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SAIW
Southern African Institute of Welding

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John's comment

Heraclitus, the Greek philosopher, said: "Change is the only constant in life", a sentiment that has recently rung true not only for me on a personal level but also for the Institute. Although I am not new to the SAIW, having been on the board for several years, I am new to its inner workings. I am therefore thankful to Jim Guild for steadying the ship through turbulent waters and especially grateful for Jim's guidance, patience and willingness to help me in any and every way he could to ensure that the transition was as seamless as possible.

The SAIW is now poised for growth in 2020, but this growth will require change. We will be working more closely, particularly with our members but also our industry, to ensure that we continue to provide world-class training, qualification, certification and accreditation programmes, as well as enhance our standing as the regional resource for information transfer, and continue to provide technical support services to our industry. We intend to grow our membership, but as important, build member engagement and ensure that we are able to deliver exceptional value to our members.

These are exciting changes that will position the Institute to effectively serve our membership and our industry. Domestically, there is great potential for the SAIW, but also importantly, in the rest of Africa. As our fellow African countries grapple with the need to industrialise and grow their economies to reduce unemployment and poverty, the role of the welding industry is obvious. In line with this, there are a number of countries that we are working with and we hope to report on this in future issues of *African Fusion*.

As we all know, this has been an exceptionally difficult year for the metals fabrication industry, some say worse than during the global financial crisis. Although the metals fabrication industry is somewhat behind the retail, clothing, textile, footwear and leather industries with respect to their development of a 'Masterplan', the good news is that the South African Iron and Steel Institute (SAISI): Steel Supply Chain Improvement Initiative committee is developing our own Steel Value Chain Master Plan. This is a key focus of the Department of Trade, Industry and Competition Minister Ebrahim Patel's plans to revive the steel sector. The SAIW is an active member of this SAISI committee and we look forward to the completion and adoption of the Master Plan early in the New Year.

#StrongerTogether was the hashtag the Springboks adopted for the recent Rugby World Cup and they emerged victorious. The majority of South African's believe that this motto is also vital to waken our sleeping economy and enable us to reduce unemployment, poverty and inequality. In the same way, the Steel Master Plan aims to bring business, labour and government together to grow our industry for the common good. As Minister Patel recently said of the Steel Master Plan, "government has lit the braai, now it is up to you to bring the wors and chops."

As our industry closes for the end of year break, it is time for all of us to spend time with our families and friends, recharge our batteries and be ready for 2020. Thank you for your ongoing support and interest in the SAIW and I look forward to working and growing with you.

John Tarboton

SAIW celebrates achievements amid

The SAIW's new executive director, John Tarboton delivers his address at the Institute's Annual Dinner and Awards Ceremony.

With sponsorship from Afrox, ESAB and Wits University's School of Chemical and Metallurgical Engineering (CHEMET), the SAIW held its 71st Annual Dinner and Awards ceremony at Emperors Place in Gauteng on October 25, 2019. *African Fusion* reports.

As the incoming executive director, it fell to John Tarboton to deliver the 2019 keynote address at the 71st SAIW Annual Dinner and Awards. "It is an honour to be here tonight celebrating the Institute's 71st annual dinner with the welding and fabrication industry," he began.

"Despite its long legacy and rich history, the reality is our industry is under immense pressure and has shown successive contractions over the past five years. The slowdown in public infrastructure spending and falling private sector capital spending is contributing to this lack of demand as well as a host of other issues that have all lead to a deterioration in the competitiveness of South African fabricators," he continued.

Despite this, however, John Tarboton is encouraged by the ongoing support from industry and particularly grateful for the contributions received from the event sponsors. "From my side, a big thank you. Without your support this event would not have been possible.

"I would also like to extend special thanks to Jim Guild for coming to the assistance of the Institute to stabilise the ship and for agreeing to a three month hand-over period to ease the transition," said Tarboton.

Turning his focus onto some of the SAIW's achievements in the past year, he first highlighted the work being done by the SAIW Foundation, in particular the 15 apprentices from ArcelorMittal who are receiving training and "making excellent progress", with feedback from ArcelorMittal's management being "highly positive".

"Work is also being completed by our Business Development manager Etienne Nel on a brand new occupational qualification supported by the Department of Higher Education and Training and the Quality Council for Trades and Occupations (QCTO)," he continued. "This will be implemented in our two centres of specialisation in welding, Boland and Uitenhage, with the aim of putting employers back in the seat of driving artisan training," he noted.

He went on to congratulate SAIW training manager, Shelton Zichawo, who has completed his MBA in which he identified key areas of improvement in SAIW. "We look forward to harnessing these insights to ensure that we are able to delight our students through the whole SAIW experience as we equip them for a career in welding," he said.

"We are also embracing the 4th Industrial Revolution, with a state-of-the-art Yaskawa robot welding system being installed at the Institute. This machine has the latest 4IR technology to bridge the man machine divide and will form the lynchpin of our new robotics course to be launched in 2020," Tarboton announced.

The reintroduction of the SAIW Levels 1 and 2 Inspection courses has also been well received as "they assist with career development and allow our students to start earning sooner". In addition, NDT training manager Mark Digby has established the SAIW Phased Array training course, which was launched in February this year in collaboration with the German NDT Society.

"Our quality and systems manager Harold Jansen reports that the International Committee for Non-destructive Testing mutual recognition agreement was granted earlier this year, which ensures that our SAIW-qualified and certified personnel enjoy international recognition," he continued.

SAIW Certification CEO and Qualification and Certification Manager, Herman Potgieter, is also reporting good growth in company certifications, despite tough economic times. "This shows that companies are ready and willing to adopt international standards to produce quality products," suggested Tarboton.

"Lastly, we have also received our ISO 17021 accreditation from SANAS which ensures the competence, consistency and impartiality of SAIW certification when providing audit and certification of management systems," he said before turning attention to the awards part of the evening.

SAIW 2019 Awards

Before presenting the SAIW Awards in four categories, Tarboton made special mention of Stefan Lottering who entered

Stefan Lottering (centre) receives his medallion of excellence from SAIW stalwart and Board Member, Joseph Zinyana (right).

The 2019 Presidents' Award and the Phil Santilhano award were both awarded to an exceptional student, Quinton Richard Ayres (centre).

Vinash Singh, the welding coordinator for Hi-Tech Pressure Engineering (centre) receives the Best SAIW Manufacturing Certification Company Award for 2019 from Joseph Zinyana (right).

turbulence

the SAIW Youth Welding Challenge held at the SAIW in January 2019. "Having undergone extensive training at ArcelorMittal in Vanderbijlpark, he and four other candidates were sponsored by the CHIETA to train at the SAIW under the supervision of our lecturer Samuel Mnguni and CHIETA representative, Etienne Nell," he said.

During the subsequent SAIW competition, Stefan excelled by winning almost all the metal categories and achieving the highest mark overall. He entered the South African World Skills competition, held in the last week of February 2019 in Durban, and again outperformed the other competitors by winning in all the categories. Stefan was then selected to participate in the international event which was held in Kazan, Russia, during August 2019. "Lincoln Electric made its demonstration area available to Stefan to be trained on the equipment to be used in Kazan, once again generously sponsored by CHIETA," he added.

During the competition in Russia, Stefan proved to be a formidable competitor by outperforming some of the best candidates in the world and achieving a remarkable 17th position out of candidates from 39 countries. "For the first time since South Africa's return to the international arena for welding, a South African was honoured with a medallion of excellence," announced Tarboton before asking Stefan Lottering to come forward to receive the medallion from SAIW stalwart and Board Member, Joseph Zinyana.

SAIW Presidents' Award for NDT and the Phil Santilhano Memorial Award

The Presidents' Award is made in the name of the past Presidents of SAIW who have helped guide the Institute to become a prominent part of the local welding industry and South Africa's reference point for high quality training in welding and NDT. The award recognises the top NDT student on Institute courses.

The Phil Santilhano award is another student award that remembers Phil Santilhano, one South Africa's leading submerged arc and electro slag welding technologists who became the Institute's first full time employee when he was appointed Technical Director in 1977. The Award is presented to the best student on the Welding Co-ordination or Welding Inspectors' training courses.

The SAIW Gold Medal Award went to the Sasol Secunda Inspection Authority 'for the outstanding opportunities made available to young local school leavers to prepare for a career in the inspection field'. From left: John Tarboton, SAIW; Mzi Mthembu, Solomon Mahlangu, Paul Bruwer and Petro van Niekerk from Sasol Secunda Inspection; and Joseph Zinyana, from New Age Engineering Solutions.

The 2019 Presidents' Award and the Phil Santilhano award were both awarded to an exceptional student, Quinton Richard Ayres, who achieved, for his NDT courses, distinctions in Magnetic Testing Level 1; Penetrant Testing Level 1 and Ultrasonic Wall thickness Testing Level 1 and, combined with Visual Testing Level 1, an overall average of 90% for all NDT examinations undertaken from August 2018 to July 2019.

In addition, he completed his Welding Inspectors Level 1 qualification during the same time period with distinctions in all three Inspectors Level 1 examinations. A remarkable achievement!

Best IIW ISO 3834 Manufacturing Certification Company Award

This Award is made is recognition of a company that has excelled in SAIW's ISO 3834 Certification Manufacturing Scheme by recognising the excellence of a manufacturing company with respect to the implementation of the ISO 3834 welding process control system.

Nominees for the award included CMP Aljym Engineering; FP Engineering; Hi Tech Pressure Engineering; ND Engineering; and Plant Design and Project Services.

Some of the evaluation criteria for this award include:

- Compliance with the requirements of the ISO 3834 scheme.
- Implementation and involvement of the management team in the quality process.
- Continuous improvement of the welding quality processes.
- Production of high quality products.
- A high degree of customer satisfaction.

All nominees showed extremely high levels of involvement and engagement for the various tasks and responsibilities of top management and the welding coordination team members. This lead to excellent management of the different projects producing high quality, traceability and the documentation required for all stages of production.

All nominees were also engaged with continuous improvement projects to further enhance their daily operations. The adjudicator, Riaan Loots, recommended to the SAIW Certification governing board that Hi-Tech Pressure Engineering be the recipient of the Best SAIW Manufacturing Certification Company Award for 2019.

The SAIW Gold Medal Award

The Gold Medal Award was introduced in 1966. It is the Institute's highest award and can be made to a company or an individual in recognition of outstanding contributions to welding technology or to the Institute.

For 2019, this award went to the Sasol Secunda Inspection Authority *'for the outstanding opportunities made available to young local school leavers to prepare for a career in the inspection field'*.

With stand-up comedian Al Prodgers as master of ceremonies and the Idols singer, Boki Ntsime entertaining guests, the SAIW Annual Dinner and Awards was a highly enjoyable and relaxing evening. *African Fusion* congratulates the award winners and looks forward to reporting on steadier progress in the welding industry.

Necsa Nuclear: SA's nuclear accredited

Our SAIW Member profile for this month comes from the South African Nuclear Energy Corporation (Necsa) Nuclear Manufacturing, which is the only nuclear-accredited facility in sub-Saharan Africa. *African Fusion* visits its workshops in Pelindaba and meets the company's ASME III-, ASME VIII-, ISO 9001- and ISO 3834-accredited fabrication team.

Originally established in 1962, Nuclear Manufacturing is based on the Pelindaba campus of Necsa and, having successfully maintained its ASME III and N-stamp status since first being accredited in 2011, holds South Africa's only nuclear manufacturing capability. It had already been certified to ASME VIII in 1996.

The manufacturing facilities include 85 000 m^2 of manufacturing area with a handling capacity of up to 100 t and a rolling and bending thickness capability of up to 35 mm. Nuclear Manufacturing has expertise in welding all grades of stainless steels, aluminium, titanium, duplex steels, carbon steels and other high alloys.

With demand for nuclear components being limited to replacement parts for Koeberg and Necsa's own NTP nuclear test facility, however, the facility has become a specialist jobbing shop for high-specification pressure vessels, heat exchangers, tanks and piping systems, mostly for the power, petrochemical, and chemical processing industries.

