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by Jimmy Myers, senior editor

HEAVY AUTOMATION

Robotics increasingly find a place in heavy equipment manufacturing

Among the goals most manufacturers share, achieving higher levels of consistency usually ranks fairly high, and they take many steps to track various metrics in order to reach that goal. Automating processes, including robotic welding, can put them on the fast track to consistency success.

Advanced robotic welding solutions are proving easier to use, requiring only one person to manage a production that would call for multiple welders using manual processes. With the right software and suitable welding cells and gantry systems, welding jobs on massive equipment can be improved through robotic welding.

Teemu Rusi, robotics application manager at Pemamek, a global welding and production automation company based in Finland, says the robotic welding cells, gantry solutions and custom software his company develops are the right fit for a dynamic, rapidly developing production environment. Pemamek is known for developing solutions for heavy equipment manufacturers and is continually developing new methods for robotic welding on materials that it was previously thought could only be welded manually.

Pemamek offers equipment for one-offs to serial production. This equipment includes heavy welding compact robot cells that can handle workpieces up to 4 tons; a long-reach gantry solution that can manage workpieces up to 5 tons; a multi-cell, unmanned production unit for workpiece handling and gantry systems; and, for the ultimate in heavy-duty workpiece handline, an automated welding positioning system that can manage up to 100 tons of material.

“Our point of view is that it’s the whole solution that counts,” Rusi says, adding that the software plays a key role in the whole solution. “I like to tell customers, ‘we’re not selling mattresses; we are selling a good night’s sleep.’”

CONSISTENCY IS KEY

Taking on a fully automated robotic welding solution can be a daunting task for manufacturers that have always relied on manual welding. But given the cost savings, more consistent welds and improved safety, the ROI is quickly realized.

Michael Bell, director of sales for Pemamek, notes weld consistency is one of the key outcomes of using an automated process.

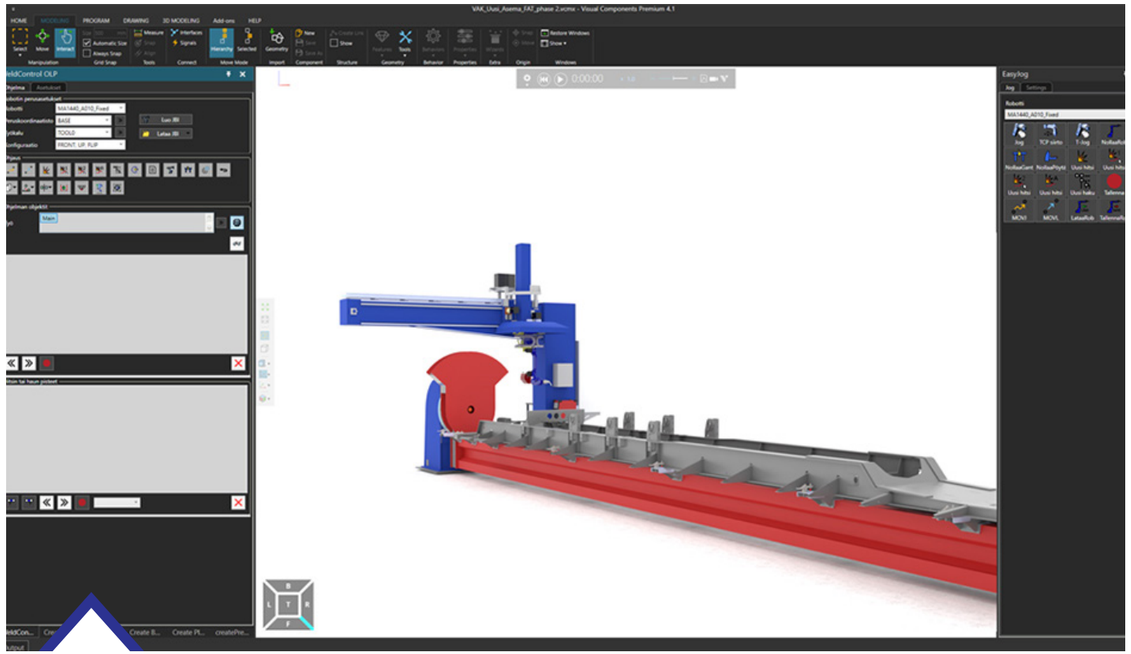
“Every welder has their own way of welding,” he says. “You can take Joe and Pete from the same company and they’re going to weld, for example, a pressure vessel in two different manners. Both would get the job done eventually, but Pete’s method leaves pinholes because his stop/starts stink. And with Joe’s method, his overlaps aren’t very good and there is a ton of cracking. An automated solution takes all those variables out.”

Rusi adds in that due to the labor shortage, “you’re not always able to even get a Joe or Pete.”

