



# TECHNOLOGY AND INDUSTRIAL EVOLUTION DRIVE WELDING TOWARDS A ROBOTIC FUTURE

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BY CRISTIANO BERGAMIN

The US welding industry will face a shortage of about 400.000 welders in 2024 according to the American Welding Society. The average age of a welder is 55 and rising and the coming wave of retirements will leave developed markets with a great deficit in skilled welders. Europe is already struggling to recruit skilled welders. The current inflation rates further increases wages and drives up costs. In addition, high energy costs increases the cost of the energy intensive welding processes. Welding consumables' costs also increases placing a greater emphasis on scrap reduction and wastage. The pending economic challenges

will require manufacturers to improve their productivity whilst maintaining quality levels to reduce their product costs and remain competitive. In many sectors, the manual work of even experienced operators is no longer able to support the objectives, meaning that for many companies, automation is the only option.

Robots are expected to create 15 million new jobs in the U.S. over the next 10 years, as a direct result of automation and artificial intelligence, equivalent to 10% of the workforce, a recent report by Forrester Research found.

## Robots are already improving productivity in many business sectors such:

1. In Amazon warehouses, many of your packages may have been handled not by people, but by robots, potentially reducing to 15 mins an activity that used to take one hour.
2. On a Royal Caribbean cruise, and you may find that your fruity cocktail is made by a bartender – and the robots can make two drinks a minute, up to 1,000 each day.
3. Robots could replace one-fourth of all U.S. combat soldiers by 2030, according to statements made in 2014 by U.S. Army Gen. Robert Con
4. At the pharmacy at the University of California, San Francisco, it isn't a human who fills the prescriptions – it's a robot.
5. Robots will likely take some journalists' jobs in the near future. A program by Narrative Science already writes short sports recaps.



## Productivity.

Thanks to the rapid technological evolution that has recently characterized the world of robots, the advantage that these systems have in terms of productivity compared to work performed manually becomes increasingly relevant.

## Quality/Safety.

Besides the need to reduce wastage and eliminate product performance issues, companies are required to collect and record all the welding data. The complexity and accuracy of collecting, analysing and storing such data is significantly reduced with automated processes.

Driven by these needs, new, simpler, lower cost and more flexible robot systems have emerged and the “robot plant” option is now viable for small/medium-sized companies that operate with medium-level production volumes.

## The key factors for future-looking welding robotic systems

- ① Robot-welding equipment integration level
- ② Optimising the welding process and the quality of the filler materials
- ③ Quality and metallurgical expertise (WPS) of the supplier
- ④ Fume control
- ⑤ Energy sustainability
- ⑥ Self-learning robots and artificial intelligence