"We are a high-integrity jobbing shop that manufactures a significant number of components for Koeberg, for example, to ASME III and ASME VIII," says Frans Lubbe, the company's project manager and estimator at Necsa.

To supplement nuclear work, Necsa's Nuclear Manufacturing also has an ASME VIII U-stamp accreditation to enable it to tender for high-tech fabrication for projects from all over the world. "As Necsa Nuclear Manufacturing we have worked with countries such as Russia providing processing vessels for the food and beverage market. These were food-grade stainless steel tanks that had to be internally polished to mirror finishes to remove the risk of microbiological contamination from product being entrapped in rough areas of the tanks," Lubbe tells *African Fusion*.

"We also manufactured vessels for Rheinmetall Denel Munitions in Potchefstroom that had to be even more highly polished," adds project coordinator, Niël van Heerden. "The vessels were part of a mixing plant for explosives and if any substances get trapped in rough areas, an explosive reaction could be initiated," he explains.

Other non-nuclear work undertaken by Necsa Nuclear Manufacturing includes:

- Process vessels for the wax plant in Sasolburg.
- Medupi and Kusile Power stations boosters and intermediate strainers for the boiler feedwater circuits.
- Piping and nozzle welding for the Sulzer pumps on the Medupi and Kusile boiler feedwater pumps, for which phased-array UT was used to confirm the defect-free quality.
- Refuelling water storage tanks for the boiler feedwater.
- Liquid- and turbine-drain flash tanks (LDFTs and TDFTs) for the air-cooled condenser circuits (ACCs) of Medupi power station.
- Coolers and strainers for the large (4.4 by 14.2 m) ACC structures for the Medupi and Kusile coal-fired power stations.

Nuclear manufacturing's unique offer-

The design, fabrication and quality management team of Necsa Nuclear Manufacturing, from left: Emmanuel Netshishivhe, Project Coordinator; Karabo Maluleka, QC Inspector; Vossie Vorster, Production Manager/Welding Technician; Johan le Roux, NDE Officer Level 1&2; Niël van Heerden, Project Coordinator; Frans Lubbe, Project Specialist; Suzan Makhado, QA Officer; Kobus Booyse, Project Coordinator; Nic Badenhorst, Engineering Draughtsman; Ian Pretorius, QC Inspector; Willard Maraire, Program Manager.

fabrication facility

Necsa Nuclear Manufacturing's team of highly skilled and qualified welders are all coded to meet ASME III and/or ASME VIII Code requirements: From left: Daniel Dlamini, Francois Strauss, Alfred Ramagoshi, Paulos Molefe, Steve Molefe and Coert Steynberg (Welding Supervisor).

ing, however, is the fabrication of components fit for deployment inside the nuclear islands of power plants. "We are currently busy with the essential water cooling systems services project, known to us as the SEC Piping project, which is for Koeberg Nuclear Power Station," says Vossie Vorster, Nuclear Manufacturing's production manager.

"This involves the fabrication of replacement cooling water piping for the two nuclear reactors at Koeberg, so it is a critical part of the plant," continues the company's design draughtsman, Nic Badenhorst. "They used to be made from carbon steel with rubber linings to provide corrosion and abrasion protection. The filtered seawater still contains some micro particles, however, that have caused the rubber to erode and lift, exposing the carbon steel to seawater corrosion," he explains.

The replacement piping being manufactured by Necsa Nuclear Manufacturing is made from a modified super duplex stainless steel material called AL-6XN/UNS N08367. "This is a complex super-duplex with raised chromium, molybdenum and nickel alloying elements that impart better high temperature, corrosion and abrasion properties to the piping," continues Vorster.

Following careful design of each individual pipe section and the development of welding procedure specifications (WPSs) and qualification records (PQRs), welding jigs were manufactured for each pipe section. "We have become specialists in duplex welding, which requires very tight control of the heat input. On this piping project, we have to achieve tight dimensional tolerances, so we manufacture the pipe sections in very precise jigs, which we have also manufactured ourselves. We have to carefully control the distortion associated with each weld pass. So, as the welding progresses, we change the welding sequence to minimise shrinkage and distortion and to ensure that when the section is removed from the jig, the end flanges are within tolerance," Vorster explains.

"Once we have a set of pipe sections, the whole assembly is mocked up on the shop floor to guarantee seamless installation onsite. Gaskets are used between each flange and, once the bolts are tightened, the gap tolerance has to be between 3.1 and 3.3 mm for fitting the pipes. This would be impossible to achieve without overcoming the distortion issues," he adds.

Accurate to within 30 µm, Necsa Nuclear Manufacturing's mobile laser-based scanning system can inspect a 4.0×4.0 m assembly from a single position while determining dimensional accuracy between multiple points selected using touch probes.

Following careful design of the SEC piping, welding jigs were manufactured for each individual section.

Each section of SEC piping is independently pressure tested and, from an NDE perspective, 100% of the butt weld joints have to pass radiographic testing (RT), while all fillet welds and brackets are subjected to dye-penetrant testing (PT). "We have our own X-ray booth and we use equipment from Gammatec for

An assembly of SEC piping mocked up on Necsa Nuclear Manufacturing's shop floor to guarantee seamless installation onsite.

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ONE STEP AHEAD.

An intermediate strainer vessel manufactured by Necsa Nuclear Manufacturing according to the ASME VIII code for the ACCs of the Medupi power station.

radiography. We also have a new pump at our pressure testing facility, which sometimes has to be used to take selected components beyond their bursting point," Vorster notes.

To enhance dimensional inspection, Necsa's Program Manager, Willard Maraire, says Nuclear Manufacturing has also recently acquired a 3D scanner for inspecting and certifying the accuracy of the SEC piping sections. Accurate to within 30 µm, this mobile laser-based scanning system can inspect a 4.0×4.0 m assembly, determining dimensional accuracy between multiple points selected using touch probes. It uses a Metra Scan 3D 750 Elite in conjunction with Handy Probe Next equipment and enables Nuclear Manufacturing to quickly perform conformity assessments of fabrications or components against the 3D CAD models or OEM specifications.

Citing another nuclear success, Willard says that in January 2018 Nuclear Manufacturing supplied the first locally manufactured ASME III (N-Stamp) vessel fabricated in full compliance to ASME Section III, Subsection NC for the Koeberg Nuclear Power Plant (KNPP). This vessel was the first locally produced safety related ASME III designed and certified Air Receiver Pressure Vessel for Koeberg. The vessel was specified to be a Safety Class 2 nuclear vessel via a comprehensive RPE-certified (registered professional engineer) design specification. "The vessel's role is to maintain pressure for the 20 m containment building equipment hatch seals under all operating conditions, including seismic events," he tells *African Fusion*.

With respect to welding choices, Voster notes that high integrity vessels invariably have a gas tungsten arc (GTA) root weld. "We then fill the joints with gas metal arc (GMA) or submerged arc welding (SAW) if we can manipulate the joint into the flat position for access," he says.

"We have a team of very highly skilled and qualified welders that are all coded to meet the ASME III and/or ASME VIII Code requirements, depending on the job," he says adding that all of the Necsa Nuclear Manufacturing workshop's welders can be deployed on any of the processes used.

"Typically, every new job requires the welders to do a requalification test piece for the work they have been allocated. These 'coupons' are sent for mechanical testing and they must pass for the welder to be considered for the work. We then proceed to do a Procedure Qualification Record (PQR) using the allocated welding procedure, and these test plates are also thoroughly tested so that, by the time the welder starts assembling the actual component, we all have total confidence in the welding procedure and the welder's ability," Voster explains.

Nuclear Manufacturing has recently been recertified by SAIW according to the comprehensive quality requirements (Part 2) of ISO 3834, Quality requirements for fusion welding of metallic materials – for the fourth time. "Although ASME III and ASME VIII are more specific and more onerous in terms of quality requirements, we also maintain our ISO 3834 Part 2 accreditation with the SAIW. This gives us international recognition and opens the door for us to tender for overseas work. Also, though, there are aspects of ISO 3834 that are not included in the construction codes, such as the maintenance, calibration and verification of the welding machines, for example, which we believe is very important," says Vorster.

"If welding equipment is neglected, it can make it more difficult for the welder to achieve the weld quality required. It can even call into question whether the specified procedure has been accurately applied. By strictly adhering to ISO 3834 requirements, these pitfalls can be completely avoided," he adds.

"We have to operate to the highest welding quality levels in everything we do and ISO 3834 gives very clear guidelines about the things one has to avoid and the things one must do to achieve the required end quality. It is impossible to know for sure that a weld is sound just by looking at it, so the step-by-step observance of a pre-certified procedure, implemented accurately by pre-qualified welders is the only way to consistently achieve success," Vorster concludes.

These high integrity pipe seams have a gas tungsten arc (GTAW) root weld, hot pass, filler and cap.

In January 2018, Nuclear Manufacturing supplied the first locally produced safety related ASME III designed and certified Air Receiver Pressure Vessel to Koeberg.

To avoid explosive reactions, vessels manufactured for Rheinmetall Denel Munitions in Potchefstroom had to be highly polished to avoid any substances get trapped in rough areas.

NDT Level 3 workshop to launch 2020

Mark Digby, the SAIW's manager for NDT, talks about the launch of an NDT Level 3 workshop, which will kick off on January 27, 2020, with various course components running until the end of March.

The SAIW is launching into 2020 with an NDT Level 3 workshop, based on the highly rated model whereby internal lecturers and respected industrial Level 3 NDT Inspectors combine their expertise to present specific course components. These well qualified individuals will present selected sections of the NDT Level 3 Basic and main method course content. The cost of the training workshop includes the Basic NDT Level 3 component combined with the relevant costs relating to the method(s) selected.

"The South African NDT industry has a lack of competent Level 3 NDT personnel and, with the growing demand

Candidates with practical NDT examinations that are more than two years out of date can complete the full Level 2 practical examination prior to attending the Level 3 course.

John Tarboton takes the reins at the SAIW

John Tarboton has been appointed Executive Director of the Southern African Institute of Welding. Leveraging many years of experience in the stainless steel industry, Tarboton has been tasked to drive the association's vision of promoting world-class excellence in welding and related technologies.

The Southern African Institute of Welding (SAIW) has appointed industry veteran, John Tarboton, as the association's Executive Director. In his new role, Tarboton is responsible for the day to day administration of the SAIW, leading its people as well as maintaining and developing the SAIW as the leading national body for welding technology, NDT and quality standards.

An experienced metallurgical and materials engineer specialising in stainless steels, Tarboton has many years of experience in the research, development (laboratory, plant and customer) and technical marketing of new and improved products, as well as technical customer services of existing products, applications and fabrication.

Tarboton spent 24 years at Columbus Stainless, where he held several positions, including engineer in training, senior metallurgist for R&D, R&D engineer and senior market consultant, among others. He later joined the South Africa Stainless Steel Development Association (Sassda), where he spent the last six years of his interesting career. He joined Sassda as sectoral manager: fabrication, welding and technical advisor in May 2013, before becoming executive director in September 2014, a role he occupied until his recent move to the SAIW.

"I have had a very interesting career, from being part of a team doing groundbreaking research to market development, customer services and then association management. It has given me a broad background to be well equipped to take on this new role. This is certainly a daunting challenge, but I believe we have an excellent team that is more than capable of driving our vision of promoting world-class excellence in welding, NDT and allied technologies," says Tarboton.

Commenting on some of his immediate areas of focus as the SAIW's executive director, Tarboton says the Institute has done phenomenally well over the years but there is always room for improvement. "In the short term, we need to improve customer service as far as course administration and the delivery of courses is concerned. At a later stage we will need to ensure quality assurance of the courses themselves. We need to delight our students in the whole SAIW experience as we equip them for a career in welding," he says.

Tarboton adds that the development of a regional presence in Mpumalanga, probably in cooperation with the Steve Tshwete Local Municipality's Local Economic Development committee, will take immediate priority.

"In the long term, we need to increase our membership and develop an engaged membership. This will allow industry to work more closely with the SAIW and to better utilise all our products and services for the good of the Institute and our industry," he adds.

