Adapting to smart factories in the wind sector

The offshore wind industry faces a shortage of qualified personnel and a high demand for production capacity for wind foundations. This necessitates a transformation of the manufacturing process. HAANE's recent Adaptive Welding System marks a major advancement and a big step toward automation in wind foundation pipe production.

HAANE welding systems is a pioneer in delivering cutting-edge automation solutions for offshore wind production lines. With over 75 years of experience in turnkey factory solutions for welding technologies, the privately owned company combines tradition with innovation and skilled personnel.

The company began its renewable journey in 2000 by constructing its first monopile installation in the Netherlands. Since then, it has expanded its expertise in managing workplace systems and providing welding solutions for the production of monopiles, towers, and foundation pipes to address the heightened challenges of the offshore wind industry.

Twenty-five years in the wind: challenges

The rise of renewables requires efficient production methods. The industry faces a dual challenge: a surge in demand and a shortage of skilled expertise. To address these, HAANE transforms monopile production into a more people-centric business, where experience and automation converge to enhance efficiency. This has significantly boosted productivity. Continuing this advancement simplifies the handling of complex welding processes.

Productivity boost through automation

Implementing multiple welding heads has proven to be a game changer but requires an intelligent system to assist the welder in handling multiple actions simultaneously. While the skills of the welder remain essential, the automation system is designed to streamline the process by automatically generating welding parameters and positioning the welding heads to account for various tolerances, including rolling tolerances, out-of-roundness, milling tolerances, and high and low spots from the fit-up process.

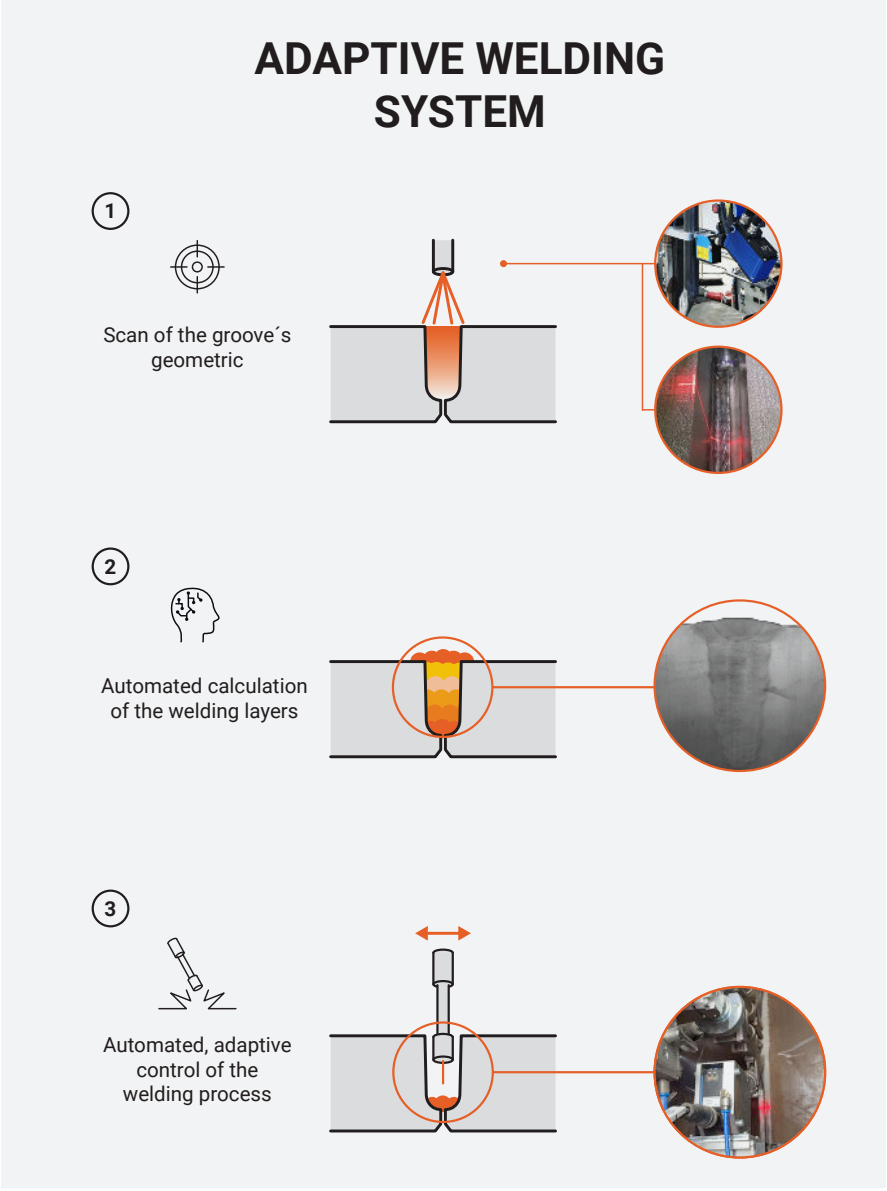
These factors demand real-time adjustments that are almost impossible to handle manually. HAANE's Adaptive Welding System automatically fine-tunes parameters, ensuring consistent crossover and cap layer processes.

