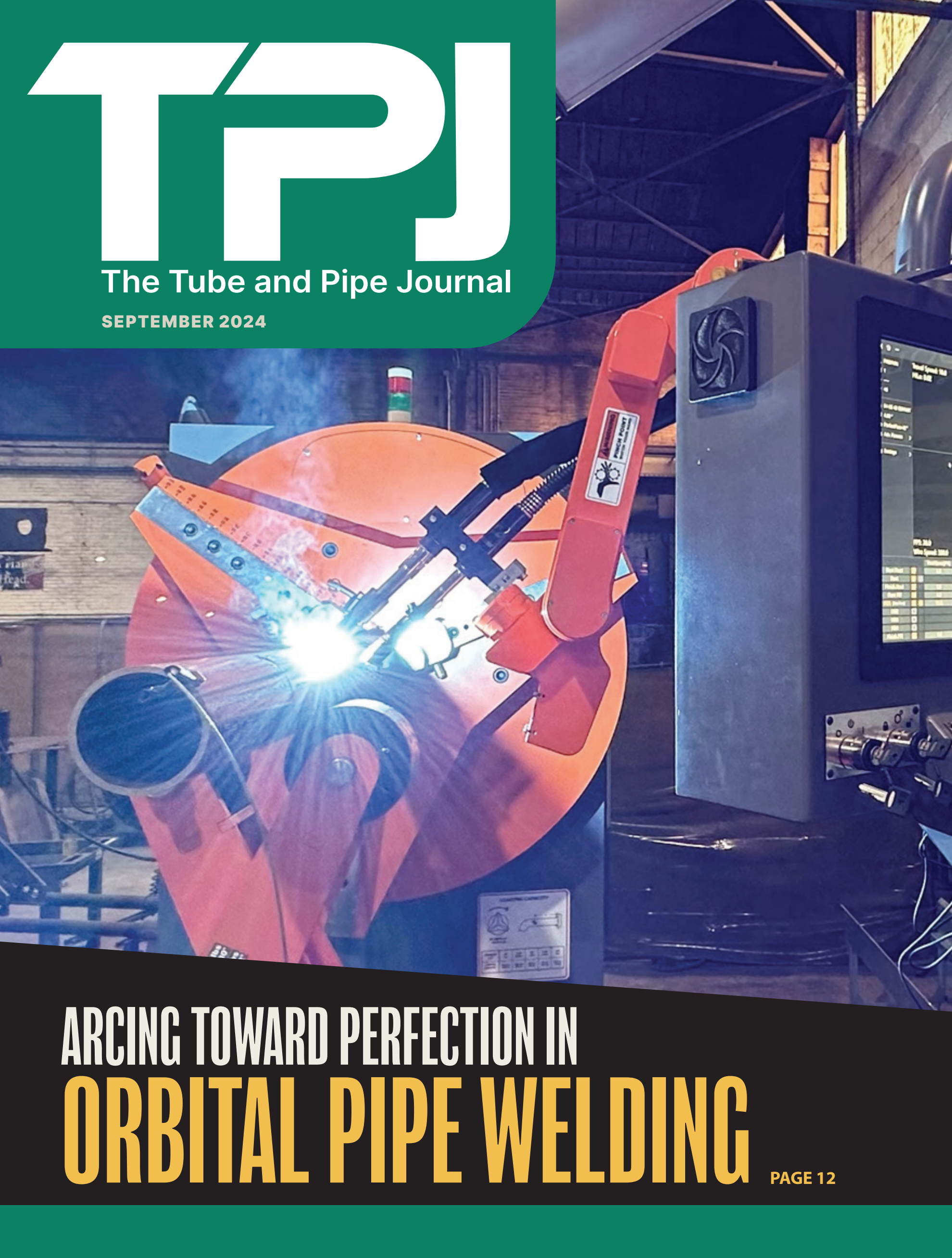


# TPI

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## ARCING TOWARD PERFECTION IN ORBITAL PIPE WELDING

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With PerfectPass iQ, the Rotoweld 3.0 welding machine is able to analyze and adapt to virtually any possible imperfection based on thousands of scenarios stored in the system's library of images. Images: McCarl's

# ARCING TOWARD PERFECTION IN ORBITAL PIPE WELDING

*Robotic rotary welding employs new software to adapt to every known variable*

By Lincoln Brunner

If anyone questions the severity of the nation's skilled welder shortage, they need look no further than the popularity of automated welding systems like Tecnar's Rotoweld 3.0 to settle the debate.

For Jon Bushmire, it was an easy decision to invest in the automated orbital GMAW system, which includes PerfectPass-iQ, Tecnar's latest software. Bushmire is operations manager at McCarl's, an industrial and mechanical contractor in Beaver Falls, Pa., that fabricates piping and structural steel vessels for customers in the oil and gas, chemical, and steelmaking industries, among others. The shop fabricates numerous materials—carbon steel, stainless, chrome, nickel alloy—in sizes typically ranging from Sch. 10 through Sch. 160.

The software runs in tandem with Tecnar's 4D Synergy Welding approach, which tracks wire speed, the pipe travel speed, arc power, and oscillation simultaneously to help ensure weld quality. It uses algorithms written by the company to adjust those four parameters in the welding machine on the fly, based on what the system's camera sees.

This latest software goes further, using a library of thousands of images to recognize and adapt to almost any imperfection that the machine might encounter. It monitors variations like high-low, out of round, and of course the weld gap.