Tarboton comes at a time when the industry is grappling with an array of challenges. "The slowdown in public infrastructure spending and falling private sector capital spending is contributing to a lack of demand. In addition, growing public debt has slowed growth by increasing the cost of capital, while inefficiencies of State Owned Corporations and high administered prices are leading to a deterioration in the competitiveness of South African fabricators.

"The expected uptick in economic growth next year should lead to a marginal increase in demand which should filter through to our industry. However, for now, the metals fabrication industry remains in survival mode," concludes Tarboton.

from end-users to have Level 3s directly involved during outages and shutdowns, combined with the global movement towards ISO 9712, a significant drive to address this shortage is required," says Mark Digby, SAIW NDT manager.

SAIW, in conjunction with the SAQCC-NDT, has therefore scheduled an NDT Level 3 workshop starting on January 27, 2020 and running until the end of March, to provide potential Level 3 candidates with sufficient training in the basic and the main methods required to qualify candidates according to ISO 9712 Level 3.

Access requirements are either a valid Level 2 certificate in a relevant NDT method or for candidates to be qualified to Level 2 with proof of having trained at Level 2 and passed relevant Level 2 examinations. In addition, the practical examination should not be more than two years out of date. If this is the case, however, candidates can complete the full Level 2 practical examination prior to attending the Level 3 course. A Level 2 and Level 3 certificate will then be issued after the requirements for Level 3 certification have been achieved.

Transition students not requiring additional training are also welcome, and at a nominal examination fee of R4 748 (VAT Included) for Basic (Parts A, B & C) or per main method examinations (Parts D, E and F). This is ideal for those currently holding non-ISO 9712 Level 3 qualifications with company authorisation wanting to add the ISO 9712 Level 3 qualification to their personal achievements. These candidates would be able to complete the relevant basic examinations, Level 2 practical and the relevant Level 3 main method examinations as part of this process.

Engineers, managers or senior personnel not needing certification but seeking advanced knowledge relating to NDT are also welcome to attend the courses. The course can then be considered as a CPD course based on the issue of an attendance certificate, without the need for examinations to be concluded. Should the candidate, however, want to be certified then the abovementioned access requirements would apply.

The SAIW Level 3 NDT course programme runs from January 13, 2020 and concludes towards the end of March. For further information, contact SAIW's Mark Digby.

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NDT Level 3 workshop: A summary programme

13 to 24 January	Level 3 Eligibility and practical examination for: MT 2, PT 2, RT 2 and UT 2.
27 to 31 January	NDT Level 3 Basic: Part A: Materials and Processes.
3 to 4 February	NDT Level 3 Basic: Part B: Qualification and Certification schemes.
5 to 7 February	NDT Level 3 Basic: Part C: PT2, MT2, VT2, ECT2, RT2 & UT2 knowledge summary.
8 February (Sat)	NDT Level 3 Basic Examination: Parts A, B & C.
10 to 28 February	Level 3 Main Method: MT 3, PT 3 and NDT Level 3 Basic examinations.
2 to 20 March	Level 3 Main Method: UT 3, RT 3. Examinations and rewrites.
23 to 27 March	Rewrites: Basic, MT, PT, RT and UT.

Note: VT 3 course presentation will depend on the number of qualified VT Level 2 applicants.

Afrox's 360-degree MCAW solution

Following several years of persistence, Afrox's welding applications team, in association with Babcock Ntuthuko Generation, has succeeded in qualifying a repeatable and robust procedure for welding high pressure piping using the Miller PipeWorx welding system with RMD and ProPulse technology coupled with metal-cored wire and a CO_2-rich shielding gas. *African Fusion* meets the team.

With Conn Roux of Babcock Ntuthuko Generation are Arnold Meyer, Thembinkozi Matyeka, Johann Pieterse and Houston Isaacs from Afrox's development team.

"We started developing pipe welding procedures using Miller's PipeWorx solution several years ago but, while we have successfully qualified procedures before, we have never been able to demonstrate repeatable results on production welds for high pressure (HP) piping," begins Johann Pieterse, Afrox's manufacturing industries business manager and applications' team leader. "That is, until December last year," he adds.

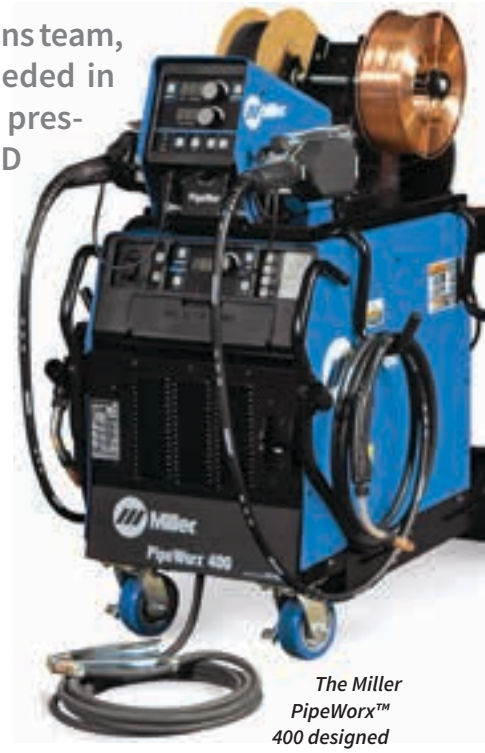
Traditionally, high integrity pipe welding has always been done using gas tungsten arc welding (GTAW/TIG) for the root pass, followed by shielded metal arc welding (SMAW/stick) for the fill and capping runs. "For many years, this has been the only proven and trusted way of welding steam piping for the power generation industry. There has been some recent success using a TIG root followed by pulsed GMAW fill and cap welds but, by and large, the traditional way is the only widely accepted solution and few inspectors and plant operators are willing even to consider alternatives," Pieterse continues.

The traditional way is neither cost effective nor highly productive. However, Power Station shutdown deadlines often have to be extended, which further increases reputational damage to the utility. "Also, big-end users can no longer accept imported welders on their sites. The traditional process requires A-class welders with very high skills' levels, and it is difficult, even for good welders, to master these processes at the quality levels required for high-temperature pressure piping," says Babcock's IIW welding specialist/technologist, Conn Roux.

Several years ago, Afrox began to explore the use of semi-automatic welding procedures using solid wire gas metal arc welding (GMAW). "When the Miller PipeWorx welding machines first became available, we started to develop pipe welding procedures that used the machine's RMD function for root welding, followed by the ProPulse mode for the fill and capping runs.

"We were able to pass the X-ray tests consistently, but when it came to the bend test, we struggled. Sometimes everything would be great and we celebrated successfully qualifying a procedure, but results on production welds were never consistent," Pieterse reports.

Above and right: Flaw-free macro and bend-test samples of the qualified test piece. "For the first time ever, we have a repeatable welding solution that offers high efficiency while maintaining weld quality," says Conn Roux of Babcock.



The Miller PipeWorx™ 400 designed for high tech workshop pipe welding applications using Miller's proprietary RMD™ and ProPulse™ current control technologies.

The tenacious team continued to look for the reason for the inconsistency so as to develop a robust and repeatable semi-automatic welding solution. "While we were continuously being told we would fail, we persisted, going back to the drawing board and asking some fundamental questions to expand the success window: was the voltage too low or the arc too narrow because of the argon shielding gas, and what could we do to change things?" Pieterse relates.

The Afrox team's International Welding Engineer and Applications Development Manager, Arnold Meyer, describes how he viewed the problem: "Argon gas tends to create a narrow and relatively cold arc. Adding more CO_2 increases the average temperature of the arc. It also widens the arc and helps the heat to be distributed more evenly across the weld pool," he says, adding that this was key to achieving better sidewall fusion.

But with solid wires, there is a limit to how much CO_2 can be used before the metal transfer becomes globular and unstable.

"By using a metal-cored wire instead of a solid wire, the current density becomes higher, which enables the semi-automatic MCAW process to deliver

for HP piping

The Miller PipeWorx 350 FieldPro™, which includes ArcReach™ and Autoline™ technologies for Africa's harsh and challenging onsite applications.

spray transfer while using significantly higher CO_2 percentages in the shielding gas," Meyer notes.

This leads to better spreading of the arc, higher temperatures and far better sidewall fusion, which enables the inconsistency problem to be much more easily overcome. "The raised CO_2 level produces a more rounded fusion profile with sufficient sidewall fusion, but using raised CO_2 percentages is only possible by moving to a metal-cored wire," he says.

Following extensive trials, the new process produced repeatability and Afrox is now confident that all procedure specifications, including the bend tests, can be met by the procedure recently qualified for Babcock. "We are no longer seeing inconsistencies and we are routinely achieving perfect radiographs followed by beautifully clean macros and bend tests," Pieterse adds.

Having resolved the inconsistency problem, the many advantages of semi-automatic welding over the traditional GTAW root and SMAW fill and capping technique become immediately realisable. "Metal-cored wires offer higher deposition rates compared to solid wires, which are already significantly higher than GTAW or SMAW deposition rates. Higher travel speeds and deposition rates mean faster weld completion times and, therefore, lower costs per weld. The deposition rate is nearly double, or to put in a different perspective, welding time is reduced by 50%," notes Roux, adding that reducing welding time is the only way of significantly reducing costs.

"In addition, with SMAW/MMA electrodes the weld metal deposited is only 35% of the mass of the electrodes purchased. With metal cored wires, this deposition efficiency is up at 93%. Most important of all, however, is that compared to TIG and SMAW welding, the process is much easier for welders. It requires significantly less practice and training than the traditional approach and we see this as having the potential to eliminate the need to import foreign welding skills," Roux tells *African Fusion*.

TIG welding is particularly difficult and welders with the required skills are very scarce – and MMA welding skills are also becoming a big issue. "This is an excellent solution for local labour because a welder can be upskilled and qualified to successfully complete a weld within a week or two. It can take us up to a year to upskill a GTAW/MMA welder to the skills required for high pressure pipe welding," he says.

"The only drawback with the use of metal-cored wires is that spray transfer mode is difficult to control in out-of-position pipe welding. This is where the Miller PipeWorx power source comes into its own, though. "The ProPulse feature of the PipeWorx system is used for the fill and capping runs. This optimised pulsed solution for pipe welding operates under constant voltage (CV) mode during peak and background periods, but the ramp up and ramp down rates and the initial peak and background current levels are under constant current (CC) control. This makes for much more manageable out of position welding," says Meyer.

For the root pass, Miller's RMD (Regulated Metal Deposition) technology is used to control metal transfer in short-arc mode. This controlled deposition technique provides less chance of cold lapping or lack of fusion, less spatter and a higher quality root pass around the pipe.

"The combination of a metal cored wire with a high deposition rate and a short arc helps to keep the weld pool cool, reducing the heat input and making the weld puddle easier for the welder to control," says Pieterse.

Roux continues: "The new solution is a paradigm shift for large bore welding in the power generation, oil and gas and industrial sectors. It offers us a better solution in terms of cost, efficiency, productivity and quality, without any of the past drawbacks associated with conventional GMAW welding. This is a breakthrough for the welding industry. Cost savings of 83% can be achieved and, for the first time ever, we have a repeatable welding solution that offers high efficiency while maintaining weld quality."

"This is another one of our 360-degree application solutions. We at Afrox strive to offer total support and we align our product offering and our development endeavours so that companies like Ntuthuko Generation get the very best end result possible.

"It has taken us several years to get this right in the power generation industry, which proves that our application team can deliver the total solution from an initial clear understanding of customer requirements all the way through to successful production welding with Afrox trained skilled labour to do the job," Pieterse concludes.

Process	MCAW	SMAW	GTAW
Consumable electrode/wire	B3, 1.2 mm	KV3, 3.15 mm	TIG B3, 2.4 mm
Gas Type	Afrox Fluxshield	N/A	Argon
Welding and Overhead Rate (R/hr)	R400	R400	R400
Deposition Rate (kg/hr)	5.5	1.2	1.2
Deposition Efficiency (%)	93%	60%	98%
Gas Flow Rate (l/min)	18	0	12
Gas Consumption (kg/hr)	1.65	0.00	1.28
Operator Factor (%)	35%	18%	18%
Labour & Overhead cost per kg (R/kg)	207.79	1 851.85	1 851.85
Weld metal cost per kg (R/kg)	69.89	116.67	56.12
Shielding gas cost per kg (R/kg)	8.98	0.00	32.00
Total cost per kg of deposited weld metal	**R286.66**	**R1 968.52**	**R1 939.97**

This cost comparison table shows how 85% cost saving are achieved due to the much higher deposition rate and efficiency of Afrox's 360-degree MCAW pipe-welding solution.

