



# Advanced orbital TIG welding arrives in SA

Having recently become the southern African distributor for Polysoude orbital welding systems, on May 19, 2017, Renttech SA held an orbital welding open day at its Secunda branch. *African Fusion's* Peter Middleton attends and talks to welding specialist, Eduan Naude.

**R**enttech SA, according to Naude, has been looking at how to help clients to implement more automated solutions for several years. "To improve productivity and quality, we know that our fabricators have to adopt automation to remain competitive against imports," he begins. "For several years now, we have been looking for new opportunities and partners that could help us improve our offering and the capabilities of our local industries," he says.

Hence the signing in November 2016 of a partnership agreement with Polysoude, an acknowledged global leader in orbital TIG welding technology.

"While orbital TIG welding is not unknown in South Africa, systems have generally been supplied from overseas and most have remained locally unsupported. In Polysoude, we have found a state-of-the-art equipment developer willing to train our local Renttech team and to offer continuous and ongoing welding and technical support," Naude adds.

Why is orbital welding important? "We have seen a serious shortage of the number of skilled welders required in the tube and piping market, which is currently being filled by importing

OCN (other country national) welders," Naude responds.

"We believe it will be far better to put in some automation and then upskill our own people to operate these. Orbital welding systems take the manual manipulations skills out of welders' hands, but the technical skills to prepare the joint and set up the equipment 100% correctly remains an essential aspect of the process," argues Naude. "This requires a sound knowledge of the process and ongoing attention to the finer details," he adds.

Naude has significant experience in orbital TIG welding, having spent years producing joints for the reheaters and superheaters for the Medupi and Kusile new-build projects. "This work involved producing 132 000 orbital welds over a six to seven year period. And while this work is now completed, the project highlighted the value and possibilities available from the process," he notes.

"We now have the experience and can offer training, procedure development, welding support and technical services from our nationwide footprint of branches, and we can reference some high-level successes from the past. In addition, Polysoude has a massive amount of global experience that it is willing to

share with us, and an R&D capability that we can access for customised solutions and/or procedure development," Naude assures *African Fusion*.

Outlining the key principle of Polysoude orbital welding solutions, Naude says that a TIG welding torch travels around the tubes to be joined, guided by an orbital welding head clamped onto the pipe.

Systems are available for tube-to-tube; pipe-to-pipe; and tube-to-tube sheet welding; and butt welds, fillet welds, flange joints, bends, T-fittings and valves on a comprehensive range of tube and pipe material types can be accommodated.

For thick-walled piping the use of narrow-gap technology, which reduces the total amount of weld metal required by reducing the pipe-end preparation – in some cases to 3.0° – makes the technology attractive with regard to weld speed and quality.

"As a company strong in the petrochemical industry, we see significant opportunities there, but in respect of orbital TIG welding particularly, our current focus is on power generation on the repair and maintenance side. This work typically involves joining new to old piping, which comes with issues such as pitting corrosion, out-of-roundness and fit-up mismatch, all of which require robust welding systems and procedures for success," Naude tells *African Fusion*.

He cites a current trial involving new-to-old boiler pipe of varying sizes. "Here, the challenge is to develop a program and procedure robust enough to handle misalignment and ovality," he reveals.

For pipes of this size, Polysoude's open welding heads are used. "Open welding heads are equipped with a TIG-torch with a gas shroud, so the gas shielding is limited to the area around the weld pool, as it would be if manual welding. Polysoude open heads can accommodate tube and pipe sizes of up to 275 mm and down to 8.0 mm," he notes.

By utilising various weld heads this range is extended from as small as

1.6 mm tubes to heavy-walled vessels several metres in diameter.

"As with most pipe-to-pipe welding, for this trial we are using a J-J preparation for the weld joint. This reduces the amount of fill needed and it provides a landing nose for the root. The nose makes it easy to butt the pipes together where mismatch is common on the root fit up. The nose of the J-prep provides material for the root, while a small amount of wire is added, smoothing out the mismatch," Naude explains.

"Once the root is established, we increase filler wire and weave for subsequent passes, with the J-prep reducing the amount of filler metal needed to complete the joint," he explains.

The heart of the orbital system for this application is Polysoude's P6 TIG welding power source with its integral orbital welding control system. These units are high-precision power sources with guaranteed precision of within 1.0 A at currents below 100 A and 1.0% thereafter. Depending on the applications, unpulsed, low frequency thermal pulsing (up to 10 Hz) and arc stabilising higher frequency pulsing of up to 10 kHz is available. The combination of all of these options offers almost unlimited waveform control.

Wire feed, gas and orbital head controls are also built into the P6 and directly linked to the welding current. Due to the different welding positions experienced as the torch goes around the pipe, different sectors are programmed with different sets of parameters. "Across the top of the weld, 45° either side of the crown of the pipe, welding is in the flat position. We generally start the weld before the crown and travel up and over. The second sector will then be in the vertical down position, the third will be overhead and the fourth sector will be vertical up," explains Naude.

"In the first flat sector, before the heat builds up, a little more current and slower travel speeds might be needed. In the overhead position on the opposite side, however, the pipe will have heated and the weld pool will tend to fall out of the joint, so the current might need to be backed off to ensure the weld pool does not get too fluid," he explains.

The Polysoude system can be programmed for multiple sectors. Parameters can be changed four or eight times



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"Also on high-level piping such as P91, the QC (quality control) function built into the P6 power source is being very well received. The parameters of every weld performed in each sector are automatically saved along with a time stamp and a unique traceability number," says Naude.

"A QC controller can take his flash drive, plug it into the USB port in front of the unit and download the data of all welds performed. He can then go back to the office and evaluate each segment of each weld to check for possible out-of-spec incidents.

"By flagging these and linking the information to an exact sector position around the weld, NDT inspectors can be directed to the most likely problem areas," he adds.

Naude warns, however, that process success is not guaranteed by the use of Polysoude equipment alone. "Previously people would buy a system and then start to work out how to prep the pipe, purge the inside seam, position and clamp the pipes together and manipulate the orbital heads onto the weld seam."

Renttech can offer the whole solution, starting with the development of a repeatable welding procedure to produce the joint quality required. "We will also supply or develop: the equipment to cut the J-preps on pipe ends quickly and accurately; the clamping systems to align the pipes to be welded; mandrels or any external systems necessary to



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mount the orbital heads; and, through Huntingdon Diffusion Techniques (HFT), the internal gas purging systems that protect the inside seam," Naude informs *African Fusion*.

"We also offer separate tacking systems from our Uniarc range to improve the usage factors of the orbital equipment. Rather than tie up an expensive orbital head for tacking, a separate team can be preparing and tacking joints ahead of the orbital system to minimise joint cycle times," he explains.

"We also offer the full consumable range, from the tungstens to the feed wire spools. Polysoude wire feeding systems use from 0.5 kg to 15 kg spools, so we can access the full range of MIG wires for use with the process – and as part of program development, we can perform consumables' tests according to individual customer specifications and requirements.

"For high-integrity applications that are currently completed using manual TIG welding – using welders with very high-level skills – the labour costs often make up to 80% of the total project costs.

"By using orbital technology and re-deploying the welders to operate these systems, the total welding time can be significantly reduced, while the rework percentages almost eliminated. Total project costs are, therefore, radically reduced, directly benefitting the bottom line," Naude concludes. ■



Eduan Naude demonstrates a Polysoude orbital welding solution at Renttech's Secunda premises. A TIG welding torch travels around the tubes to be joined, guided by an orbital welding head clamped onto the pipe.