

Recommendations for the calibration and preventive maintenance of orbital welding equipment to improve quality and safety

Introduction

For a number of years, numerous sectors have been facing a demand for constant improvement in the quality and safety of the products being sold. In the agro-food, chemical and pharmaceutical industries, the handling of products is subject to draconian restrictions and an imposing rulebook. Anything affecting quality is of crucial importance and the manufactured product may be affected by various factors of internal – cross contamination, microbial growth – or external origin. Numerous directives and standards govern the qualification of installations. They also give many recommendations on how to ensure hygienically acceptable welds. Other than exposing welding procedures for joining pipes, fittings and valves at the cutting edge of technology, this paper acknowledges that orbital TIG welding (GTAW) is the technique that offers the best quality in the execution of welds for the fabrication of thin wall stainless steel tubing.

In the Oil industry, it is the continuous evolution in extraction techniques, productivity gains and environmental safety that compel the firms in the industry to improve their production and lengthen the useful life of their equipment.

The environmental safety also affects other industries such as nuclear power.

Numerous recommendations also highlight the importance of the quality of joint preparation to ensure perfect workpiece alignment, the importance of electrode grinding, etc. Inspection means are presented and advice given to counter the most commonly occurring defects.

Physical disruptions

These recommendations are founded on the idea that the items of welding equipment used become reference elements, the baseline for implementing these rules.

Polysoude, specialists in orbital welding using the TIG process, proposes equipment designed to fulfil these quality requirements. The TIG process is the only technique capable of producing the clean, smooth seams demanded by the standards. Its main characteristics are:

- a root flush with the inside wall of the tube,
- insignificant heat input,
- minimal oxidation which, where it does occur, can be easily be stripped,
- ensuring that quality can be maintained consistently and is documented outside of the welding process
- preservation of mechanical and metallurgical characteristics of the materials used

In order to prevent oxidation, a smooth metallic inside wall is a prerequisite for the natural passivation process which offers lasting surface protection. Additionally, the resulting metallurgical properties exceed the criteria of the strictest standards.

The principle of the TIG welding process is based on creating an electric arc. This arc is generated between the refractory tungsten electrode and the workpiece. The electrode concentrates the heat of the arc while the workpiece metal melts, thus forming the weld pool. Even if the conditions for generating and maintaining the electric arc are totally controlled by the power source, experience has shown that drifting may occur in practice. Such drifting is linked to the conditions of use of the equipment. For instance, the operating time (compliance with duty factors) can cause the temperature of certain electrical or mechanical components to rise which, in some cases, can alter their characteristics. Component wear and tear is another factor that influences equipment setting parameters. It is important to remember that the environment – including dust, temperature, humidity, corrosive vapours, draughts, etc. – influences equipment performance.



Fig.1 - Polysoude TIG welding equipment

Latest-generation power sources are designed to help operators quickly get to grips with the equipment and make it easier to develop welding programs. This can only be achieved through a computerized Human-Machine Interface.

While it is true that proper preparation of the tubes and parts to be assembled and compliance with tolerances are very important notions for ensuring quality and safety, two other recommendations cannot be ignored: calibration and preventive maintenance of the welding equipment.

Calibration

In line with the company's "zero defect" objectives, Polysoude power sources are all tested prior to shipment and a calibration certificate is provided on delivery of the equipment.

Always keeping its ear to the ground, Polysoude has for many years been offering its customers the possibility of having their power sources calibrated at regular intervals according to a precise protocol. All the measuring equipment that we use to perform the calibration is regularly checked by a COFRAC accredited laboratory. This allows the most reliable settings and parameters to be preserved.

If any parameters are seen to have drifted during calibration, the Polysoude technician is also capable of correcting the defect and restoring the equipment to the same quality level as when it left the factory. Any defects that may be caused by electrical or mechanical drifting on the welding equipment are therefore eliminated, maximizing the performance of the production tool.

After calibration, a label is affixed to the power source stating the date of calibration, the certificate number and the recommended date for the next check.



Fig.2 - Example of a calibration label and certificate

Users can therefore organize the recalibration of their equipment well in advance and thus optimize their productivity.

Under certain conditions, Polysoude also offers specific training to enable users to calibrate their own equipment independently.

Preventive maintenance

For years, attempts have been made to engrain compliance with a number of important principles required to obtain quality welds in the operators' routine. But what about equipment?

Nowadays, no-one thinks twice about taking their vehicle into their garage for a regular service but, unfortunately, this does not apply to work tools.

Here too, Polysoude takes care of its customers by offering preventive maintenance operations. The purpose of these operations is to keep equipment in ideal working condition while ensuring personal safety in accordance with the requirements of directive 2006/42/EC, the "Machinery Directive". It must be remembered that electrical energy is present throughout the welding process. If the quality and health security of the

installations are important, then the safety of the persons who build them is certainly no less so.



Fig.3 - Measuring and checking a printed circuit board during a maintenance operation on a Polysoude power source

A full service must be scheduled regularly to pre-empt all risks and possible equipment failure. It must cover the entire installation including the weld head, power source, cooling unit, wire feeder and other devices. Polysoude maintenance technicians are highly qualified and trained to propose a quality service within the shortest time frames, enabling preventive maintenance to be slipped comfortably into a production schedule.

Through its servicing activity, Polysoude also proposes a list of parts to be kept in stock and offers advice on the components to be changed periodically. Polysoude maintenance technicians are also in a position to pass on best practices in term of daily maintenance operations. In addition, they offer training which forms a valuable complement to the maintenance instructions provided in the operating manuals for the products and helps extend the service life of the equipment.

Polysoude also proposes preventive maintenance contracts that ensure optimum uptime of the production tool at a reduced, budgetable cost.

Conclusion

Today many standards and directives govern health security, environmental and operator safety in all industries. While consortiums of industries, laboratories and institutions publish numerous guidelines which stand as authoritative documents in their field, Polysoude proposes calibration and preventive maintenance services as an additional step forward in helping to reduce risks and to progress towards the “zero defect” objective.