Evaluation of austenitic and nickel-base flux-cored wires for welding of ferritic 5 to 9% Ni steels for low temperature service

This paper by Hannes Pahr, Elin Westin and Gerhard Posch of voestalpine Böhler Welding in Austria was presented at the 72nd IIW Annual Assembly and International Conference in Bratislava, Slovakia in July 2019. It summarises an evaluation of the use of flux-cored wires for welding the ferritic nickel steels used for liquefied gas pipelines and tanks.

Increased demand for liquid ethylene gas (LEG) and liquid natural gas (LNG) as energy sources means that new plants are being constructed, but there is also a need for pipelines and tanks for transporting and storing liquefied gases. Due to their excellent fracture toughness at cryogenic temperatures, the preferred base material used for these is ferritic 5 to 9% nickel steels.

Depending on actual application and parent metal, different welding methods and fillers can be used. Fabricators are trying to optimise the procedures towards high productivity processes to keep project costs down. Vertical-up welding of cryogenic tanks for LNG or LEG is typically performed using nickel-base flux-cored wires for high welding speeds and to ensure sufficient strength and low temperature ductility in the welded joints.

Manganese-alloyed austenitic filler metals may also be suitable for this type of application. For this reason, two flux-cored wires were used for welding ferritic A645 Grade A (X12Ni5) and X7Ni9 steels. For 5% nickel steels, the austenitic wire of 17Cr-14Ni- Mn type may be a cost-effective alternative, but for the 9% nickel steel, only nickel-base wire of Ni 6625 type fulfils all the requirements.

Introduction

The transport and storage needs for liquid ethylene gas(LEG) and liquefied natural gas (LNG) are growing constantly [1]. Today, already about 30% of the world's energy demand is covered by natural gas [2]. The global gas supply is mainly served via pipelines, but mobile transport in liquefied form with special tankers plays an increasingly important role in the energy supply chain [3,4].

Liquefied gas tanks, as a flexible means of transport, are considered high-tech products that are often made of ferritic 5% or 9% nickel steels to meet the specified low temperature properties. The field of application in the transport of these cryogenic liquids extends to temperatures of -120 °C down to -196 °C [5,6]. In the manufacture of components for cryogenic use, welding is an essential process step.

Special attention needs to be paid to the choice of filler material as regards to required strength and impact toughness. Nickel-base filler materials meet these criteria and are the first choice when welding critical parts. However, steel construction companies are facing economic challenges related to raw material prices, most notably, the fluctuating nickel price. It can be difficult to predict the price over time and calculate the total cost of the fillers for a large project running over several years. For this reason, manufacturers are looking for more cost-efficient alternatives including welding methods that can be mechanised, but also fillers containing less nickel. Austenitic stainless solid and flux-cored wire electrodes of the 17Cr-15Ni-Mn type have been developed with the aim of having similar properties, while containing less nickel than the nickel-based alloys.

Flux-cored wires offer high productivity for out of position welding and may offer cost savings compared to other manual welding processes. Here the suitability for flux-cored welding of A645 Grade A and X7Ni9 was investigated using two different wires; one austenitic stainless of the 17Cr-14Ni-Mn type and one nickel-base of the Ni 6625 type.

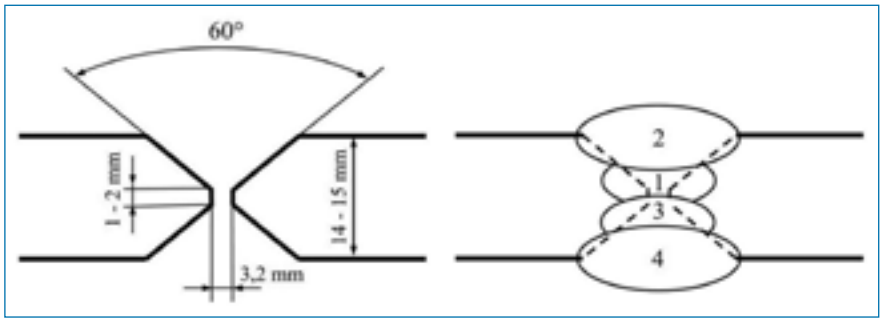


Figure 1: Joint design and layer sequence.

Experimental procedure

The ferritic base materials were A645 Grade A (X12Ni5), a 5% nickel steel mainly used for service at -120 °C to -140 °C; and X7Ni9, a 9% nickel steel utilised down to -196 °C. The chemical composition is shown in Table 1.

The base metal (BM) plates were cut into sizes of 500×160 mm and machined to an X- groove butt joint configuration as shown in Figure 1. Welding was carried out in the vertical up position (PF/3G) with the Fronius TransPuls Synergic 4000 system using direct current electrode positive (DCEP) FCAW. The shielding gas was Ar+18% CO_2 with a gas flow of 16 ℓ/min. The joint design and layer sequence are illustrated in Figure 1. After welding the first side (Layers 1 and 2), the root pass was ground back from the other side to ensure proper fusion.

Two flux-cored wires were used for welding: Ø1.2 mm FOXcore 625-T1, a commercially available nickel-based rutile wire of the Ni 6625 P/NiCrMo3-T1 type; and one trial heat of Ø1.2 mm austenitic wire of the 17Cr-14Ni-10Mn type (17/15-T1). The chemical composition of the all-weld metal is given in Table 2.

The applied welding parameter range for both fillers is shown in Table 3. No pre-

Grade	Thickness	C	Si	Mn	P	S	Mo	Ni	V
X12Ni5*	15mm	0.05	0.23	0.56	0.006	0.001	0.27	4.81	0.03
X7Ni9**	14mm	0.02	0.18	0.55	0.004	0.001	0.08	8.73	0.03

*Table 1: Chemical composition of the parent material, wt.%. *Subgroup 9.2 in ISO/TR 15608:2017: **Subgroup 9.3 in ISO/TR 15608:2017.*

heating or post-weld heat treatment was performed. The heat input was controlled to minimise the risk overheating the weld metal. The interpass temperature was kept below 150 °C and the welding torch was slightly weaved to ensure good side-wall fusion.

Non-destructive testing was carried out before preparing test specimens and included visual inspection (ISO 17637), dye-penetrant testing (ISO 3452-1) and radiographic testing (ISO 17636-1). Tensile testing across the welds was carried out for three samples at room temperature (ISO 4136).

Weld cross-sections were ground and polished using conventional methods. Metallographic examination was conducted after etching the samples in a solution of three parts glycerol, three parts concentrated hydrochloric acid and one part nitric acid. This is a general-purpose etchant for high-alloy austenitic weld microstructures.

Charpy-V impact toughness testing was performed in accordance with ISO 148-1. The notch positions were chosen to be in the centre of the weld metal and at the fusion line of the joints. The 5% nickel steel was tested at -140 °C and the 9% nickel steel at -196 °C with five samples for each material/filler combination.

To provide an indication of the variation in strength and microstructure of the weld metal and heat affected zone (HAZ), hardness tests were performed across the weld (ISO 9015-1). The threshold values for hardness (HV10) are specified in ISO 15614-1.

Type	Standard designation	C	Si	Mn	Cr	Ni	W	Mo	Nb
17/15-T1	TZ17 14MnWP M2 1 2*	0.20	0.4	10.5	17.5	14.0	3.5	-	-
625-T1	TNi 6625P M21 2**	0.02	0.5	0.3	20.7	Bal.	-	8.5	3.3

*Table 2: Chemical composition of all-weld metal, wt.%: *EN ISO 17633-A; **EN ISO 12153 and AWS A5.34/SFA-5.34 ENiCrMo3T.*

Voltage [V]	Amperage [A]	Wire feed speed [m/min]	Travel speed [m/min]	Heat input [kJ/mm]	Wire stick-out [mm]
20-26	150-180	7.0-9.5	0.10-0.25	0.89-1.44	15

Table 3: Welding parameters.

Results and discussion

To simulate typical fabrication of LNG storage tanks, manual welding was carried out in the vertical-up position. Here flux-cored wires have a clear advantage with typical wire feed speeds of 7.0 to 10.0 m/min as compared to 3.7 to 4.8 m/min with solid wire [7]. With the resulting higher welding speed, it is possible to significantly reduce the welding time and the total welding costs, in spite of increased material costs as compared to solid wires [8].

Both the manganese-alloyed and the nickel-based flux-cored wires showed good weldability in the vertical-up welding position and no end crater cracks were detected. The fast-freezing slag made the weld pool easy to control resulting in uniform weld formation, including when weaving. The surface appearance was similar for both wires, but in direct comparison, the shiniest surfaces were obtained with the nickel-base flux-cored wire.

Due to fine drop transfer, the spatter formation was negligible. The visual heat tint formed on the weld surface could easily be removed with a stainless brush. The process parameter range was very similar and the slag easy to remove. While the recommended stick-out for flux-cored wires is normally 15 to 25 mm, it was observed that a shorter stick-out of 15 mm had a positive effect on the arc intensity and stability of the tested filler metals. The wires run very well at higher currents and wire feed rates, but the welder may not be able to keep up with the welding speed. This indicates that mechanised welding may be of interest to optimise productivity and further push down manufacturing costs.

Visual inspection and dye-penetrant testing confirmed that the weld appearance and condition were satisfactory for all weld tests. The surface was free from cracks, undercut, porosity, etc. Radiographic testing did not reveal any porosity, cracks, or voids and all examined plates were accepted.

Figure 2 shows macrographs of the weld cross-sections. The samples were etched to have a contrast between base material and welds. For the 5% Ni and 17/15-T1 filler

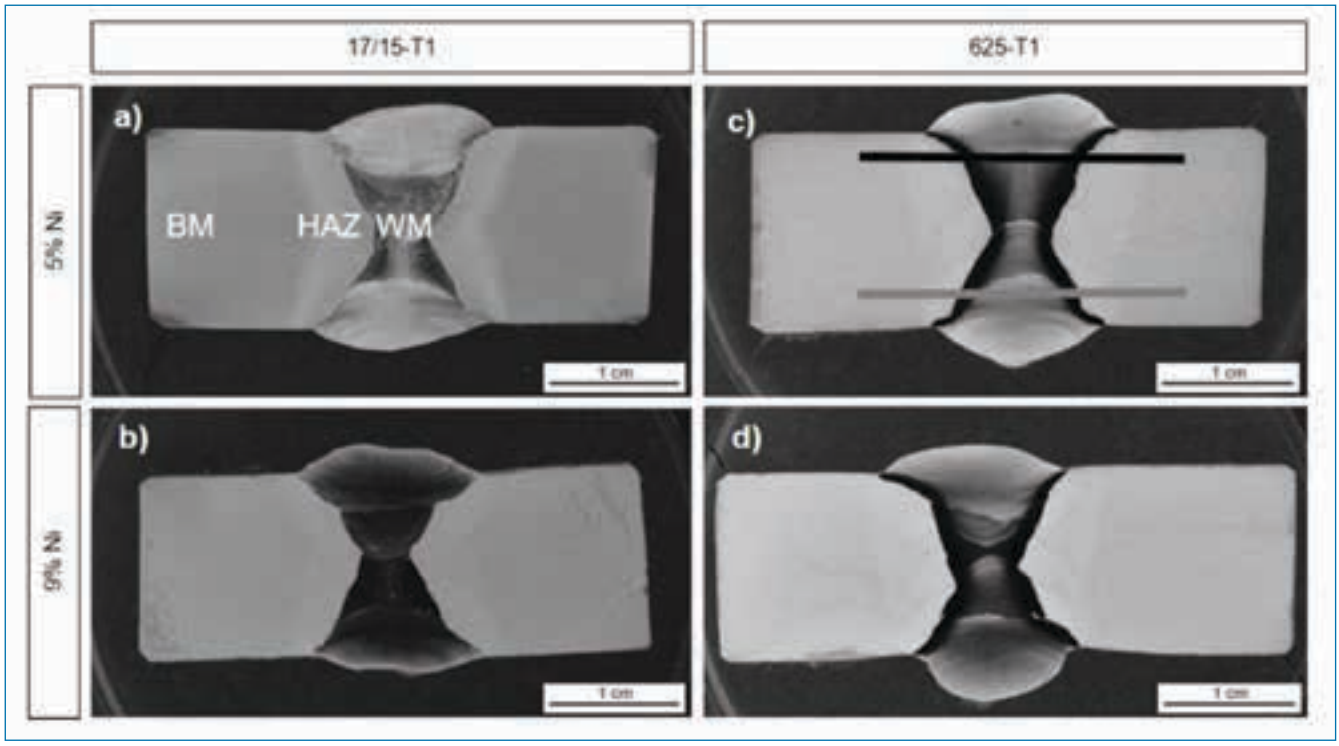


Figure 2: Macroscopic examination of welded joints: a) 5%Ni+17/15-T1; b) 9%Ni+17/15-T1; c) 5% Ni+625-T1; d) 9% Ni+625-T1.

