ironic that we just happened to be doing some parts that were perfect for this," he said.



Bigger Welds, Bigger Savings

The part in question concerned a 2,000 pound chevron (or inverted v) bracket, which is used to provide buildings with lateral support reinforcement. This component has fillet weld sizes ranging from 5/16" to 5/8". Some welds are four feet in length and require up to 10 manual passes. On average, one finished chevron bracket would take a single welding operator up to 12 hours to complete.

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Using the robotic HyperFill process, a single operator can now produce the same part in 2 hours or less, according to Barngrover. Consider that the average project requires 60 to 115 parts for a steel-frame building, and it's easy to see how fast the time – and cost savings – can add up.

“A lot of people will read that and not get it,” Barngrover said. “But really, it’s a combination of the HyperFill process, coupled with the robotic positioner that has allowed us to gain so much time back.”

“The greatest thing of all is after we had the first run going, the CEO came over to watch. He was standing there for about 10 to 15 minutes. I thought he was about to walk away, because all he was seeing was welding. Then all of a sudden, it re-positioned itself and spun all the way around and started again, and he stood there and watched it for another 30 minutes. Then he asked me, “Why didn't we get it sooner?”

How HyperFill Works

Unlike tandem welding, HyperFill utilizes two smaller-diameter wires with a single power source, feeder, gun liner and contact tip. The setup feeds two wires through a single torch and uses a special output waveform to produce a “liquid bridge” that creates a single, large weld droplet and arc cone that is optimized for making bigger welds.

Most single-wire processes run optimally around 13lb/hour, but with the HyperFill process, manufacturers can deposit metal at more than 24lb/hour for up to 85% increased productivity.

On the chevron piece, that means the same four-foot long fillet weld can be completed in less than half the time compared to our normal welding process.

Putting it All Together

Few robotic integrations are without some hiccups along the way, however.

Shortly after the start-up process, operators experienced a slight porosity issue. After working through the problem, it was determined that a larger flow regulator was needed to provide the proper amount of gas shielding for the HyperFill process.

Having an employee with a degree in robotics and welding experience was a definite plus, as was Lincoln Electric's responsive support team, Barngrover said.

“One of the biggest things that helped me make the decision was having someone with the background. But I think, to Lincoln's credit, having the meetings, keeping people informed, talking about who's responsible for what and the expectation set every week, was a real key for me.”

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"I've never experienced that in buying any equipment before."

Since the HyperFill cell was installed in September 2020, it has been in continuous operation. Discussions are underway to study the use of HyperFill in other applications.

"The beauty of what we're doing with HyperFill is now you've actually opened up everyone's minds," Barngrover said. "So now that it's in place, everybody can see what it can do. And whenever a job comes in, they're looking at it and saying, 'Hey, we could run that part there, or we can do this part here'."

"Basically, I don't foresee us shutting this thing off for the next three to five years."

ARTICLE

The Solution

Lincoln Electric Fab-Pak® Robotic Welding Cell with:

- Fanuc® M710iC/12L R-30iB Robot
- Lincoln Electric Power Wave® S700 w/ 4R220 Wire Feeder
- Licensed HyperFill Waveform
- Skyhook Positioners
- Servo Robot Track
- Magnum® PRO Water-Cooled Robotic HyperFill Torch
- Lincoln Electric Power REAM® Torch Maintenance System
- Touch Sense Keyence Laser System
- Allen Bradley® 10.4" Touch Panel User Interface
- Custom Robotic Tooling
- ANSI / RIA 15.06 – 2012 Compliant Work Cell, including:
 - Solid Steel Cell Walls
 - Rear Access Door
 - Steel Light Curtains
 - All Required Electrical and Safety Component

*HyperFill® Waveform Activation Capability with Power Wave® and PIPEFAB™ Systems

Your purchase of a Lincoln Power Wave or PIPEFAB Welding System comes with (i) a license to use Lincoln Electric standard Power Wave / PIPEFAB waveforms, and (ii) HyperFill waveform capability, which requires the purchase of premium Lincoln Electric wire or purchase of a separate license. Unless one of these is purchased, the HyperFill waveform will not be available for use on these machines, and only the standard Power Wave / PIPEFAB waveforms are usable.

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