

COBOT SOLUTION FOR THE SHIPBUILDING INDUSTRY

Accessibility and tight working environments are increasing the welding operation effort in disadvantageous working conditions. We care about welders and welding quality as much as our customers do. Therefore we introduce Hyundai Welding integrated Cobot solution for Shipbuilding as well as our ongoing application developments for the industry.



HYUNDAI WELDING

HYUNDAI WELDING is a global manufacturer of welding consumables and equipment. As the top leading manufacturer of welding consumables in Korea, and with a global network of sales, distribution and manufacturing plants, HYUNDAI WELDING has developed into a key player in the international welding industry.

Our company is fully committed to the ever-changing needs of our customers and has evolved in just under 50 years to provide welding expertise and breakthroughs in welding technology. HYUNDAI WELDING understands customer needs and offers customers world-class products and world-class solutions.

INNOVATIVE SOLUTION FOR INSIDE - BLOCK WELDING

In addition to weld integrity, surveying and re-work which are adding up to the welding cost and overall operational efficiency, lack of skilled welders is a headache for shipbuilding industry like all other welding industries.

Together with the owner of some of the world's largest and most advanced shipyards in their welding operations, our application development engineers aim to overcome the issues related to the most complicated welding sections especially inside-block welding.

Accessibility and tight working environments are increasing the welding operation effort in disadvantageous working conditions. For this reason, HHI has implemented our Cobot solutions for inside-block welding operations in their yard.

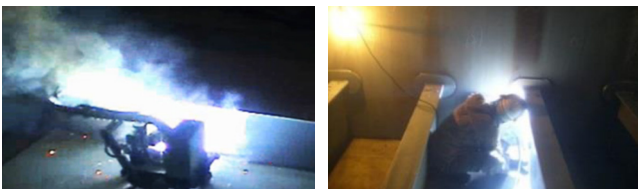


ADVANTAGES OF COBOT WELDING FOR INSIDE - BLOCKS

- Efficient, simple and cost-efficient welding automation
- One person can operate multiple systems
- No need for arc observation (Welding DB)
- Minimize unwelded length
- No restrictions on welding position
- Excellent welding quality (arc sensing)
- Enables welding with minimal training time
- Can be carried by hand inside the location
- Safety certification can be obtained

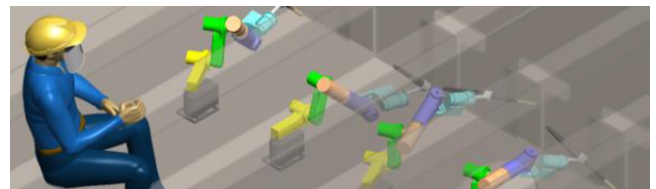


Carriage & Manual Welding



- Reduced arc-time, as welder needs to maneuver around the section, carrying carriage, wire feeder, cable package and torch
- Heavy workload for the welder inside the narrow area.
- High skilled welders required to execute welding.
- Team of welders required (average of 5 welders needed per middle sized, heavy duty block).

Cobot Welding

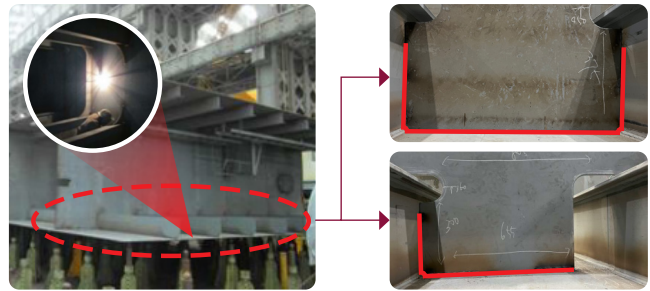


- Small, portable and lightweight cobots are resistant to workload
- Cobots allows novice welders to operate welding
- Improve productivity by operating multiple cobots per single welder.
- Through the Arc Seam Tracking and Touch Sensing capability, limited programming required.

APPLICATION FEATURES

Cobot Welding maximizes welding efficiency vs carriage welding with significant reduction of manual welding as well as adjusting bead segments in welding order to reduce welding defects.

Cobot welding is also desired for the internal hull welds in the lower deck block units – most complex welding operation, due to accessibility and enclosed workspace – is improving welding operation efficiency.