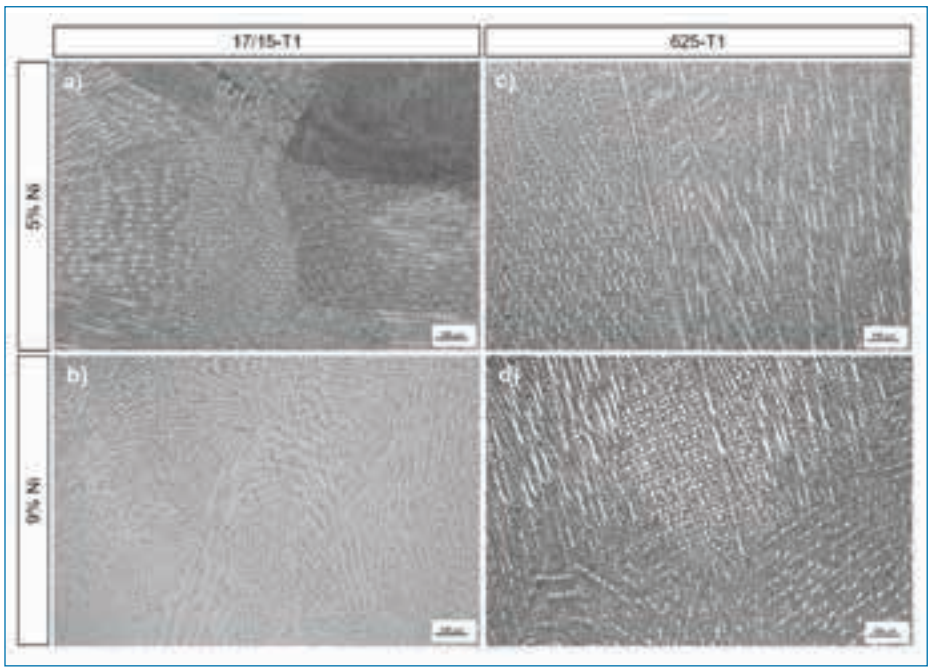


Figure 3: Micrographic examination of the weld metal: a) 5%Ni+17/15-T1; b) 9%Ni+17/15-T1; c) 5% Ni+ 625-T1; d) 9% Ni+625-T1.

combination (Figure 2a) the etching time was increased to elucidate the weld bead layers. All samples showed normal weld shape and good sidewall fusion.

Figure 3 shows the metallographically prepared and etched weld cross-sections. The morphology was homogenous with the typical dendritic solidification pattern. No large slag inclusions or unmolten flux particles could be found. At higher magnification, fine inter-dendritic precipitates were seen for the 17/15-T1 welds. Due to the high carbon content of this wire, these are suspected to be carbides.

Table 4 shows the tensile test results for the 5% nickel joints. Both fillers meet the requirements for the base materials in the EN standard 10028-4:2017 and the ASME Boiler Pressure and Vessel Code ASME BPVC.II.A-2017. For the austenitic filler 17/15-T1, the failure occurred in the weld metal, but at a strength exceeding the limits in the standards. In this work, the 5% nickel steel X12Ni5 was of type A645 Grade A, which has higher strength than the typical X12Ni5 fulfilling EN 10028-4:2017, but not ASME BPVC.II.A-2017. For the standard European X12Ni5 alloy with lower strength than for A645 Grade A, the failure location when tensile testing welded samples will most probably be in the base metal. For the nickel-base 625-T1, the fracture always occurred in the base metal.

Filler metal	Yield strength [MPa]	Tensile strength [MPa]	Failure location
17/15-T1	513 ±8	658 ±2	WM
625-T1	498 ±9	664 ±3	BM
EN 10028-4:2017	Min 390	530 to 710	
ASME BPVC.II.A-2017	Min 450	655 to 795	

Table 4: Transversal tensile test results of 5% nickel joints (average of three specimens) and requirements according to the material standards.

Filler metal	Yield strength [MPa]	Tensile strength [MPa]	Failure location
17/15-T1	527 ±9	655 ±6	WM
625-T1	587 ±13	695 ±4	BM
EN 10028-4:2017	Min 390	680 to 820	

Table 5: Transversal tensile test results of 9% nickel joints (average of three specimens) and requirements according to the material standard.

5% Ni at -140 °C			9% Ni at -196 °C		
	WM	FL		WM	FL
17/15-T1	75 ±3 J	50 ±4 J	17/15-T1	72 ±3 J	165 ±5 J
625-T1	81 ±2 J	52 ±3 J	625-T1	82 ±2 J	130 ±3 J
	Requirement > 27 J			Requirement > 80 J	

Table 6: Results of Charpy-V impact testing in the weld metal (WM) and along the fusion line (FL).

Table 5 shows the tensile test results for the 9% nickel joints. Here only the nickel-based 625-T1 filler passed the requirements set by the standard. For the austenitic filler 17/15-T1, the failure occurred in the weld metal and the tensile strength was not met. This indicates that the austenitic manganese-alloyed wire is under matching in strength and thus not an alternative for welding 9% steels.

The results from the impact tests are shown in Table 6. The requirements were met with both wires for the 5% nickel steel. For the 9% steel, the weld metal impact toughness was somewhat below the 80 J requirement for the 17/15-T1 wire.

Figure 4 shows the hardness measurements on the cross-section of the welds in Figure 3. The lines in Figure 3c indicate where the hardness profiles were made. The hardness range was 157 to 304 HV, well below the maximum hardness of 450 HV10 set in ISO/TR 15608:2017 for the base materials. The base metal hardness was constant at around 230 HV, while the highest peaks were found in the fusion line. For 625-T1, the weld metal hardness was slightly lower than that for the base material, but 17/15-T1 showed a significant drop, especially when welding the 9% nickel steel. This supports the opinion that the tensile tests failed in the weld metal due to under matching strength.

The mechanical properties verify that the requirements for cryogenic applications can be met with both filler concepts when butt joint welding 5% nickel steels in the vertical-up position. This means that for joining these alloys, manganese-alloyed austenitic filler metals can potentially be used, providing a cost-effective alternative to the nickel-base alloys established in the market.

Increased weld metal strength would be needed, however, to ensure that tensile test fracture occurs in the base metal for A645 Grade A. When welding 9% nickel steels, only the 625-T1 wire showed satisfactory strength and impact properties. This is in agreement with the recommendation that only nickel-based fillers should be used for welding 9% nickel steels [9].

Conclusions

Two types of high-alloyed flux-cored wires have been evaluated for the suitability of welding 5 to 9% nickel steels in the vertical-up position for cryogenic applications: a

nickel-base 625-T1 wire; and an experimental manganese-alloyed austenitic 17/15-T1 wire especially developed for welding 5% nickel steels. Based on the present investigation, the following conclusions could be drawn:

- Both wires showed good weldability in the vertical-up position and a wire feed rate of 10 m/min was easy to handle manually. This allows for high welding speeds, which in turn enable a reduction in the welding time and improved productivity.
- The preferred stick-out length was 15 mm.
- All welds were free from defects and irregularities.
- When welding the 5% nickel steel, A645 Grade A, both flux-cored wires passed the mechanical requirements in EN 10028-4 and ASME BPVC.II.A, but tensile test fracture occurred in the weld metal for the 17/1-T1 wire. The A645 Grade A has higher strength than the EN X12Ni5 steel, so it is to be expected that the weld metal strength exceeds that of the parent material.
- Only the nickel-based 625-T1 wire passed all requirements when 9% Ni X7Ni9 plates were joined.
- The austenitic 17/15-T1 wire may be a cost-effective alternative to 625-T1 when welding 5% Ni steels for cryogenic applications, but for 9% Ni, nickel-base wire is required.

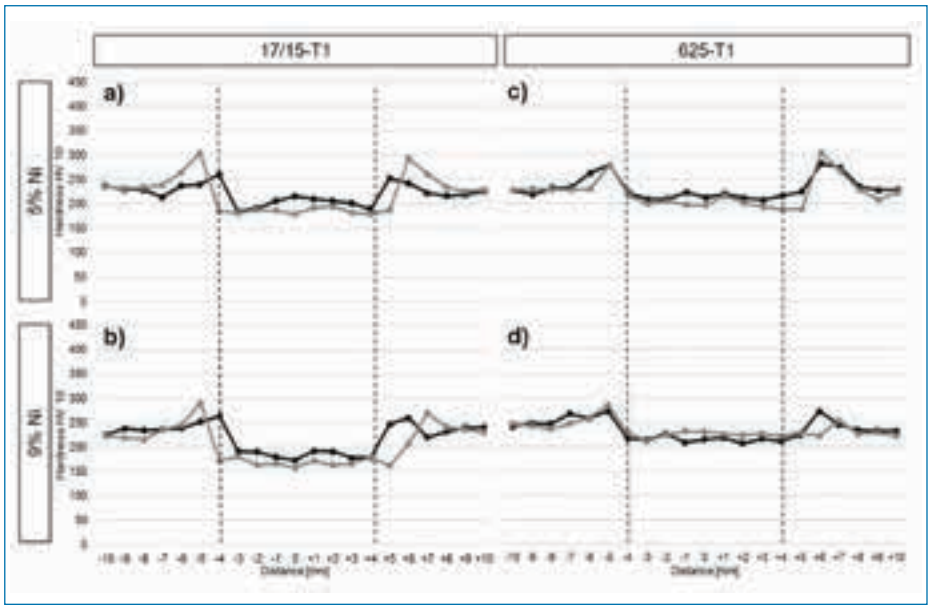


Figure 4: Hardness measurements of welded joints: a) 5%Ni+17/15-T1; b) 9%Ni+17/15-T1; c) 5% Ni+625-T1; d) 9% Ni+625-T1.

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Orbital pipe welding for improved

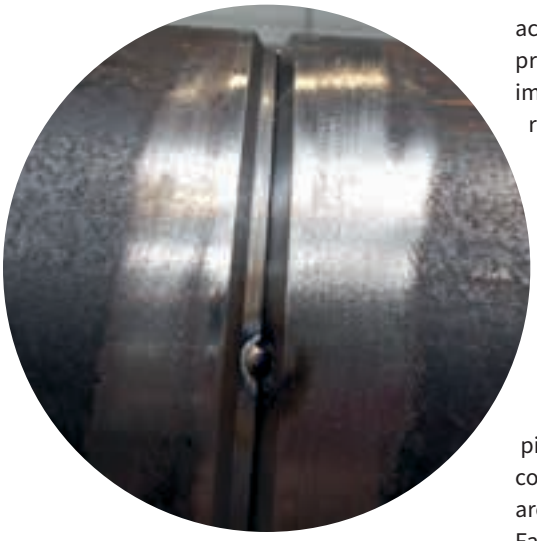
ARTIS – *Atlantique Réalisation Tuyauterie Industrielle Soudage* (Atlantic fabricator of Industrial pipework) – is a company with a factory in Derval in the district of Loire-Atlantique in the west of France. The company specialises in the production of industrial pipe networks and buried pipelines for the transport of fluids such as gas, oil and water. This article highlights the advantages of using Polysoude orbital welding systems to meet the quality and safety requirements for ARTIS' welded pipe.