HELPFUL DEVELOPMENTS

Pressure vessels are a focus of Pemamek, having recently developed a tool to solve the time-consuming step of welding the nozzle. Most pressure vessels have a nozzle ▸

Long and heavy workpieces, such as those manufactured for truck trailers, are efficiently manufactured on Pemamek’s customized robotic welding system.



WeldControl 300 is 3-D CAD-based software specifically designed for heavy equipment manufacturers that often deal with large bevels and complex geometries.

component to them, which have traditionally only been welded by hand due to the technical nature of the weld, which is a multi-pass procedure involving many starts and stops and frequent repositioning.

Pemamek's recently developed Pema Automated Nozzle Welding Solution brings robotics into the mix. This new offering works in concert with Pemamek's software, so heavy equipment manufacturers can gain more control over how they weld nozzles.

"Welding the nozzle is very demanding," Rusi says. "It is a huge time killer for the welder to sit there and weld a nozzle by hand. That's why it's a good process to automate with a robot."

Part of the "magic" behind Pemamek's automated robotic welding is a laser that scans the groove between the materials that are to be welded, mapping out exactly where and how the weld will be laid down. For general fabrication and heavy equipment manufacturers, Pemamek developed ▸

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> *Teemu Rusi, robotics application manager, Pemamek*

WeldControl 300 software, which is the brains behind the process.

“The software has some unique functions,” Rusi says, “such as the visual motivator pattern tool, which meets the thick material manufacturing demands of heavy equipment. Those materials often have big bevels and the programming can otherwise be difficult for the robot.”

One of the issues manufacturers battle when dealing with welding large structures is the inaccuracies in geometric measurements that occur. These inaccuracies lead to fluctuations in the welding groove cross section. With traditional robotic welding, there are often inconsistencies between the CAD drawings and the pre-welds on the workpieces. WeldControl 300 addresses these issues.

“We program the robot to go and sense the groove variation with a laser,” Rusi says. “That data is thrown back to the software where we can make a new weld pattern or load an existing welding pattern to that groove. The software makes the welding adaptive. The robot knows, according to the scanning data, that if the groove gets bigger, we need to slow down the welding speed to get a uniform filling for the weld.”

The operator can monitor the action through cameras positioned over the weld. “The operator is the failsafe,” Bell says.

EASY ADAPTATION

When identifying qualified operators for utilizing Pemamek’s robotic welding solutions and software, Rusi says they only require that operators have “some kind of basic knowledge of simple welding.”

“They don’t need any prior experience on programming,” he continues. “I teach the offline programming to these operators in one day. By the next, they have already started programming themselves.”

Bell adds that every manufacturer has their own challenges; some are prevalent throughout multiple industries, such as the skills gap/labor shortage, while others are more specifically “self-made.”

“We really focus on solving the particular challenges for each customer,” he says. “That’s where Pemamek really thrives is taking a solution that is 90 percent there and pushing it the extra 10 percent, so the customer drills down to solve their inherent issues. We’re helping a lot of companies with throughput as well.”

Furthermore, customization is a big part of Pemamek’s value to customers, and is something they focus on to assist heavy equipment manufacturers with their low-volume, high-mix production.

“If you need to make something unique – that’s really where Pemamek

Pemamek’s FF Flange Fitting Station is another heavy equipment manufacturing option that enables fast and safe, but extremely accurate, fitting and welding of flanges.

is going to excel," Bell adds.

EVALUATING FOR ROBOTIC SUCCESS

To assist customers in acquiring the heavy equipment manufacturing solutions they need, Pemamek has developed a five-step process, which begins with a thorough evaluation and predesign phase with the supplier and purchaser to ensure they have the right solution.

"It's something we do with every project," Rusi says, adding that they request a 3-D model from the customer, need to know generally the maximum size piece they'll be welding and need to select a suitable robot arm.

Other steps include evaluating possible design changes related to groove geometry and groove preparation; the welding process modifications for robotic welding; a customized training process for the customer; and follow up and maintenance post-implementation.

"If the customer doesn't have existing robotic welding in their production," Rusi says, "all the parameters and consumables they use are for manual welding. This means they will have to adapt their specifications for robotic welding, which is done with greater welding parameters, which increases the welding speed. So, Pema has welding engineers in-house and has the ability to do destructive testing and non-destructive testing for the welding specimen."

Pemamek also has a robotic help desk for customers to utilize under their service contract to troubleshoot any problems. Online assistance is also available. Furthermore, Pemamek has representatives available to customers in the United States who can visit the premises and tend to any issues on-site. ■

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One of the newest offerings from Pemamek is technology that automates nozzle welding, which has traditionally only been done manually.

PEMAMEK