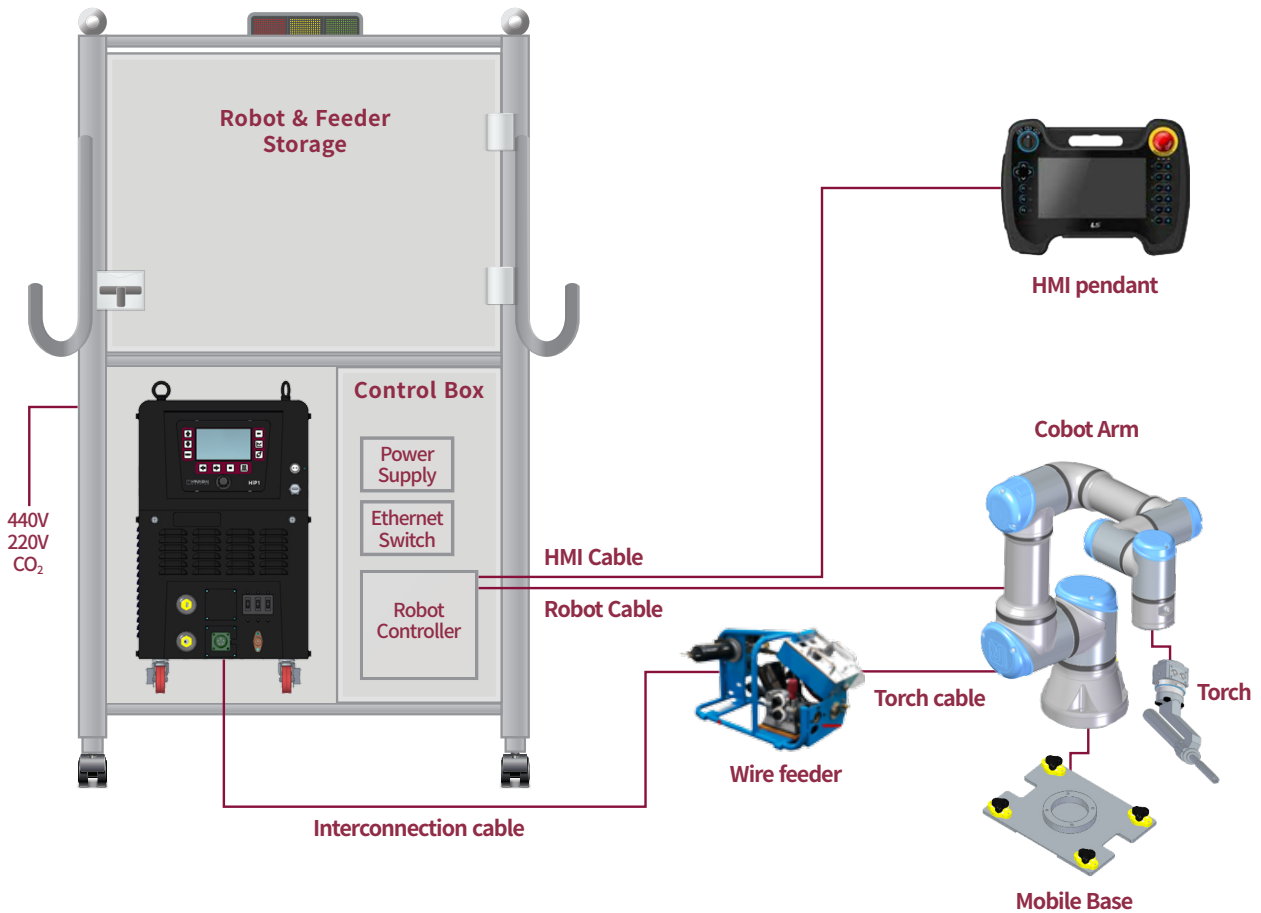
* based on example from major shipyard in South Korea

Carriage Welding	Cobot Welding	
<p>1 operator can cover 36 cells/day on avg (using mini carriage, vertical carriage)</p>	<p>1 operator can cover 50 cells/day on avg (1 operator uses 2 units)</p>	<p>Cobot arc sensing motion for curved blocks under development</p>

<p>Type A</p>	<p>Carriage access limitations</p>	<p>Manual Welding 270mm</p>		<p>Manual Welding 0mm</p>
<p>Type B</p>	<p>Carriage limitations</p>	<p>Manual Welding 1,125mm</p>	<p>Minimal manual welding required</p>	<p>Manual Welding 60mm</p>

PORTABLE COBOT WELDING SYSTEM CONFIGURATIONS

Configuration diagram of portable collaborative robot welding system



Integrated connections to intuitive control full welding operations



Pendant

Modbus TCP

Single control pendant as user interface (UI) to:

- Control cobot traction
- Power source and wire feeder control



Robot controller

Modbus TCP

**Digital I/O
Analog I/O**

- System overall control program driver
- Create and run robot motion programs
- Robot arm pressure sensor detects base material
- Detection of signals requiring constant monitoring, such as emergency stops



Welding power source

**Modbus TCP
Analog I/O**

- Welding power provided through robot controller
- Provide base material detection signal through robot controller