Orbital TIG (GTAW) welding for mild steel pipes being completed using an open type MU Polysoude welding head.

A key objective for ARTIS is to support and contribute to the projects of its customers from the outset, using its experience and extensive welding technology knowledge. Furthermore, when it comes to quality and safety, ARTIS does not tolerate compromises with respect to people, products or service. The importance placed on safety awareness is shown by the fact that, in addition to its ISO 9001 certification, the company also holds a MASE-UIC certificate – *Manuel d'Amélioration Sécurité des Entreprises from the Union des Industries Chimiques* (Company Safety Improvement Manual for petrochemical industries from the Union of Chemical Industries).

One important ARTIS customer is a major supplier in the field of fluid transportation that not only insists on meeting the EN 12732 standard, but has also developed internal specifications for the construction of gas pipelines subject to pressures from 16 to 80 bar.

In order to meet these demanding specifications without problems, while guaranteeing continuous quality and repeatability of the products and reducing manual work as far as possible, ARTIS decided to purchase additional equipment for orbital TIG (GTAW) welding with filler wire.



The joint preparation of the pipe ends is different. A J-preparation is used on one pipe section end while the existing 30° V-preparation is used at the opposite end.

The order was won by the French company Polysoude, situated in Nantes, France. Although the proximity of the companies is perhaps an additional advantage, the decisive reasons for the choice were undoubtedly the precise knowledge of Polysoude's welding specialists, together with their guaranteed support, advice and fast response to technical problems.

Ultimately though, the equipment proposed by Polysoude fulfilled all the requirements and could be put into operation very quickly. The equipment delivered comprised two open orbital welding heads of the MU family, a wire feeding device and a power source of the type P6.

To guarantee the safety of pipework across its entire life span, companies must produce high quality welds without any imperfections, spatter or oxidation. With regard to pipe networks for the transportation of dangerous substances, the approval of a certification body has to be obtained before the production of welded joints can be started.

Due to its high level of responsibility and in accordance with the demands of the customer, ARTIS was required to establish Welding Procedure Specifications (WPSs) to qualify the pipe welding processes to be used. "We considered this to be a must, because we are using the equipment on site," explains Fabrice Chailloux, assistant manager of ARTIS. "Procedure qualification is an important investment: destructive material testing, X-ray inspection, training of the staff, preparation of the specimen and so on incurs significant costs, which have to be recovered," he adds.

To enable reliable penetration of the root pass when using orbital welding, a J-preparation without a gap is required, whereas manual welding is commonly carried out using a V-preparation with a root gap. Unfortunately, the pipes concerned had already been prepared by the manufacturer with a V-preparation for manual welding.

After comprehensive preliminary tests at Polysoude's application department, the specialists proposed an unusual and innovative approach, which was eventually accepted by the parties involved. The J-preparation required for orbital welding with a flange angle of 37° at the end of one pipe section would be joined to a pipe section with an existing 30° V-preparation at the opposite end. This enabled mismatching of up to 1.0 mm to be tolerated.

"Respecting the specified tolerances is very important in achieving reliable penetration of the root pass and ensuring repeatability of results when applying the WPS," notes Chailloux. Most specifications focus on a high-quality level on the inside of the root pass, as this is the surface that comes into direct contact with the medium being transported and guarantees the service life of the joint.

ARTIS's decision to invest sufficient time and money to achieve the necessary qualifications for the process was driven by its primary aim to maintain a high level of quality and reliability. Performance and economic efficiency were considered to be less important.

One of its young technicians who had

Orbital welding of a joint between a pipe and an elbow using an open orbital welding head of the MU family with arc voltage control and filler wire.

already qualified in boiler construction participated in a thorough training programme on the new equipment. After basic lessons given by the experienced welding experts from Polysoude's application laboratory, he was given the opportunity to familiarise himself with the machines for three weeks, whilst preparing specimens for process qualification. "Due to the successful training, the orbital welding equipment was put into operation very quickly," says Chailloux. "The relevant welding parameters can be adjusted very precisely and this, together with the installed arc voltage control, meant we were able to improve our quality and decisively increase our competitive advantage," he points out.

A real-time view of a welding cycle on the user Interface (GUI) of the Polysoude power source.

As a result of close cooperation between the teams involved, all necessary qualifications for the process were obtained. Furthermore, the management of ARTIS decided, for a period of time, to extend its experience of using Polysoude orbital welding equipment to joints where less rigorous qualifications are required.

In the course of 2019, ARTIS plans to deliver a detailed report to the customer so that its management can also profit from the experience gained.

With the technical challenges now resolved, ARTIS can continue to implement the orbital welding process as a useful production tool, confident in the knowledge that it completely meets the quality and safety requirements and clearly distinguishes the company's offering from its competitors.

Pipe specimens prepared for the qualification of the orbital welding process by a certification body.

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Microbulk gas supply offering, a customer's view

This article summarises a customer experience of Air Liquide's Microbulk gas supply offering. Mwali Kawawa and Thuso Oliphant of Air Liquide visit Scheffer Mechanical Technology and share some insights on how the Microbulk offering has been received.

Customer experience is one of Air Liquide's key pillars and a core focus of its service delivery initiatives. "Throughout 2019, we have been profiling customers to find out how our services are being perceived, with a view to differentiating our offering," says Air Liquide's business developer, Mwali Kawawa, adding that his most recent call was to Morne Scheffer of Scheffer Mechanical Technology to get insight into the company's use of Air Liquide's Microbulk offering.

"Managing gas welding and cutting cylinders in our production environment is somewhat challenging because of having to coordinate the availability of cylinders at the workstations while dealing with cylinder handling and safety issues. This led us to looking for a solution to mitigate these risks and is how we discovered the Air Liquide Microbulk offering, which was game changing for us," says Scheffer.

"Since migrating from predominantly using cylinders to the use of Microbulk, we have realised a significant increase in productivity. This is largely due to permanently available gas supply points strategically placed throughout our factories, which enables welders to access the welding gas they need easily and instantly.

"In addition, by switching to Arcal™ Speed (ISO 14175-M20), we are seeing cost savings, because the gas is produced and mixed onsite by mixing liquid Argon gas in the bulk tank with a cylinder manifold of carbon dioxide (CO_2)," he adds.

Air Liquide Microbulk incorporates a two or three thousand litre cryogenic argon storage vessel, a CO_2 manifold and Air Liquide's Dynamic Onsite Mixer. The facility occupies less than 5.0 m^2 in terms of footprint and is fully enclosed in a stainless steel cage for optimal safety. It is inexpensive to operate and install, it consumes minimal power and is mounted on a skid base, which means it requires no civil works for deployment.

"Microbulk also allows for telemetry. Our service teams continuously monitor the levels of the storage tanks and schedule deliveries when levels are low," adds Kawawa.

For welding purposes, Air Liquide can supply up to three different shielding gases simultaneously, with a capability of supporting up to twenty seven welders. Replenishment of the high purity argon takes place onsite via a dedicated road tanker allowing the end user to continue with production without the need for downtime.

Established in 1991, Scheffer Mechanical Technology is a heavy engineering firm that carries out specialised fabrication including mechanical, welding and machining for mining and related industries. Its operation in Emalahleni, South Africa, has over 4 500 m^2 under roof and employs around one hundred employees with approximately 40% of the workforce being welders.

The applied welding practices, workmanship and quality requirements are in accordance with the AWS D14.3 specification and original equipment manufacturer (OEM) requirements. Scheffer Mechanical Technology services over nine mining houses in four groups, which include some of the most globally renowned OEMs. Products and services on offer include fabrication, repair and maintenance of materials handling and earthmoving equipment.

"We look to continually improve on efficiencies and to reduce costs wherever possible and Air Liquide's Microbulk solution has certainly added to our competitive edge," Scheffer concludes.

Air Liquide Microbulk incorporates a two or three thousand litre cryogenic argon storage vessel, a CO_2 manifold and Air Liquide's Dynamic Onsite Mixer.

Scheffer Mechanical Technology services over nine mining houses in four groups, which include some of the most globally renowned OEMs.

Replenishment of the high purity argon takes place onsite via a dedicated road tanker, allowing the end user to continue with production without the need for downtime.

The perfect duet: TPS/i TWIN push tandem welding

Fronius' high performance TPS/i TWIN push tandem welding system enables significantly higher deposition rates and welding speeds, while it reduces the amount of pre-fabrication and rework required.

Fronius is now offering its tandem welding process on the TPS/i welding platform. The TPS/i TWIN Push high performance welding system is not only more compact, easier to use, and network-capable, it also integrates enhancements to the welding process. For users this means higher deposition rates, higher welding speeds and increased efficiency in production due to the reduced need for pre-fabrication and rework.

High performance welding is characterised by a high deposition rate that permits a high weld seam volume or high welding speeds. This is particularly relevant when joining high-volume components or long seams for construction machinery, commercial vehicles as well as automotive parts and in shipbuilding. The high processing power of the TPS/i further improves the synchronised TWIN Push tandem process: the process is even more stable and reliable; and the enhanced gap-bridging ability saves the user time at the component preparation stage. The amount of rework can also be reduced, since precise control of the welding process enables controlled droplet detachment and low heat input into the component, permitting low-spatter results with minimal distortion.

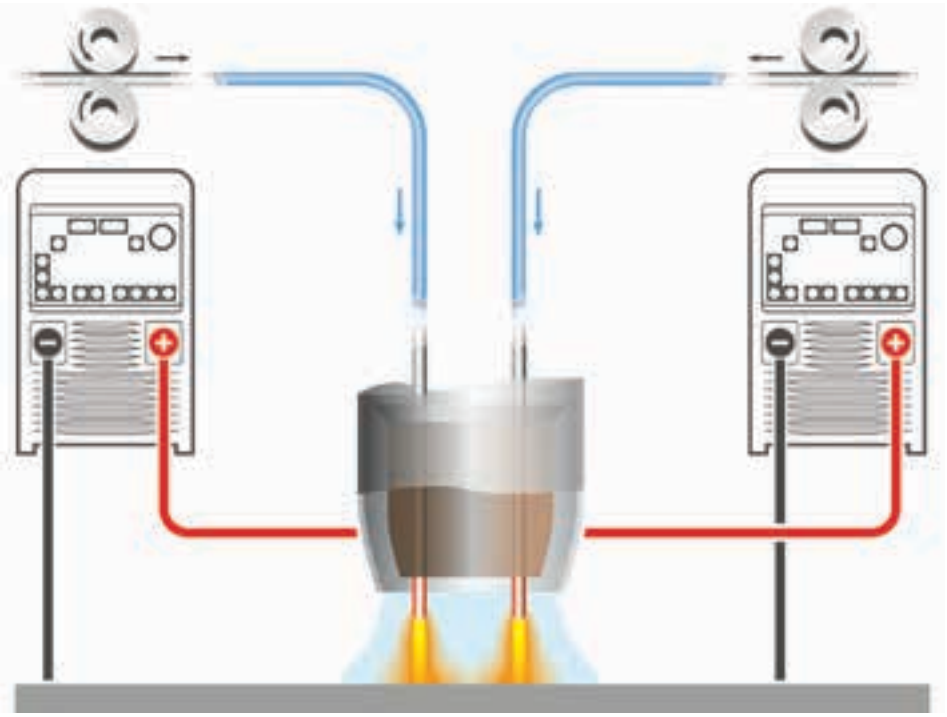
The tandem high performance welding process ensures that high-volume components and long seams are joined efficiently. The two wire electrodes are isolated from each other, allowing the arcs to be controlled individually.

Fronius offers new process and control options with the TPS/i TWIN Push: PMC (Pulse Multi Control) TWIN features a short, focused pulsed arc that enables improved penetration and a higher welding speed. The PulseSync option allows the user to select widely varying travel speeds for the two wire electrodes. This gives the user greater flexibility to adjust the welding parameters to the component and maximise welding speeds. The power source will automatically correct all relevant power source parameters, such as the ignition properties, the point of droplet detachment, and the pulse ratio.