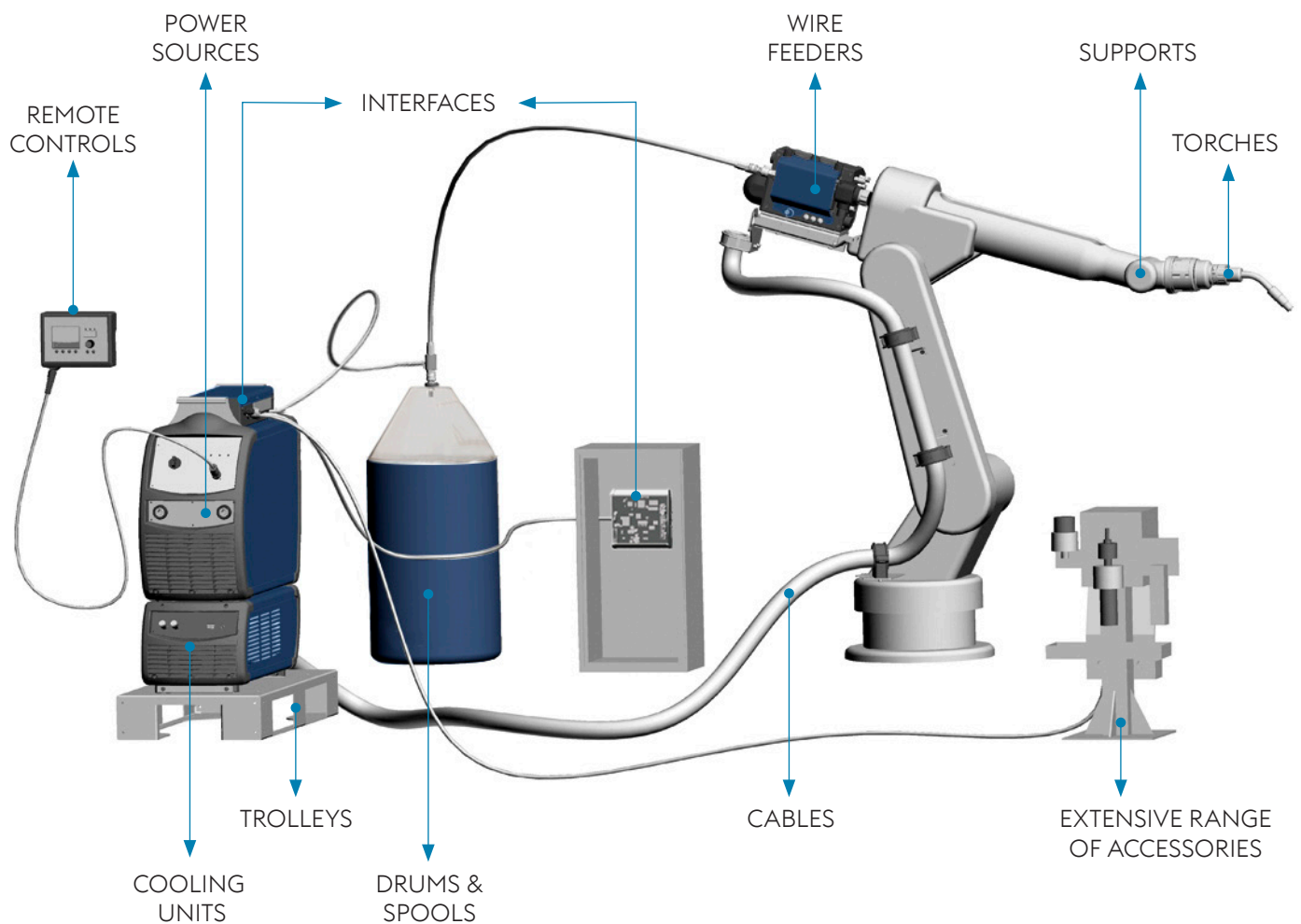
# 1. ROBOT-WELDING EQUIPMENT INTEGRATION LEVEL

Welding robots constitute 25 % of globally installed robots and are critically dependent on the level of integration between the equipment that controls the welding process and the robot that performs the movements of the welding torch. Unlike professional welders, robots cannot take corrective actions when welding problems occur. It therefore follows that efficient welding processes requires effective and complete the integration between robots and welding equipment in terms of sharing and transmitting process parameters.

voestalpine Böhler Welding has therefore designed a wide range of digital interfaces that allow dialogue between all

system components and that are compatible with all communication protocols currently used in robot applications (both hardware and software). This portfolio of interfaces allows for the exchange of a high volume of information and detect and control the main welding parameters as well as a whole series of functions that optimize the process and improve the welding execution.

The transmission of thousands of signals between robot and welding equipment combined with an extremely fast feedback loop produces a better quality of the welded joint and a strong increase in the speed of welding which translates into higher productivity.

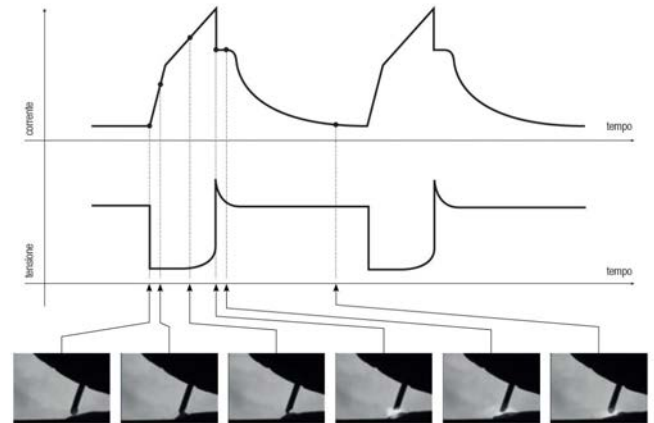


## 2. FINE-TUNING OF THE WELDING PROCESS AND QUALITY OF THE FILLER MATERIALS

The industrial experience of voestalpine Böhler Welding and continuous research are the basis of the development of MIG/ MAG and TIG welding processes dedicated to robot production plants that ensures a highly reactive arc, even in difficult welding positions, and lower spatters production.

