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Rail Transit Welding Manual Welding vs. Dual-Wire/ Multi-Wire MIG Intelligent Welding Equipment ** Comprehensive Comparison

I. Core Cost Comparison (Aluminum Alloy Body Chassis/Roof Welding)

Project	Manual Welder	Dual-wire MIG intelligent welding equipment
Configuration	5 Team Members	1 set of intelligent welding robot
Daily unit price	¥100 / day	1 intelligent welding robot
Overall welding cost	Piece-rate wages	Total equipment investment: ¥400,000; construction period shortened by 50% of days; construction days reduced by 50%;
Subsequent costs	Ongoing expenses such as staff salaries, social security, and accommodation.	Low-cost maintenance

II. Comparison of Construction Period and Efficiency

Standard construction period	20 days	5-8 days, shortened by 60 %
Operational stability	Affected by welder skills and number of workers	24-hour continuous operation
Quality Consistency	First-pass yield rate: 90 % –95% Welding deformation: 8–15 mm Residual height/ melt depth fluctuation 2-5 mm	First-pass yield rate: 95 % –98 % ; Welding deformation: ≤5 mm Residual height/ melt depth fluctuation ≤ 0.5mm
Production Capacity Comparison	≤200 vehicles	Increased to 500 vehicles

III. Comparison of Typical Application Scenarios

Main weld of the bogie frame	Feasible: High labor intensity , large quality fluctuations in manual welding , and high rate of rework due to flaw detection.	It replaces manual welding, with an automation rate of approximately 95%; welding quality and efficiency are significantly better than manual welding.
Bogie side beam/ crossbeam welding	Feasible: Large volume welding of long straight bevel joints leads to inconsistent quality due to welder fatigue.	Suitable for use, reducing single-beam welding time by 50% ; welding quality and efficiency are significantly better than manual welding.
直接添加在开头	Feasible: The weld seam can be several meters long. Manual multi-layer welding is prone to deformation, resulting in poor appearance and a large amount of grinding required.	doubling the efficiency: Suitable for applications with an automation rate of ≥95% resulting in a 2x increase in efficiency; welding quality and efficiency are significantly superior to manual welding.
Aluminum alloy chassis/roof	Feasible: Thick-walled cylindrical circumferential seams require a large amount of welding, involve high labor intensity, and have strict sealing requirements.	This system is suitable for hydrostatic and airtightness testing, achieving a 100% pass rate;It boosts efficiency by 2 to 4 times,while its welding quality and efficiency are significantly better than those of manual welding.
删除In brake air reservoir / cylinder		

IV. Summary of Overall Advantages

- Advantages of manual welding
- High flexibility
 - Good adaptability
- Dual-wire MIG intelligent welding equipment
- Dual-wire MIG intelligent welding requirements
 - Welding time shortened by 60 %
 - Higher welding quality and efficiency

Welding time shortened by 60%, accelerating production rhythm.

Shipbuilding Industry A Comprehensive Comparison of Manual Welding vs. Intelligent Collaborative Robotic Welding Equipment with Collaborative Robotic

I. Core Cost Comparison (10,000-ton bulk carrier, 16 main compartments)

Project	Manual Welder	Collaborative welding robots
Configuration	10 Team Members	4 sets of intelligent collaborative welding robots
Daily unit price	¥60 /day	15 workers
Overall welding cost	30 days × 15 workers × ¥60 = ¥ 2700	No daily wage, one-time investment
Payback Period(months)	—	Total equipment investment: ¥250,000; construction period shortened to 15 days;
Subsequent costs	Continuous expenditure	Payback within 10 months
		Low-cost maintenance

II. Comparison of Construction Period and Efficiency

Standard construction period	30 days	Reduced by 50 % , approximately 15 days
Operational stability	Affected by welder skills, number of workers, and personal safety	24-hour continuous operation
Quality Consistency	Depends on the individual skill level of the welder	The weld formation is excellent , with a first-pass yield exceeding 90%.
High-altitude/ Hazardous operations	The space is narrow and enclosed, posing a high risk of personal injury accidents.	Equipment replacement ensures enhanced safety.