New control mechanisms assist the welder in other ways too – the arc length stabiliser and the penetration stabiliser increase process stability and make it easier to configure parameters. Where the position of the interface varies, possibly due to component distortion or imprecise clamping, automatic seam tracking assists: during welding the welding system transmits a seam tracking signal to the robot so it can make corrections as required.

The TWIN process is based on tandem welding and features two wire electrodes that are fed into a welding torch with a single gas nozzle, while remaining electrically isolated from one another. As a result, the arcs can be controlled independently and, despite differing outputs, can be precisely synchronised and coordinated. In addition to two TPS/i power sources, the TWIN Push system requires a TWIN Controller. The controller synchronises the welding process and acts as an interface that is compatible with all makes of welding robot. The compact wirefeeder, cooling system, hosepack and TWIN welding torch complete the welding system.

The cooling system for the torch has been improved, extending the service life



The TPS/i TWIN Push welding system consists of two powerful TPS/i welding systems, the TWIN Controller, a compact wirefeeder, a cooling system, hosepacks and the TWIN welding torch.

of wearing parts. Alongside this, Fronius has developed the Robacta TSS/i TorchServiceStation: This welding torch cleaning system combines a number of cleaning methods, including high pressure cleaning, brush cleaning and magnetic cleaning, as well as cleaning by means of a cutter. The professional torch cleaning device lowers overall system costs by extending the service life of wearing parts.

The efficiency of the welding system can be further increased by using the TX TWIN welding torch change station: This console allows for automatic switching between TWIN and single torch bodies. This means the same system can be used to weld areas that are particularly difficult to access with the more compact single torch body. The robot automatically changes the torch body – allowing for unmanned shifts.

Fronius' Perfect Welding business unit is an innovation leader in arc and resistance spot welding and a global market leader for robot-assisted welding. As a systems provider, the Fronius Welding Automation division also implements customised automated complete welding solutions for the construction of containers or offshore cladding, for example. The range is rounded off by power sources for manual applications, welding accessories and a broad spectrum of services. With more than 1 000 sales partners worldwide, Fronius Perfect Welding has excellent customer proximity.

Fronius products are available in South Africa through the Bolt and Engineering Distributors Group (BED).

Above: Precise control of the welding process enables controlled droplet detachment and low heat input into the component, permitting low-spatter results with minimal distortion.

Left: The process is particularly suitable for joining high-volume components or long seams for construction machinery, commercial vehicles as well as automotive parts and in shipbuilding.

ESAB ARCAIR SLICE: cuts, burns or pierces anything, anywhere

Eugene van Dyk of ESAB South Africa unpacks the company's Arc SLICE exothermic cutting solution, an alternative cutting process that is highly portable and much more suitable for onsite and difficult to access cutting work.

Most exothermic cutting processes use a combustion process to generate the heat needed to melt and remove material along the cut line. ESAB's ARCAIR SLICE process uses a hollow steel rod as the fuel and industrial oxygen as the exciter. Once ignited, which is done under battery power, the ESAB SLICE system maintains a flow of oxygen through the torch and rod, which causes the rod to continuously burn and be consumed. This creates heat at temperatures of between 4 425 and 5 540 °C (8 000 and 10 000 °F), which quickly melt the material being cut.

This process allows cutting, piercing and gouging on almost any ferrous or non-ferrous material, including steel, iron, aluminium and magnesium. And with the SLICE torch, virtually anything placed in front of it can be cut, including copper, brass, concrete and brick.

Used predominately for plant maintenance, building renovation or demolition, scrap clean-up and salvage work, ESAB's SLICE cutting process is routinely used to remove edges on loaders for repair or replacement and it even burns through mud or rust-covered machinery frames.

One of the biggest applications for SLICE cutting is pin removal on heavy equipment. When a pin in heavy machinery will not budge, it must either be cut or have a hole burned through its centre for removal. When piercing a hole right through the middle of the pin, the metal from the pin is physically removed, so the pin will actually shrink allowing for easy removal once cooled.

Another application for which SLICE cutting is becoming more popular is fire and rescue incidents. SLICE cutting packs come complete with a torch, power supply and oxygen cylinder case, all of which can be worn as a backpack or carried using handles, making them practical and easy-to-use. This feature allows firefighters and rescue teams to more easily gain access to any obstacles in front of them.

While many may understand the basics of exothermic cutting strategies, real professionals must know how to safely and effectively use the technology. Below are some helpful tips on how to get the most out of SLICE cutting equipment.

Tips for cutting using the SLICE process

While cutting procedures vary from job to job, normal cutting is done using a drag technique, where once the rod is in contact with the piece to be cut, the professional drags the rod in the direction of the cut. The tips below will be useful:

- Maintain a consistent travel speed that is slow enough to slice through the material. The speed of the cut is too fast if the operator can't see the kerf and molten material is being blown back up towards the operator.
- Always remember that the steel cutting rods continue to consume as long as the oxygen is flowing. If the rod is not kept in contact with the work piece, cutting will stop but the rod will continue to be consumed. To stop combustion of the rod, the oxygen must be shut off.
- Use a sawing motion when the material to be cut is thicker than 75 to 100 mm (1½ to 2-inch) to ensure complete melt through the material.
- Be sure to use a smooth motion to complete the cut.
- After completing the cut, releasing the oxygen control lever on the handle will stop the oxygen flow and stop the combustion.

Note: Because the cutting rod will continue to burn as long as oxygen is supplied, be sure to hold the torch safely away from your body until the rod cools.

Special procedures must be used when piercing to promote safety for the end user and a high-quality finish on the product. When piercing, use a collet extension, which will extend the life to the torch. In addition, a hand shield will greatly improve operator safety and comfort. Be sure to hold the torch at arm's length and wear plenty of protective clothing, along with eye and ear protection.

If possible, remove the cutting rod from the pieced hole before releasing the oxygen lever. This helps prevent the cutting rod from getting stuck inside the pierced hole.

For hole piercing, these steps should be followed:

- Strike the cutting rod on the striker.
- Hold the torch at arm's length.
- Keep the cutting rod at a 90° angle (perpendicular) to the pierce point.
- Slowly push the cutting rod in at the pierce point until it is at the required depth or until you've achieved burn through.

Another crucial aspect of exothermic SLICE cutting is oxygen usage. The cutting process uses standard industrial grade oxygen to support the exothermic reaction and to remove the molten metal. All SLICE equipment uses standard oxygen fittings.

The most commonly recommended operating pressure is 5.5 bar (80 psi) but some applications, such as cutting material sections of 75 mm (3-inch) and thicker, might require higher operating pressures. Pressures as low as 2.75 bar (40 psi) have also been successfully used for operations such as washing off rivet heads and scarfing out small cracks for repair.

Even the best techniques for exothermic cutting equipment will change from job to job. Please be aware, as in any applications, some adjustments in operating conditions may be necessary in order to ensure you get the most out of your ESAB SLICE cutting equipment, while meeting optimal safety requirements.

Hydra Arc: a plant maintenance and fabrication leader

Lizelle Maciel of the Hydra Arc Group tells of the company's 30 year history and gives a sense of the company's transition from a supplier of specialist welders into a leading provider of maintenance fabrication services to petrochemical and other industries.

Hydra Arc was started in 1987 by José Maciel, who recognised the need for skilled welders to service the local petrochemical and power industries. One year later Maciel founded Hydra Arc (Pty) Ltd as a specialist supplier of specialist contract welders to service plant needs. The company quickly became a fully-fledged maintenance contractor and, in 2002, Jomele Training and Placements was established to recruit, train and place skilled artisans for its clients and for its own contract needs. By that time, mechanical and piping construction services had been added to its offering.

Notable progress since then includes: the move in 2010 into MEIP Construction Projects that involved the fabrication of modular plant assemblies, the first of their kind in the Southern Hemisphere; and the addition of water storage solutions to the portfolio in 2015, which are fabricated under-roof at Hydra Arc's Sky Hill facility before being transported to site.

With IIW 3834 certification under the SAIW's Welding Fabricator Certification Scheme along with an SABS ISO 9001:2015 certificate until December 2021, and an ASME U-stamp, the Hydra Arc Group of today provides project management, procurement, construction, fabrication maintenance and related services to clients in the petrochemical and other industries. Companies within the Group fabricate vessels, supply specialised construction and welding consumables and provide skilled construction and maintenance labour.

"Our core business is welding. We combine the latest technology with the best welding skills on carbon steel, stainless steel, aluminium and chromium- and nickel-based alloys using processes such as Gas Tungsten Arc Welding (GTAW), Shielded Metal Arc Welding (SMAW), Flux Core Arc Welding (FCAW), Submerged Arc Welding (SAW) and Oxyfuel Welding (OFW)," says Lizelle Maciel, the company's marketing manager.

"We aim to achieve excellence in all that we do, making sure that our quality management systems comply with and exceed internationally recognised quality standards," she adds.

Describing the company's vision and values, she says that Hydra Arc aims to become a global leader in the steel construction and fabrication industries. "We area on a mission to become the best in all we do while delivering long-term value to our clients, the community and our people," she says.

As a leading South African pressure vessel and piping fabricator, Hydra Arc's state-of-the-art equipment, design capability and skills enable the company to fabricate very large pressure vessels and an unlimited range of piping and structural steel to meet the most stringent local and international specifications.

Hydra Arc's state-of-the-art equipment, design capability and skills enable the company to fabricate very large pressure vessels.

The company's Sky Hill complex has successfully completed small, medium and large fabrication projects, from design to delivery. "Our focus remains on quality and the rapid, cost-effective fabrication and refurbishment of vessels, piping and equipment through the innovative use of the latest fabrication technologies," Maciel says.

On the training side, The Hydra Arc Group's Mshiniwami Artisan Academy, which is a division of Jomele Training and Placements, currently trains 1 000 learner welders, 450 pipe fitters and 50 boilermakers per annum. "The success of our training is evident in the fact that 96% of our graduates are currently employed in their trade, with the rest having taken up supervisory positions. Added to this, our commitment to skills development and empowerment is illustrated by our current Level 2 B-BBEE certification," she continues.

To date, the Hydra Arc Group has successfully completed a number of significant construction projects, including: pressure vessels; heat exchangers; duplex and super duplex piping and vessels; storage tanks; complex piping systems; dragline buckets and shoes; and modular structural assemblies. "By integrating and focusing our existing fabrication, construction, maintenance and labour skills to execute medium to large construction projects, our financial stability and our ability to deliver on projects are enhanced," says Maciel.

As a leading provider of maintenance services Hydra Arc enables clients to optimise their use of assets and enhance the productivity of their facilities, while maintaining the highest levels of safety and quality. Dependability, expertise and operational safety have established the company as one of the leading onsite service providers in the industry.

Group maintenance services include: overall shutdown management and execution; vessel repair, piping replacement, mechanical overhauls and high pressure cleaning; and on-going plant and equipment maintenance in complex facilities.

The Hydra-Arc Group has also developed its own tooling and equipment supply business, WeldMech – Tooling & Equipment Solutions, which provides all the specialised tooling requirements for the Group and for clients' short- and long-term needs.

"We aim to achieve excellence in all that we do and to ensure that all our employees share and consistently act in terms of our common values. We believe in sharing our success by enriching the lives of others through skills development, job creation and community programmes, while also being committed to making a difference to our planet and our people through environmentally sound and suitable workplace practices," Maciel concludes.

First Cut's vibrant new profile in Mpumalanga

First Cut has appointed former Johannesburg-based employee, Nico Nel, as the key salesperson for its Mbombela branch.

First Cut is developing an exciting new profile in the Lowveld at Mbombela (formerly Nelspruit). The company's presence builds on the foundation of an existing company, Bremsaw, which is a well-known local saw doctor business, explains director of First Cut, Gary Willis.

Dave and Anna Bremner owned the company for some 20 years. While the company had been a customer of First Cut for many years, buying various sawing-related products, a change came about when Dave and Anna decided to sell their business.

