

Kobe Steel's Research and Development in Welding Materials, Robotic Welding Systems, and Welding & Joining Processes

Welding and joining technologies using heat sources such as arcs and lasers are indispensable for manufacturing structures in the fields of shipbuilding, architectural steel frames, construction machinery, bridges, automobiles, and energy. Kobe Steel develops welding materials, welding systems, and processes for carbon steel, low alloy steel, and high alloy steel, with a focus on arc welding. This special issue introduces the latest welding and joining technologies with the keyword "solutions".



Fig.1 Compact and portable welding robot KI-700 for nickel steel

Figure 1 shows the KI-700, a compact and portable welding robot designed for Ni steel. As the world moves towards carbon neutrality, 9% Ni steel is becoming increasingly crucial for storage tanks used for liquefied natural gas, a key transitional energy source. However, welding 9% Ni steel requires high levels of skill to prevent defects, such as lack of fusion. This welding robot, combined with specialized welding materials, offers a solution that enables deskilling, high efficiency, and quality stabilization.

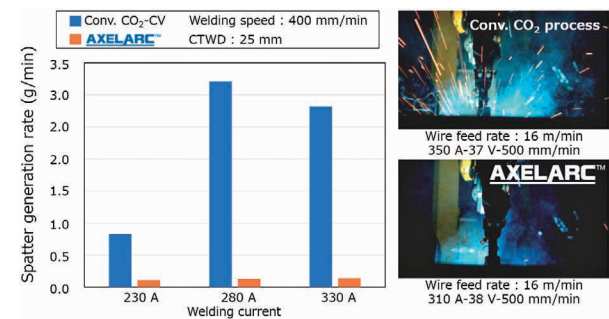


Fig.2 Comparison of spatter generation rate between constant voltage welding process and AXELARC™

Figure 2 shows a comparison of spatter generation in constant voltage welding and AXELARC™. The latter employs a unique wire feed mechanism and current waveform control that ensure stable droplet transfer, without relying on a short circuit. This innovative approach results in a significant reduction in spatter generation, as compared to constant voltage welding using 100% CO₂. Additionally, AXELARC™ facilitates deep penetration, enabling high-quality welded joints without any defects such as lack of fusion, even when welding thick plates.

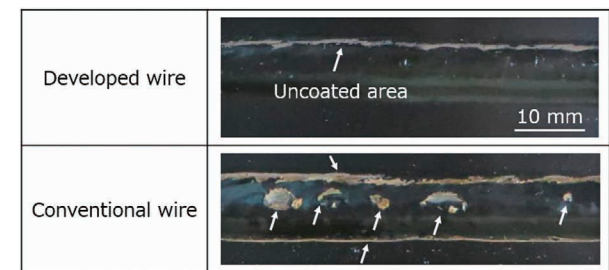


Fig.3 Comparison of weld bead appearances after electrodeposition coating

Figure 3 compares the appearance of the weld bead after electro-deposition coating on a lap weld joint fabricated using a conventional wire and a newly developed wire. The composition of the newly developed wire is adjusted to facilitate the formation of an electro-deposition coating on the slag generated during welding, resulting in a significant reduction in areas lacking electrodeposition coating. This development holds particular promise for welding automobile undercarriage parts that are frequently exposed to highly corrosive environments, where it is expected to greatly improve the corrosion resistance of these parts.

Cover Photos

Shown on the cover are a new manipulator and power source for the robotic system for welding architectural steel frames and a welding solid wire for the New REGARC™ process. Also shown is a compact, portable welding robot for Ni steel and special flux-cored wire, used for welding LNG tanks. Kobe Steel offers new welding solutions with these welding systems, welding materials, and welding techniques.

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