Mechanized and Automated TIG Welding

Fig.1 – Zero Risk/Zero Defects with TIG welding

Polysoude is producing innovative, customer-focused solutions with its mechanized and automated TIG welding technology – a technology which has the power to weld tube, pipe and tube sheet applications, capable of withstanding severe mechanical stress, absorbing high dynamic loads and providing corrosion resistance.

TIG welding offers the possibility to work with or without filler wire. Using mechanized or automated TIG welding equipment, any desired quantity of welds can be produced, with sustained reproducibility and with each individual joint exceeding the requirements of the strictest production objectives - the 'Zero Risk/Zero Defects' approach. Manual welding skills are no longer required, as proficient operators take over by running the automated TIG welding equipment. Results, therefore, are excellent, sustainable and quality is predetermined.

Preprogramming, for perfect results

Before mechanized or automated TIG welding takes place, the particular procedure and all related parameters are developed and approved customer-specific welding sequences and instructions are stored and transferred to the designated welding equipment by means of a PC or a USB flash drive, in the workshop or on site. Moreover, in the case of the most sophisticated equipment, such as the P6, programming is even further developed. This technology incorporates a touchpad, which has an easy-to-understand, intuitive graphical user interface (GUI). The virtual synoptic of the GUI (Fig.2) is presented on the touchscreen, not only allowing for complete weld data management, but also offering numerous auxiliary functions to support the development and finish of any TIG welding sequence.

The welding sequence

The operator must ensure that the work-pieces are correctly positioned. However, after the welding cycle has started, the equipment is completely controlled and monitored by the uniquely designed power source, which initiates and controls all functions and movements of the installation.

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The TIG welding cycle begins without the addition of filler wire. Wire feeding speeds and pulsed wire feeding are programmed and managed by the power source. The welding current starts with a relatively low intensity, and without any movement between the electrode and the work piece, a pool of molten metal forms. Only then, is the current raised to the programmed final level, the movement of the torch or the rotation of the work piece starts and the filler wire is added. The filler wire comes from a spool fitted inside the motorised wire feeder; this particular innovative arrangement means that wire feeding can be started or stopped at any moment and, if necessary, the wire end can be retracted. By this procedure any occurrence of weld defects is excluded. A similar procedure at the end of the TIG welding cycle avoids crater formation. The wire is retracted slightly, the welding current intensity lowers continuously, the movement is brought to an end and the arc diminishes progressively.

Hot wire TIG welding (Fig.3) substantially increases both melting rate and welding speed. The hot wire current, which pre-heats the filler wire before it enters the weld pool, is supplied by an additional, separate power source and transferred to the wire via a contact nozzle in the wire guide. The wire is heated by electrical resistance within the wire nozzle, on entering the weld pool, so that less energy is necessary for its final melting. Significantly, the hot wire TIG process does not reduce the achievable quality of the welds in any way. Generally, TIG welds are characterised by “zero defects”, fine grain structure, small HAZ, absence of pores, and a smooth and even surface.

The power source also controls the shielding gas. Due to the shielding behaviour of the inert gas, TIG welding seams show a blank metallic surface, so grinding or brushing is not necessary and multi-layer welds can be carried out continuously without interruptions for cleaning purposes (Fig.4).

An effective option developed by Polysoude in the area of hot wire technology is Narrow gap preparation of pipe ends (Fig.5). This design, improves overall productivity of the joining operations of line pipes. The mechanical characteristics of the pipe material and behaviour in terms of welding shrinkage are considered in order to keep the angle of the weld groove as small as possible. This preparation of the pipe ends requires the removal of less material, so that machining becomes easier and faster, since less material is required to be replaced by the weld, welding time becomes shorter, and filler material consumption decreases.

The Benefits

The benefits to the customer are obvious. The number of required welders can be reduced drastically. This equipment is extremely well-suited to harsh environmental conditions on site (Fig.6). Sustainable quality is achieved. The time needed for filling and capping is gone. The resulting sound, defect free joints bring about an immense increase in productivity, as time-consuming repair work is no longer necessary and the controlled heat input of the process guarantees that the required mechanical properties of the welds are achieved, without additional attention.