Redefining accuracy

The system starts with a deep scan of the narrow gap groove, a critical area for welding. In the preheating phase, the system conducts thorough analyses of important geometric features that guide the welding process. The integrated control system with a submerged arc welding (SAW) head and multi-axis control, uses these scans to calculate the most effective welding parameters and determine the ideal pass positions.

The technology optimises the entire welding procedure by adhering to precise Welding Procedure Specifications (WPS). An additional advantage is to finely tune the adjustment of the welding head's penetration angle, ensuring efficient slag removal throughout the operation.

The automation system continuously adjusts in real-time for changes in groove geometry caused due to shrinkage or other variables, ensuring a smooth welding process. This limits downtime caused by necessary manual adjustments of the operator being handled in the current workflow.



User-friendly automation

Despite system complexity, user-friendliness is paramount. The automation system guides welders intuitively, eliminating the need for extensive programming skills. The user interface can be tailored to employees' specific needs and the plant's external conditions. This ease is critical as the industry moves toward greater reliance on automated solutions.

Online access helps technicians to address and resolve issues remotely, without needing to halt production, ensuring faster response times and efficient troubleshooting.

In addition, the online platform facilitates operator training, allowing personnel to familiarise themselves with the system's functions and updates while reducing the need for on-site training sessions.

The next frontier

Looking ahead, AI integration into the Adaptive Welding System will enhance automation capabilities. This will enable the system to deal with complex situations, particularly in challenging groove areas where welding precision is critical. Moreover, a digital training simulation is currently in development.

The system automatically detects flaws or inconsistencies during the welding process and adjusts in real time to address them. As a result, inspection and production lead times are expected to be significantly reduced, as issues will be corrected on the spot without extensive manual intervention.

Conclusion

The adaptive welding system is advancing offshore wind production lines to Industries 4.0 through innovative automation solutions. Combining extensive expertise in welding technology with state-of-the-art automation and intelligent systems enhances productivity and guarantees high-quality outcomes in a demanding industry.

This marks a significant milestone in automating the production of wind foundation pipes with real-time adjustment, using advanced laser scanning and seam tracking to adapt to changing conditions and ensure precision, even in challenging situations. Coordinating two welding heads is akin to the European League, while managing four is comparable to the Champions League, a truly unmatched capability in the market. Besides, the integration of multiple welding heads improves productivity, allowing a single operator to oversee multiple operations simultaneously thereby improving overall quality.

Future AI-based developments continue to push the boundaries of automation in renewable energy production and ensure the technology meets the evolving demands of the offshore wind industry.

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Portal with two welding heads

Portal with four welding heads