III. Comparison of Typical Application Scenarios

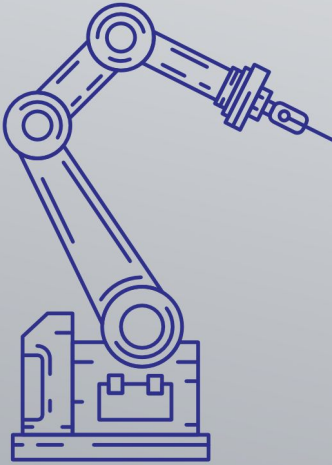
Ship compartment welding		It is well-suited for confined spaces , and its welding quality and efficiency are significantly better than manual welding.
Large plate welding	Applicable	Suitable for high-volume work areas, its welding quality and efficiency are significantly better than manual labor.
Ship field welding		Adaptable to complex working conditions, its welding quality and efficiency are significantly better than manual welding.
Outfitting workpiece welding	Software upgrade and adaptation for non-standard parts	Non-standard parts software upgrade and adaptation

IV. Summary of Overall Advantages

- Advantages of manual welding
- High flexibility
 - Good adaptability
- Advantages of Collaborative Intelligent Welding Robots
- Payback in several months
 - Welding time shortened by 50 % , faster payment collection
 - The personal safety risks of welders have been greatly reduced.
 - Good welding quality and high welding efficiency
 - Higher value in long-term operation
- Multi-person operations and mutual coordination of multiple processes
- Payback within 10 months
- Greatly reduced personal safety risks for welders
- Higher welding quality and efficiency



Sky Welding Tech Limited COMPANY PROFILE





01 COMPANY PROFILE

We focus on welding automation and intelligent manufacturing, combining passive vision systems with deep learning algorithms to improve welding efficiency and precision. **Our company has created intelligent welding systems to realize remote video transmission from the work area, fully improving construction safety. Equipped with deep learning-based adaptive weld seam tracking system, the robots detect real-time deviations of weld positions and adjust welding paths automatically. Based on human-machine learning and expert system, the experience of skilled welders is digitalized and collected. Combining seam tracking with an expert system, intelligent welding robots can optimize welding passes and specifications, enabling the robots to control the welding process like skilled welders. Our welding equipments are strong adaptability, and highly precise and efficiency. They also reduce reliance on manual processes.**

The company maintains in-depth cooperation with universities and research institutes worldwide. All patented technologies are developed and owned by our team. We have developed three types of intelligent welding equipment, including entry-level, mid-range and high-end fully automatic welding robots. In the near future, we will launch demonstration applications of our intelligent welding equipment in extreme environments such as aerospace, deep sea, and high-pressure regions.

02 APPLICATIONS / SCENARIOS



Energy Construction

Welding and fabrication of pipelines and special pressure vessels, ensuring the safe operation of energy lifelines.



Aircraft Industry

Precision welding for shaped and non-standard lightweight metal parts, complying with stringent standards for deep-space environments.



Rail Transit

Welding production of components operating in complex spaces under frequent alternating loads, safeguarding every high-speed journey.



Shipbuilding

Efficient welding in confined spaces and high-risk environments, empowering marine vessels to sail across the oceans.

03 TECHNICAL BARRIERS

The entire process chain includes arc welding, laser welding, cutting, and cleaning. We provide cutting-edge technologies in additive manufacturing and remanufacturing. **We also specialize in damage analysis and life assessment of in-service equipment under special operating conditions, as well as material microstructure analysis and performance evaluation.**

Our technical support covers one-third of the pressure vessel welding in China, and we have become a backbone of the industry.