Conclusion

Polysoude mechanized and automated TIG welding technology offers astounding results in industrial application and is a serious incentive to industries striving for a ‘Zero Risk/Zero Defects’ approach in joining technology.

Photos

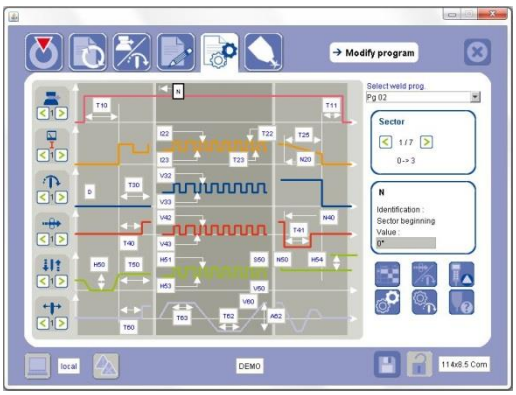

Fig.2: GUI presented on touchscreen to manage complete weld data and to use numerous auxiliary functions

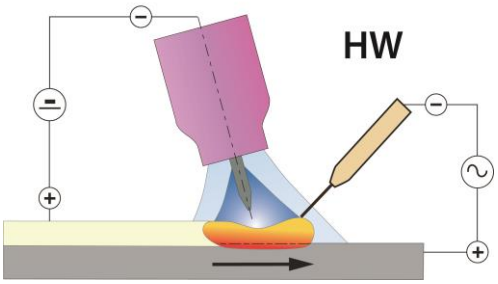

Fig.3: Hot wire TIG welding principle

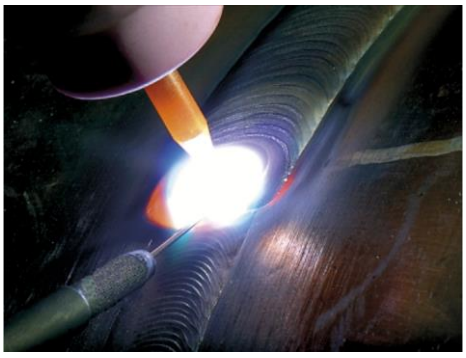

Fig.4: The shielding inert gas guaranties a perfect oxidation-free weld

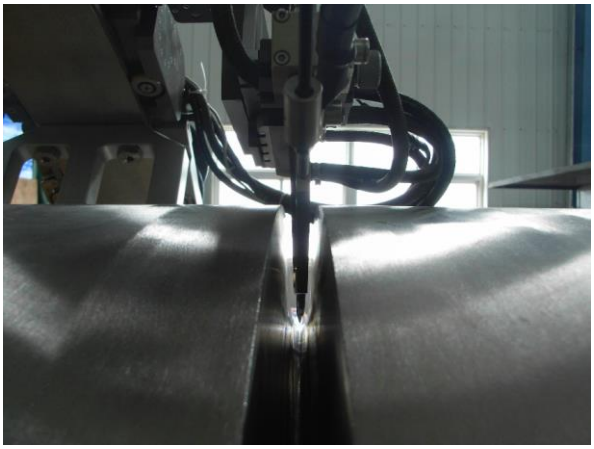

Fig.5: Narrow groove torch with its hot wire guide in a narrow gap joint

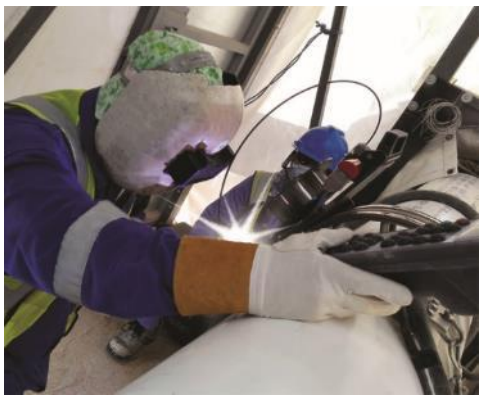

Fig.6: Equipment used on-site for the pipe laying, in harsh environmental conditions