

How Fairbanks Morse Defense's Advanced Robotic Welding Technology is Setting New Standards for Speed, Quality, and Versatility



Executive Summary

In demanding industrial and defense environments, the need for rapid, reliable, and precise welding is paramount. Traditional manual methods, while effective, often face limitations in speed, consistency, and operator strain, especially in complex or confined spaces. Fairbanks Morse Defense (FMD) has addressed these challenges with its state-of-the-art robotic welding technology. This system combines a portable, modular design with machine learning and advanced automation to deliver unparalleled efficiency and quality. By complementing the skills of human welders, this technology accelerates project timelines, enhances workforce productivity, and ensures adherence to the strictest industry standards across a wide range of critical applications.

The Challenge: Monitoring Critical Welding Processes

Across heavy industries—from naval defense and shipbuilding to power generation—welding is a foundational process. However, many critical applications present significant hurdles. Projects often involve repetitive tasks in physically demanding or hazardous environments, leading to potential inconsistencies and physical strain on skilled welders. Furthermore, tight project timelines for essential repairs and manufacturing demand faster solutions without compromising quality.

The primary challenge was to develop a welding solution that could:

- Operate effectively within confined or difficult-to-access spaces.
- Drastically increase welding speed to reduce downtime and accelerate production.
- Deliver consistently perfect welds that meet stringent quality and compliance standards.
- Support and empower skilled human welders, not replace them.

The Solution: FMD's Robotic Welding Technology

FMD's robotic welding system is a comprehensive solution engineered to overcome the limitations of traditional welding. It creates a powerful synergy between robotic precision and human expertise. This innovative technology is defined by several key features that make it adaptable and highly effective for diverse applications.

- **Modular and Portable Design:** Engineered specifically for versatility, the system is portable and can be easily deployed in challenging environments, including the confined spaces of a ship or submarine.
- **Unmatched Speed and Efficiency:** The robotic welder operates up to three times faster than conventional manual welding. This capability can shrink a three-week welding job down to just one week and has been shown to reduce crank bore repair times by 50–75%.
- **Advanced Welding Capabilities:** The technology is built to handle complex geometries, including both top and bottom crank bores and thrust bearing saddles. Its design is future-proof, allowing for upgrades to tackle new challenges.
- **Machine Learning Integration:** An integrated AI system analyzes weld quality in real-time. This allows for immediate process adjustments and continuous improvement, ensuring every weld meets exact specifications.
- **Workforce Synergy:** The system handles repetitive, strenuous tasks, freeing skilled technicians to focus on higher-value work such as peening, porosity correction, and complex weld oversight. This reduces physical strain and boosts overall team productivity.

Implementation Across Applications

The versatility of FMD's robotic welding technology allows for seamless implementation in numerous scenarios. Whether for planned manufacturing or emergent repairs, the process is streamlined for maximum impact. The portable unit is transported to the worksite, assembled quickly, and programmed for the specific task.

FMD technicians oversee the automated process, leveraging their deep expertise to ensure optimal performance and quality control. This collaborative model has proven effective in various high-stakes situations.

Use Case Example: Mission-Critical Submarine Repair

A prime example of the technology's impact was an emergent crank line repair required for the USS Florida submarine. The project demanded both speed and perfection to minimize the vessel's downtime. FMD deployed the robotic welding system, which operated flawlessly within the submarine's confined quarters. The result was a swift and successful repair that met all stringent Navy-certified procedure requirements, validating the technology's reliability in a time-critical, high-consequence operation.

The Results: A New Benchmark for Welding Excellence)

The deployment of FMD's robotic welding technology yields transformative results, setting a new industry standard.

- **Accelerated Project Turnaround:** The dramatic increase in welding speed leads to significant reductions in project timelines, getting critical assets back into service faster and boosting overall operational efficiency.
- **Superior Quality and Consistency:** Automated, AI-monitored welding ensures consistent, high-quality results that adhere to strict compliance and industry standards, eliminating human error in repetitive tasks.
- **Enhanced Workforce Support:** The technology complements skilled welders, reducing their physical burden and allowing them to apply their expertise to more complex and valuable aspects of a project. This leads to a more productive and safer work environment.

The Conclusion

Fairbanks Morse Defense's robotic welding technology is more than just an automated tool; it is a strategic asset for modern industry. By blending robotic speed and precision with the invaluable skill of human welders, FMD provides a solution that drives efficiency, improves quality, and offers unmatched versatility. From urgent naval repairs to large-scale industrial manufacturing, this technology is a proven and essential solution for any organization that relies on welding for mission-critical success.