September 18,2026

Nippon Yakin Kogyo Co., Ltd.

HALO-W Process: A Novel Laser Overlay Welding Technology Utilizing Stainless Steel Strip Electrodes

Nippon Yakin Kogyo Co., Ltd. and Hiroshima University have jointly developed a new overlay welding technology, HALO-W (Hot-band Assisted Laser Overlay Welding), based on their collaborative research on hot-wire laser welding technology (Fig. 1).
The HALO-W process aims to achieve both high-efficiency overlay welding and improved weld quality through the combination of Joule-heating assistance applied to a strip electrode and laser heating for welding.

Conventional hot-wire laser welding processes have primarily employed metallic filler wires for overlay welding.
In contrast, the newly developed HALO-W process utilizes a dedicated feeding system capable of supplying preheated metallic strip electrodes.
The preheating effect reduces the thermal load required from the laser heat source, enabling wider-area overlay deposition than conventional wire-based processes.
Furthermore, the process provides superior weld quality, particularly with respect to dilution control and weld bead morphology.

One of the key advantages of the HALO-W process is its flexibility in filler material selection. In addition to strip electrodes used in conventional overlay welding processes such as Submerged Arc Cladding, HALO-W can utilize a wide range of commercially available strip materials.

Laboratory-scale investigations commenced in 2025. Experimental trials were conducted using SUS309L stainless steel strip, with a thickness of 0.5 mm and a width of 9 mm, as the filler material.
The results demonstrated the ability of the HALO-W process to suppress penetration depth while producing smooth bead profiles, thereby achieving a favorable penetration shape ratio and low dilution rate.
The results of this research were presented at the 79th IIW Annual Assembly and International Conference on Welding and Joining, organized by the International Institute of Welding (IIW) in July 2026.

In addition to overlay welding, the HALO-W process is applicable to narrow-gap groove welding

by matching the strip width to the groove width, as well as to Additive Manufacturing.
Furthermore, the process is not limited to stainless steel strip materials and can also be applied to various materials, including nickel-based alloys and aluminum alloys, making it a promising technology for broader industrial applications in the future.

Nippon Yakin Kogyo Co., Ltd. and Hiroshima University will continue their collaborative research efforts and further advance the development of this innovative welding technology.

Fig. 1 Conceptual illustration of the HALO-W process (generated by Copilot)

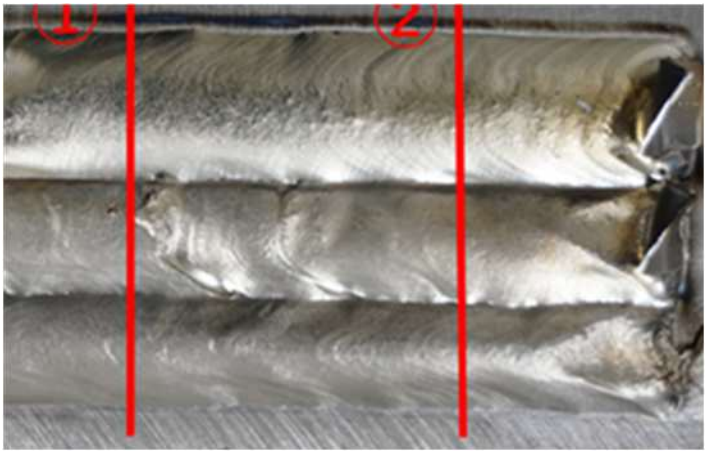

Fig.2 Appearance of the overlay weld produced by the HALO-W process

For inquiries about this article, please contact: https://www.nyk.co.jp/en/contact/index.php