



Welding automation — buggies, robots and turnkey installations



Column and boom installations are ideal for applications involving large parts with long welds.



A robotic welding solution by Robotic Innovations with the capacity to handle hundreds of different part sizes and configurations. A Lincoln 355i welding power source is being used to weld truck axles.

African Fusion talks to Nahanni Nagle, regional manager of Lincoln Electric sub-Saharan Africa, about welding automation and how to go about making appropriate choices from a welding perspective.

“In welding automation, you often get a sense that the robot suppliers think only about robot solutions and the column and boom manufacturers think only about column and boom solutions – and neither give proper regard to the right choices,” begins Nagle. “I like to think that we are a little different, in that we start from the welding perspective. When we look at a job, we focus on the right welding approach – the right process and welding technologies – and only then do we look at automation. The first people we send in to look at an automation possibility are not automation specialists, they are welding specialists, who are able to recommend the best welding solution and to

properly assess whether welding automation is feasible,” he says.

“More than half of the welding applications that customers bring to us for automation are totally unsuitable,” he claims, “so we never go looking to sell robots – we sell welding solutions.”

The first decision that needs to be made on examining the feasibility of an automation solutions, is whether hard-automation or flexible automation is more appropriate. “Hard-automation solutions include the likes of columns, booms and rotators, combined in systems that are not easy to reconfigure.” Flexible automation is mostly about robots, “because you can reprogram a robot relatively easily,” Nagle explains.

Also differentiating Lincoln Electric from competitors in the automation market, is its long term view, states Nagle. “We are interested in total customer satisfaction,” he claims. “We want to have an on-going relationship with all of our customers to make them more successful, so we have a vested interest in making sure that they are completely satisfied with both our equipment and the consumables that, together, make

up a whole welding solution.”

A lot of customers equate welding automation to a ‘dream solution’ – no need for qualified welders, your penetration problems are instantly solved and troublesome details like joint preparation disappear. “They think that you can hit the big green go button and out comes a finished product,” he argues, “but it doesn’t work that way, you still have to know what you are doing.”

The simplest and the least costly way of taking a welding torch out of a welder’s hands is to use a system like BUG-O, says Nagle. “The great thing about BUG-O is that you don’t have to move the parts around – you bring the automation to the product. You can attach a magnetic BUG-O track along a joint to be welded much more easily than you can move a 40 ton vessel to a fixed column and boom.”

The big differentiator between a BUG-O-type system and a fixed installation such as a column and boom, is usually the scale in terms of the number of parts required and the regularity of the welding. “If you have to make girders all day, it probably makes more sense to go for a fixed installation

like a column and boom, but if you expect to have to make four girders before having to move onto something else, then BUG-O makes sense – it is much more flexible and perhaps fits more comfortably into the flexible automation category,” Nagle tells *African Fusion*.

Lincoln has several options for customers seeking column and boom installations and systems, he continues: “We can provide a full Lincoln turnkey system in conjunction with worldwide and local strategic partners to give the end users single source responsibility. We can integrate rotators and column and boom systems with seam tracking, arc-length control and all of that,” he adds.

Welding robots, Nagle tells us, are also on the flexible side of the automation equation. “Everybody used to assume that welding robots were an upper-end cost option. This is no longer true. I would say that robots have come down in price by a factor of five since I began in the industry 15 years ago. But while a robot arm may not be that expensive, the tooling or jigging can be.”

Depending on the accuracy required, the tooling can get very complex and very expensive. In the automotive industry for example, tooling must be custom made, heat treated to remove any stress and all of the holding surfaces have to be machined so that the robot knows exactly where the parts are, explains Nagle. They also want the robot to be welding all the time, so typically, the clamping is automated using pneumatically controlled clamps, so that as soon as the welding finishes, the table turns around, the clamps open, the operator removes the part and then reloads the jig.

“The automotive industry also want parts-in-place sensors. They want to know, before the robot starts to weld, that all of the parts are there. The operators who load and unload the station, do the same task hundreds of times a day and it is not uncommon that they forget to load a part,” Nagle informs us. “Parts-in-place sensors are there to prevent the robot from starting to weld unless all of the pieces needed, say for a suspension arm, are actually in the jig.”

One of the key reasons why more people don't automate, is the perception that it is too costly and that you have to be an automotive-type application – with high-volume similar parts – before it makes sense. “This is not the case any more, for two reasons, first, the cost of the robot systems themselves has come down enormously and most applica-



BUG-O systems – possibly the simplest and the least costly way to automate a welding process. A magnetic BUG-O track is attached along a joint to be welded. All positional welding is possible and weave features are available.

tions don't need the very sophisticated tooling used for automotive-type applications, and second, the digital nature of all modern systems, enables you to have multiple jigs running off the same robot.”

Lincoln has a global partnership with Fanuc Ltd, the world's largest supplier of robots, which involves the technical integration of Fanuc's robot controller with the digital output of Lincoln's software driven welding machines. “Locally, we team up with Fanuc Robotics, South Africa, and a specialist robotic integrator, Robotic Innovations,” says Nagle. “If we think that a welding application is suitable for robot automation, then we will call in Robotic Innovations to handle the integration of the welding equipment, the robot and the jigging,” Nagle explains. They have a very clever approach to flexible jigging. For each different part and its associated jig, they also attach a box of electronics – a unique identifier – that, when plugged in, will automatically select the correct programme for the part to be welded. The robot automatically recognises the jig and the part, making it very easy to change over between batch production runs and offering the flexibility to run a large number of different parts using the same robot.

“Robots have so much programming power now that you can drop in all kinds of different tooling solutions and the robot can just pick it up and go. The key point of this is that you no longer have to be a high-volume similar parts manufacturer to benefit. In South Africa, while most robot use is probably still in the automotive industry,

the number of non-automotive projects is growing exponentially. Robots are now much more accessible to many more people.”

We ask about labour in South Africa? “There is a perception in South Africa that labour is cheap,” responds Nagle. “Unskilled labour might be cheap, but you can't rely on unskilled labour for welding and skilled labour is far from cheap here, more expensive than China for example.”

The benefits? “Cost and productivity are the big ones but there are also substantial benefits in terms of quality, which I think people sometimes overlook. Automatic systems do not over-weld – they put down the right size weld with the same penetration and the same heat input every time. Automation results in a more reliable and repeatable welding process.”

Lincoln can bring much more than a robot arm to the welding table, says Nagle. “We start with the right welding solution, which we then try to automate – using a BUG-O system or a turnkey installation or an integrated Fanuc-Lincoln robotic welding system. If a manufacturer has separate suppliers for welding equipment, robot arms, manipulators and consumables, they can all point fingers in different directions when problems arise, but if you use a whole-solution supplier then there will be very little opportunity to deflect responsibility.

“That is why we at Lincoln say no to automation as often as we say yes,” concludes Nagle, “because neither we nor our clients have any interest in systems that don't work.” AF