Bushmire said the speed and quality that the automated orbital welding system and its new software deliver has made them a welcome addition to the welding operation at McCarl's. Because the unit is strictly a GMAW machine, applications for biopharmaceutical or other clean-process uses that require a GTAW root pass still have to be done manually. However, for most of the shop's other customers, the Rotoweld is the go-to machine.

"Mainly our benefit with this machine is the production we get out of it and the man-hours that it saves and the schedule time that it saves,"

Bushmire said. "You basically have a machine doing production welds. The stuff that is really tedious, we utilize our skilled welders to do."

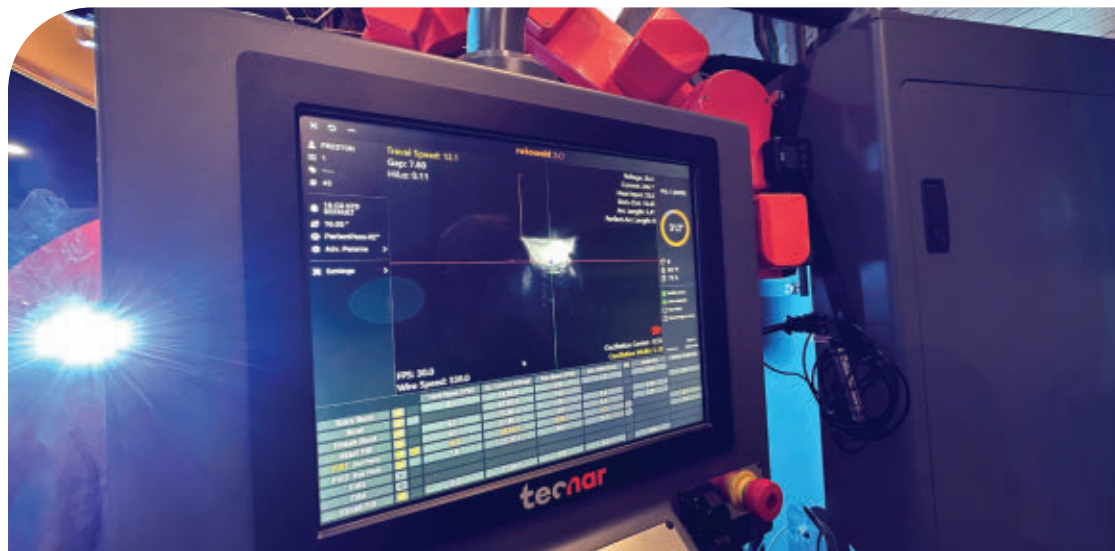
Western Pennsylvania is no exception to the nationwide lack of certified welders, so having a unit that increases both speed and quality has helped McCarl's improve production and remain competitive without having to simply rely on more people to do the job.

"There's a major shortage of skilled labor out there," Bushmire said. "So, being able to utilize robotics [on] an application that's automated to help save man-hours and help save schedule, that machine is a perfect fit for that."

"The robotics also help eliminate the need to have a second shift in most cases," he added. "We saw the cost benefit to buying the machine in how quickly you can pay the machine [off]. That is really attractive. The time that it saves and the money that it saves far surpass anybody doing it by hand."

## Real-Time Adaption versus AI

The idea was to create a system that recognized all the variations that the camera recorded—es-



With their new system, operators at McCarl's can track multiple weld variables simultaneously and in real time.



pecially on the edges—and automatically adjusted the welding machine, much like a person would. It does all that while measuring all the solid, liquid, and plasma material in the weld zone in real time, as well.

"It's quite easy to do software that will see something—it's quite difficult to do software that will deal with all the edge cases," Tecnar CEO Alexandre Nadeau said. "So, you have some grinder cuts, you have some magnetized metal particles in the image, some super-bright reflections coming from the arc. You'll have a lot of things that your brain just deals with. But we've developed this image recognition that's like a human brain ... that deals with all the expected edge cases that we see in pipe welding."

While the system relies on its library of images, it does not run on an AI model, Nadeau said. Rather, the software was written to work with the 4D system already in place to adjust the machine in real time to whatever conditions the machine sees with its camera—not simply a set of predetermined variables.

"To be clear, this is not AI," Nadeau said. "We did not train a model. If you train a model, you're limited to what you've trained it to do. We did not want to go there. I mean, it's easy to have—we have access to all the same libraries these days."

"We wanted to say, 'No, it's a pipe weld. We know what to expect on the stainless, on the carbon, on the high-lows. So, we're going to create extremely difficult edge cases and develop software that's going to be able to deal with them and always track all the parameters we want to see in that preparation.'"

### Overcoming Skepticism in the Shop

The system may have proven itself to the folks at McCarl's since its installation nine months ago, but acceptance wasn't automatic. Bushmire said that because McCarl's is a union fabricator, there was some skepticism among the shop's 20 welders. However, the unit's results quickly turned skepticism into enthusiasm as the welders saw the unit's speed and quality and how one of the latest iterations of welding automation could help them.

"As we got the machine [running] and everybody started to use it, everybody started to get more excited about what's out there for advanced technology in the welding industry," said Bushmire.

"I would say it's probably one of the top technologies out there for welding applications, especially for pipe. So, it draws a lot of attention, and once the guys got the machine and started using it, it kind of brought all the attention."

Though Bushmire doesn't have a complete list of the productivity improvements he's seen the machine yield, he noted that the machine is most effective for production of the shop's bread-and-butter products—4-in. Sch. 40 through Sch. 80 pipe.

"By hand, [on those products] it would take double the time to do what that machine can do," Bushmire said. "In the world we live in, you have to adapt to the technology that's out there in order to stay competitive and to keep the overall cost of labor and cost of business as low as possible." **TPI**

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