04 INTELLIGENT PIPELINE WELDING ROBOT PRODUCT SERIES

01 Entry-level product

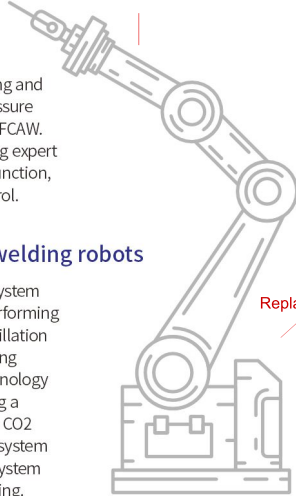
MIG/MAG all-position magnetic crawling welding robot, which can realize pipe filling and cover welding, and can automatically adjust the welding parameters and positions of each layer. **capping welding**

02 Mid-range product

Products can achieve all-position filling and capping welding of pipelines and pressure vessels using GMA, CO2 welding, and FCAW. They have a built-in intelligent welding expert database and remote visual control function, enabling wireless operation and control.

03 High-end fully automatic welding robots

The intelligent hot-wire TIG welding system with torch oscillation is capable of performing root, fill, and cap welding. Both the oscillation and TIG modes ensure superior welding quality. Furthermore, the hot-wire technology significantly boosts efficiency, reaching a deposition rate comparable to that of CO2 welding. Equipped with an intelligent system and an expert welding database, the system enables fully automated robotic welding.



Replaces manual labor, enhanced safety

Project Cases:

This solution has been successfully deployed on-site for pipeline welding in high-profile projects, including the CNOOC Engineering Zhangzhou LNG Storage Tank Project and the Energy China Lanzhou New Area Thermal Power Project. By allowing just 2 to 3 operators to replace a full team of traditional welders, the on-site crew can now be streamlined to include only auxiliary workers (such as fitters and installers) and process technicians.



Aircraft Manufacturing

Aircraft manufacturing Comparisons of Manual Welding vs. Pulsed MIG/TIG Intelligent Welding Equipment

I. Core Cost Comparison (200 Oxygen Stents)

Project	Manual Welder	Pulsed MIG/TIG Intelligent Welding Equipment
Configuration	Group of 3	1 set of intelligent welding robot
Unit price	¥80 / piece	¥20 / piece
Overall welding cost	200 x 80 = ¥16,000	Total equipment investment: \$120,000 RMB ; construction period Shortened by 50%;
Subsequent costs	Continuous expenditures such as employee social security and accommodation	Low-cost maintenance

II. Comparison of Construction Period and Efficiency

Standard construction period	200 days	Shortened by 50%
Operational stability	By welder skills, number of workers, and personal safety	24-hour continuous operation
Quality Consistency	Depends on the individual skill level of the welder	The weld formation is excellent, with a first-pass yield exceeding 95%.
Construction period / Hazardous operations	Continuous expenditure on personnel salaries	Equipment replaces manual, safer

III. Comparison of Typical Application Scenarios

Component	Manual Welder	Argon Arc Intelligent Welding Equipment
Aircraft oxygen bracket		
Aircraft radiator frame	Suitable	The welding quality and efficiency are significantly better than manual welding.
Landing gear bracket		
Ventilation duct bracket		

IV. Summary of Overall Advantages

- Advantages of manual welding
- High operational flexibility
 - Good adaptability to small spaces
- Argon Arc Intelligent Welding Equipment 1200
- Equipment costs can be recovered within 1,000 products welded.
 - Construction period shortened by 50%, faster project capitalization.
 - Welder wages, equipment, food and accommodation expenses have been reduced significantly.
 - Higher welding quality and efficiency
 - Flexible and adaptable to welding of multiple products. **Flexible and adaptable to welding multiple products—the more it runs, the more it saves.**

V. Conclusion (Aerospace Welding Manufacturing)

- **Small-batch, non-standard parts production:** Suitable for manual batch operations; the number of welders must meet the production schedule requirements.
- **Mass production and large-scale production :** Intelligent robots are the clear winner , significantly reducing labor costs, with welding quality and efficiency far superior to manual labor, high return on investment , low long-term maintenance costs and shorter construction periods.