Trend 3: Welding sources and additive materials

Welding companies in Western Europa are challenged every day to realise more complex constructions, consisting of materials that weld less well. Standing still is going backwards. Quality guarantee and cost-efficiency are keywords. The welding sector is permanently seeking the ideal ratio between manual, mechanised and automated welding. Hereby the impact of work preparations, welding seam preparation and assembly is very important. The correct choice of additive materials (welding wire choice, welding gasses, …) on the basis of the basic materials and specific applications is hereby crucial. This increasing complexity requires well-trained professionals: assemblers, welders, welding coordinators, …

3.1 A range of welding techniques

Welding techniques can be divided into two large groups: fusion welding and pressure welding. The pressure welding processes mainly include spot welding, seam welding and projection welding, but this will not be discussed here. The fusion welding can be done through electric energy (TIG, MIG/MAG, covered electrode, laser welding, …) or through chemical energy (autogenous welding, thermite welding, …).

In recent decades many variants (TIME, STT, CMT, ForceArc, ColdArc, …) have been introduced on the market of classic semi-automatic (MIG/MAG) welding. The welding industry requires higher deposition speeds, guaranteed corner fusion penetration, less spatters, a more stable arc and user-friendly controls. Worldwide manufacturers of welding sets are working on this. The use of several wires with semi-automatic welding is also an example of this.

The TIG welding process remains leader with regard to welding quality. In recent years much work has been carried out to increase the efficiency (deposition speed) of the TIG welds. The use of automatic wire supply, improved balance control and advanced pulse settings are a few examples of this. Parallel to this, TIG devices became easier to use, were lighter in weight and more energy efficient.

Under pressure of quality assurance and cost savings automation is increasing, but it has its limits. A fine example is the orbital TIG welding of thin-walled tubing, which is frequently used in the food and pharmaceutical industry, but which can be used less evidently with larger wall thicknesses and more complex geometries. Similar is the evolution to use welding robots (semi-automatic) for efficient and qualitative welding parts, for example for machine construction, the automotive industry, building sector and furniture industry. All this requires a well-trained welding operator. It is certainly worthwhile to train these operators through virtual welding. Valk Welding and also Binzel Benelux will show their respective systems at the welding event. With automatic welding laser seam sensors and other sensor techniques such as camera surveillance are increasingly used for adaptive welding. Welding devices are becoming more energy efficient. The choice and consumption of welding gas and the type of additive material are important work aspects.
With regard to laser welding it can be stated that the sources are becoming cheaper, while the optics are becoming more efficient and controllable. The laser welding process is becoming more accessible, for example through the use of flexible robots, because they are ‘easier’ to operate and also thanks to hybrid systems, cold- and hot-wire, laser soldering...

The necessary strict tolerances of the projects, in other words, the preparations you have to make for the projects to be welded, are a permanent challenge.

The quality/cost-price ratio, possibilities and restrictions of each welding process and the lot size determine the final process choice. New welding processes such as magnetic pulse welding also find their way to the market. Besides new evolutions, older techniques can still be found for specific applications. An example of this is the re-introduction of copper pipes for medical applications. After a period in which synthetic pipes were used for oxygen and respiration air, the use of copper with its bactericidal effect became compulsory again. The obvious technique for connecting these pipes is hard soldering (e.g.: oxygen/acetylene or hydrogen/air-hard soldering).

3.2 Motives: efficiency and quality

The welding sector is therefore a lively sector. It is part of the construction sector which is as lively. Key aspects are weight restriction and efficiency increase. In this respect the development and use of stronger basic and additive materials is part of this. Filled wires increase the deposition efficiency and at the same time influence welding aspects such as spatters, fusion penetration and visual view of the weld. Successfully applying filled wire requires the necessary know-how and attention of the welding coordinator and welder. A purposive practical training course of the welder is a must to maximally use the advantages of these filled wires, provided that the parameter settings (mainly higher currents/welding speeds) are correct.

Qualified welders and welding procedures are the essence of quality assurance. Modern welding devices make it possible to lay down the welding parameters in a specific programme linked to the welding method description (WPS/PQR). This is undoubtedly an excellent resource in the context of the increasing international quality requirements.

This article was realised after discussions with ir. Fleur Maas and ir. Peter Meys of the Belgian Institute for Welding and with ir. Leen Dezillie, IWE, managing director of the VCL/CPS and after reactions to the basic text by persons from various companies, including Johan Goossens of Messer België, Jan Laerte of Binzel Benelux, Peter Pittomvils of Valk Welding, Pedro Vanrijckeghem of VAC Machines....