

Fierce competition, new regulations and complex designs are just some of the challenges shipyards are currently facing. And while the market is recovering and pre-crisis figures are within reach, there is a need for technological developments and a flexible production environment. Automation and robotic welding can offer a solution to cope with these challenges.

To increase construction efficiency, modern shipbuilding of large ships often involves pre-fabricated block sections. These sections consist of steel plates with reinforced stiffeners and girders, and can be as large as 24 x 16m. Subsequently, consistent welding of block sections is a time-consuming process. Small spaces in these sections, such as double hulls in oil tankers, make manual welding one of the most difficult and dangerous tasks for human workers in shipbuilding. Additionally, each section is complex, unique and demands non-repetitive operations. Sounds like an impossible job to automate, but actually it's a perfect job for robots when you equip them with smart software

However, like manual welding, robotic welding is not without its challenges. The main issue of automating welding in shipbuilding is that it involves non-repetitive tasks, as each product is unique. Telling the robot what to do for each new product is hardly an option, so robot programming has to be automated. This calls for intelligent software. Also, ship designs are getting more complex due to innovations in the shape and functionality of ships. However, shipbuilders can automate welding of even the most complex parts, by establishing a link between design and production through 3D CAD.

Netherlands-based Kranedonk, a robot integrator specialising in shipyard automation, has come up with a new weld production software that it claims overcomes these challenges. Called RinasWeld, the software automatically generates robot programs based on a 3D CAD model to create a direct interface between CAD design and production automation to maximise arc welding time.

In order to properly handle the immense size of block sections, a flexible production environment is needed. For this reason, the Dutch company designed a gantry with suspended welding



# Welcome to the machines

## NEXT GENERATION ROBOTIC WELDING FOR THE SHIPYARD

robots to achieve maximum flexibility. The gantry, traveling on rails across the block sections, was found to provide a stable external axis and accurate motion control to enable the robots to deliver high quality welds on any weld position or contour. For double hull sections, the gantry was equipped with an elevator to suspend the tiny robots in the smallest places, such as sections of 700 x 700mm.

### SMART SOFTWARE

Robots that can reach any weld position (horizontal, vertical and curved) is the first need for welding block sections, but to really benefit from robotic welding, ship and rig builders will need to automatically program and control the robots. With complex and continuously changing designs this becomes a problem. RinasWeld is claimed to offer a solution because it generates all production data for the robots based on 3D CAD, including collision-free robot paths, balanced workload and predefined weld parameters.

In some of the most advanced panel welding lines that the company has supplied, eight robots simultaneously weld on the same panel, all fully controlled by RinasWeld. Offline work preparation takes only a few minutes for setting up a block section, which gives many hours of production. The software automatically recognises weld seams and determines the most efficient robot paths. Robot programs are then exported to the shop floor, where only one supervisor is needed as the software takes care of all robot movements, safety and quality control, says the company.

'With new solutions, shipyards can make a difference in the post-crisis era. Ongoing digitisation of the production process is facilitated by these intelligent robot welding systems. Because all welding times are known weeks before the production starts, shipyards can streamline the production process, saving costs throughout the yard,' says Kranedonk. 'Robot technology enables manufacturing companies to produce more efficiently and effectively.'

## HHI develops mini-welder for the confined space

Hyundai Heavy Industries (HHI) has developed mini welding robots for shipbuilding. The compact design of the welding machine, measuring 50cm by 50cm by 15cm when its welding arm is retracted, can operate in confined areas inaccessible to human welders. The robot's six joints enable the machine to carry out almost all types of welding work at a similar speed usually done by a welder.

A magnet on its body means the machine can be attached to steel walls or ceilings. Weighing just 15kg, an operator can control three machines at the same time, increasing productivity threefold.

With the installation of software for steel cutting, blasting and painting, the robot can perform these other shipbuilding roles. Hyundai Heavy also plans to improve the robots to be usable for building onshore/offshore facilities and construction equipment.

The mobile welding robots have been in operational use in shipbuilding since the second half of this year.

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