All welding processes have been designed to maximize productivity and speed thanks to the specific waveform and precise arc control.

voestalpine Böhler Welding is world renowned for its expertise in manufacturing high performance quality welding consumables and to combine these with the robotic welding processes to achieve a high level of productivity, reproducibility and weld quality for all the main industrial metals such as carbon steel, stainless steel, aluminium, copper and others.



## 3. QUALITY AND METALLURGICAL EXPERTISE (WPS)

A crucial but widely underestimated element in the world of robot welding is the metallurgical know-how as the welding process decisively influences the chemical and physical characteristics of the welded joint and therefore the quality and reliability of the product.

These skills and experiences are made available to customers through a team of technicians and experts dedicated to the area of robot applications that offers support both in the design of the system and in its installation.

voestalpine Böhler Welding has long invested considerable resources in this field, creating skills and gaining experience through the production of steel and filler materials for welding.

The team is also able to provide complete assistance to customers for the development of WPS (Welding Procedure Specifications) for the specific welding process, contributing to the achievement of the expected performance and reliability.

	PB	FW	Steel (≤S355J2)	3.0	2.1-6.0	G3 Si1 ER70-S	82%Ar18%CO <sub>2</sub> (M21)	0.8 1.0 1.2	S1.007Cd S1.008Cd S1.009Ci	3155.13	WPS 85 PWPS 89 WPQR 91
				5.0	3.0-10.0	G3 Si1 ER70-S	82%Ar18%CO <sub>2</sub> (M21)	0.8 1.0 1.2	S1.007Ck S1.008Ck S1.009Ck	3170.15	WPS 95 PWPS 99 WPQR 101
				12.0	6.0-24.0	G3 Si1 ER70-S	82%Ar18%CO <sub>2</sub> (M21)	0.8 1.0 1.2	S1.007Ci S1.008Ci S1.009Cd	3160.13	WPS 107 PWPS 111 WPQR 113

## 4. HAZARDOUS FUME MANAGEMENT

Welding fumes are classified as carcinogenic and manufacturers are required to protect its workers from welding fumes. Whilst extraction systems are generally fitted to welding stations, hazardous fumes may escape into the

general workplace, endangering general workers. Böhler Welding has invested heavily in the development of welding wires that have reduced hazardous elements and hence reduced hazardous fume emissions.

# 5. ENERGY SUSTAINABILITY

Robot welding systems are characterized by intense duty cycles and large power consumption. With current high-energy costs, improved energy efficiency is rapidly becoming a key driver for fabricators. This also directly influences the customer's sustainability agenda.

**Böhler Welding has made significant strides in supporting customers by focusing on the following:**

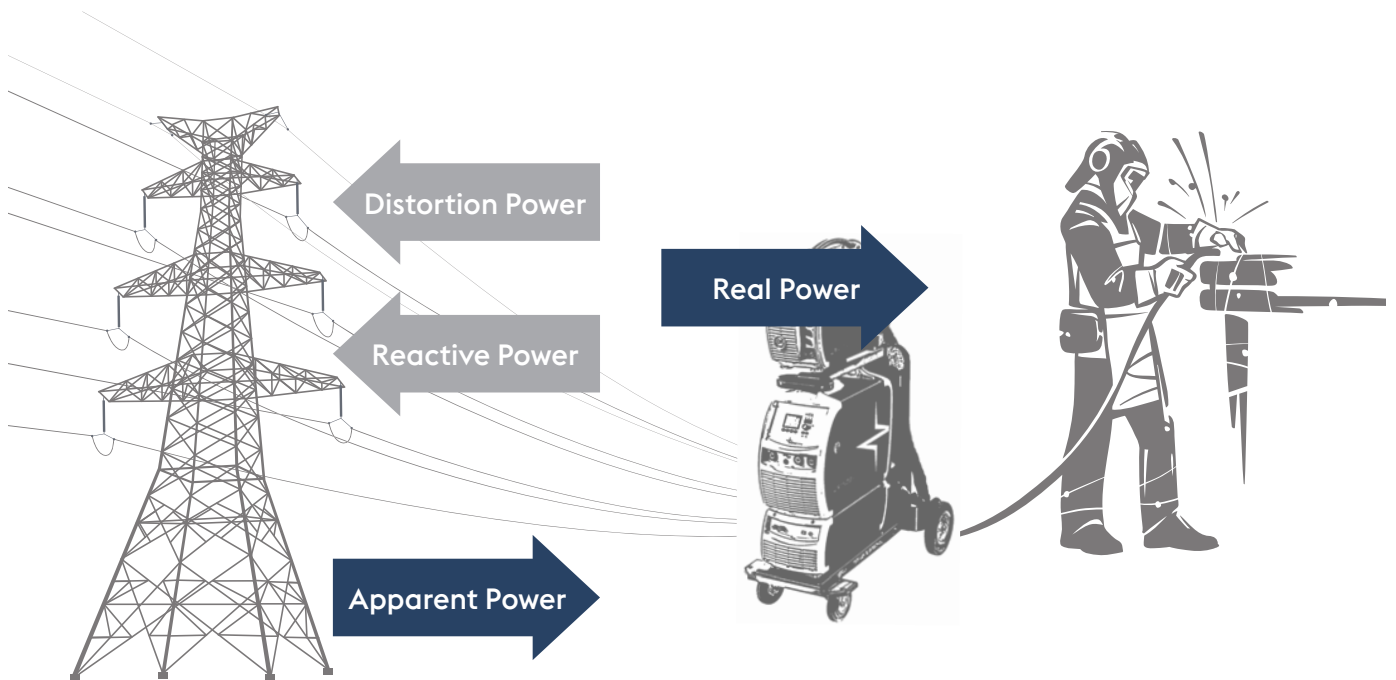
- a) More energy efficient welding machines
- b) Reducing the carbon footprint in the manufacture of the steel used for its welding wires
- c) Development and supply of copper free welding wires
- d) Mig/Mag welding processes.
- e) More environmentally friendly pickling and passivating chemicals

**More energy efficient welding machines** – The development of the patented greenWave® technology that allows Böhler Welding power sources to reduce and optimize the power draw from the network, increasing the overall energy efficiency of the system.

**Sustainable welding consumables** – voestalpine is implementing a substantial investment program to develop green steel that would be used for the production of the Böhler Welding consumables. This, in turn, directly supports customers to meet their sustainability objectives, especially in the automotive segments.

**Development copper free welding wires** – With advanced surface engineering that uses less harmful chemicals and reduced energy consumption in the production processes. These wires also operate at higher welding speeds improving the KW per kilogram of weld metal deposit. In addition, copper free wires produces less fumes that reduces health risks whilst also reducing energy load in the fume removal process.

**MIG/MAG welding processes** – Improvement of welding productivity and hence reduced cost. Böhler Welding is continuously developing processes to optimize the customer's productivity and quality. For instance, the processes Rapi-Deep and QuickPulse allow achieving the highest welding travel speeds in robotic applications. Moreover, thanks to the Böhler Arc synergic welding programs, the best electric arc performance is guaranteed using the Böhler Welding filler metals through a harmonized, perfectly coordinated interaction of material and power source.





## CRISTIANO BERGAMIN

GLOBAL SALES EQUIPMENT DEVELOPMENT MANAGER

I have been working in the welding industry for more than 25 years, since 2020 as Global Sales Equipment Development Manager at voestalpine Böhler Welding.

The focus of my activities is to further develop the Equipment and Robotic business and to support colleagues in scouting and developing the robotic business, especially in partnering with system integrators to support the integration of Böhler Welding Equipment into robotic applications.

Furthermore, I take care of analysing the needs of the Equipment welding robot market to support R&D in developing new products, features and accessories.

### **JOIN!** voestalpine Böhler Welding

We are a leader in the welding industry with over 100 years of experience, more than 50 subsidiaries and more than 4,000 distribution partners around the world. Our extensive product portfolio and welding expertise combined with our global presence guarantees we are close when you need us. Having a profound understanding of your needs enables us to solve your demanding challenges with Full Welding Solutions - perfectly synchronized and as unique as your company.