Willis has had a long and successful relationship with Bremsaw. "It's always a business we have had an interest in," he explains. The ultimate result was that First Cut took over the business in August 2018, with the former owners staying on to assist with the management and transition phase until July this year.

First Cut has appointed former Johannesburg-based employee, Nico Nel, as the key salesperson at the branch. "Nico has many advantages going for him in that he has excellent product knowledge and also knows the area and the customers around Mbombela extremely well, having represented us there for some time when he was working at First Cut in Johannesburg," explains Willis.

Currently, Bremsaw is relatively small company with a team of 10 people; however it does have a saw sharpening and repair facility on site. As such, the business can handle all types and sizes of saws for sharpening or repair. Bremsaw has traditionally supplied blades to the local timber industry.

First Cut, however, is keen to grow not only the timber industry market share; but also to aggressively market the rest of its cutting consumables and capital equipment offering.

"As we like to say when training our sales people, First Cut's ethos is to cross-sell and upsell – or 'sell your (product) basket'," says Willis.

"We therefore see Bremsaw as an excellent base and springboard from which to market our products to customers from Mbombela, all the way up to Tzaneen and even as far as Maputo," he explains, adding that the opportunities offered by the region are considerable and there is much potential for growth in the branch's sales. To realise this potential, First Cut is planning to hire a further salesperson who can embark on building relationships with new and existing customers.

"Our team has worked hard to inject fresh energy into what is fast becoming a vibrant business," Willis continues. Apart from circular and bandsaw blades for the timber industry, First Cut offers customers the choice of locally manufactured hacksaw blades and cutting consumables; as well as capital equipment, such as sheet metal and tube lasers, brake presses and tube and wire benders.

"From First Cut's perspective, we have been in the business of supplying cutting consumables and capital equipment for 63 years," he explains. The company's policy of supplying top quality premium brand products has stood it in good stead, as it has weathered the various economic cycles of the past six decades.

The company is renowned for delivering superb products and for its consistently excellent advice and service; which enhance the productivity and profitability of its customers. First Cut maintains excellent relationships with a range of overseas principals who are recognised globally for supplying state-of-the-art, highly advanced technology.

The acquisition of Bremsaw is a valuable addition to the other branches First Cut has around South Africa," explains Willis.

"We look forward to taking Mpumalanga's timber industry to new frontiers of productivity with our cutting-edge products – and to supplying a range of cutting, grinding, bending and welding technology to other forward-looking industries in the Mbombela region," he concludes.

www.firstcut.co.za

Air Products celebrated 50th with golf day

Air Products invited key customers and distributors to a prestigious golf day at the Glendower Golf Club in Edenvale during September of 2019 as part of the company's 50th birthday celebrations. Golfers received special treatment during the entire day and won great prizes. More importantly, it was an opportunity for guests and key Air Products employees to relax and enjoy some time outside the office and meeting rooms.

The winning four-ball, from left: Clayton Tree (Special Steels), Ismail Abdul (Special Steels), Marco Steyn (Horizon Global), Jason Allen (Horizon Global) and Rob Richardson (Air Products).

During the prize giving ceremony, Air Products' managing director, Rob Richardson, thanked customers and distributors for their loyal support over the years. He emphasised that the company is currently one of the largest suppliers of industrial gas in Southern Africa, which is largely as a result of their loyal support.

Richardson further noted Air Products' reputation for its innovative culture, operational excellence and commitment to safety and the environment, resulting in the company being able to manufacture and supply products of the highest quality for 50 years.

"I am honoured to be the company's MD as we celebrate this milestone in Air Products' proud history – it is such an achievement for the company to have shown the growth and experienced the successes that we have celebrated over the years. Our aim with this event was to thank our customers and distributors for the role they have played in our business and to commit to providing an even better service and secure supply of gas in the future," concluded Richardson.

www.airproducts.co.za

Torch technology for world welders

MB Evo Pro torches from ABICOR BINZEL provide a greater sense of control, enabling welders to feel 'as one' with their torches. Latest enhancements include the reduced weight BIKOX® LW cable assembly.

ABICOR BINZEL South Africa is setting new standards in welding torch technology. Being a subsidiary of German based company, Alexander Binzel Schweisstechnik, which recently won the 'The Grand Prix of Small and Medium-Sized Enterprises', the most prestigious SME prize in Germany and awarded for the 25th time this year. The motto of this year's competition was 'Sustainable Economy'.

ABICOR BINZEL South Africa imports and distributes ABICOR BINZEL branded products into the Southern African market. The company specialises in MIG, TIG, Plasma, Robotic and LASER welding torches, consumables and accessories. ABICOR BINZEL offers smart welding solutions that connect welders around the world.

Quality, safety and functionality are rising demands on technical products and this is also the case for welding torches. Lighter torches and effective fume extraction are required to meet welder's fitness. Special materials and applications need precise welding knowledge to guarantee what counts most: The perfect welding seam.

With ABICOR BINZEL South Africa, welders and fabricators have an ideal business partner in arc welding for manual, semi-automatic or full automation solutions.

Most recent product advancements include, the MB Evo Pro torches, which include the reduced weight BIKOX® LW cable assembly; ABIMIG torches with screw on nozzles; lightweight cable assemblies; ABIBLUE, a water-based spatter protector; and a new ceramic spray for nozzle protection against spatter adhesion.

Further advancements in the field of robotic and laser welding are also under development. ***www.binzel-abicor.com***

Böhler Welding diamondspark cored wires for weather resistant steel

Böhler Welding's diamondspark range of seamless cored wires offers stable, reliable and consistent high-quality cored wire welding. Produced in Europe, these wires fulfil both EN ISO and AWS codes to meet the most stringent requirements. Precise alloy and slag concept ensure excellent corrosion resistance and mechanical properties.

Böhler Welding's weather-resistant diamondspark seamless cored wires provide very high toughness and total resistance against moisture absorption.

The product range includes three seamless FCAW wires and one SAW-FCW in combination with three different fluxes: BÖHLER NiCu1 Ti T-FD (Rutile FCAW for all positions); BÖHLER NiCu1 T-MC (Metal-cored MCAW); BÖHLER Kb NiCu1 T-FD (Basic FCAW); BÖHLER SUBARC TNiCu1 & UV 306; BÖHLER SUBARC TNiCu1 & UV 400; and BÖHLER SUBARC TNiCu1 & UV 421 TT.

The product range offers various advantages in welding, such as higher travel speeds, higher deposition rates, multi-position welding, low amounts of silicates, and more.

BÖHLER SUBARC TNiCu1 & UV 421 TT is particularly special because of its extremely high fracture toughness, which offers the safest possible solution for high toughness requirements in product quality reviews (PQR).

www.voestalpine.com/welding

MultiCam turns 30

MultiCam, the global supplier of CNC Cutting solutions, is celebrating its 30th anniversary this year. Founded in 1989, the company began with a single CNC Router appropriately named: 'the MultiCam' and since then has become one of the world's leading suppliers of CNC cutting technologies.

MultiCam's early success was due to its strong value proposition, ease of use and open architecture capability, which allowed end-users to use their preferred CNC software to operate the machine. Their systems remain open architecture; however, to fulfil customer demands, MultiCam developed its own highly intuitive software package, Coreo, to enhance machine-operator workflow on all MultiCam cutting technologies.

MultiCam is a well-known provider of USA engineered and manufactured CNC machinery, which has led to its steady growth, even in highly competitive CNC marketplaces. From its early beginnings of manufacturing three to five machines a week, MultiCam has produced and shipped over 13 000 machines out of its 10 000 m^2 (108 000 ft^2) facility in North Texas.

While CNC Routers have been their top seller since the company's debut, MultiCam has since added a full product family of digital cutters: lasers cutters, plasma equipment and waterjet systems to its cutting portfolio.

Ecotek PS is a proud distributor for Multicam throughout Africa and offers local support in South Africa. With hundreds of installed machines in the region in an expanding number of industries, Ecotek is looking forward to solidifying its offering and satisfying an ever larger number of customers.

cnc@ecotek.org

A MultiCam 1000 Series CNC plasma cutting table.

AIR VANTAGE® 600-i from Lincoln Electric: powerful, dependable and advanced

Thulani Mngomezulu, technical manager of Lincoln Electric South Africa, introduces the company's new Air Vantage 600-i generator-driven welding solution.

The Air Vantage 600-i from Lincoln Electric is a powerful, multifunction diesel-driven welding machine that offers up to 600 A of welding current, 20 kW of auxiliary power and 1.7 m^3/min (60 cfm) of compressed air in a single package. This 3-in-1 workhorse has been designed to meet the most challenging onsite needs and environments, handling a wide array of tasks from heavy-duty carbon arc gouging to pulsed GMAW welding.

Diesel engine-driven, the Air Vantage® 600-i welding power source uses a brush type alternating current generator for multi-purpose dc welding, and includes both 120 and 240 Vac single phase and 240 V three-phase auxiliary standby power sockets. The welding control system uses state of the art chopper technology and the package includes a belt-driven rotary screw compressor.

For welding, any one of five standard process modes can be selected, including cc-stick, downhill pipe, touch start dc-TIG, cv-wire (GMAW) or arc-air gouging mode with a maximum output for carbon rods of up to 9.5 mm.

Arc performance is optimised for minimal spatter for stick or pipe welding and enhanced gouging performance prevents the engine from stalling, resulting in smooth material removal.

The Air Vantage 600-i from Lincoln Electric is a multifunction diesel-driven welding machine ideally for onsite use.

Expanded welding capabilities are included via customised modes for welding stainless steel, aluminium and carbon steels, as well as advanced submerged-arc welding (SAW). If the ArcLink® communications accessory is added, advanced orbital pipe mode and pulsing capabilities also become available to enable better arc control for out-of-position work or for lower heat input welding of critical welds.

From a reliability perspective, the unit is manufactured in an ISO 9001 and ISO 14001 facility, and is laboratory tested and field proven for ruggedness and durability. It is engineered for outdoor use in the harshest environments (IP23-rated) and includes high quality electrical insulation, stainless steel panelling and potted PC boards for added protection and durability.

A turbocharged Deutz® TD2.9L4 4-cylinder, 50 kW (65.7 hp) industrial diesel engine powers the unit smoothly and quietly, while standard engine gauges allow performance to be monitored at a glance. This Tier-3 engine does not require ultra-low sulphur diesel and the 94.6 ℓ (25 gallon) fuel tank enables exceptionally long running times before refuelling.

Key features of the new Air Vantage 600-i include:

- An IEC welding output rated for 575 A at 43 V with a 100% duty cycle.
- 20 kW of auxiliary power to run all types of industrial tools or an additional inverter welder.
- 1.7 m3/min@6.9 bar (60 cfm@100 psi) of compressed air powered by a VMAC®-manufactured unit.
- Powered by an industry proven 50 kW (65.7 hp), turbocharged Deutz® diesel engine-generator set.
- Capable of gouging with up to 9.5 mm carbon steels.
- Lab tested and field proven for ruggedness and durability, and engineered for outdoor use and harsh environments (IP23-rated).
- Encapsulated GFCIs, stainless steel panelling, and potted PC boards for added protection and durability.
- Welding performance offers minimal spatter for stick or pipe welding.
- Expanded welding capabilities for stainless, aluminium, and steel.
- With the ArcLink® communications accessory, pulsed GMAW is enabled for out-of-position and low heat input welding.
- Enhanced gouging performance with ArcLink® prevents the engine from stalling, resulting in smooth material removal.
- For GMAW, FCAW and MCAW, a Power Feed® 25M, a compact workshop or onsite wire feeder that includes push-pull capabilities for aluminium welding and extended gun feeder distances.

Other features of the feeder include: the Lincoln's MAXTRAC® drive system with full digital controls; internal lighting to illuminate the wire drive for working in dark environments; and internal heating to maintain control of the humidity by keeping consumables warmed and protected within the enclosed feeder case.

Other associated add-on capabilities and equipment for Lincoln Electric's Air Vantage 600-i include: the ArcLink Communications accessory for seamlessly sharing information between intelligent components and transferring critical data to system components such as wire feeders; a remote output controller; a large trailer with a fender and light kit; and a cable rack for the safe storage of approximately 30.5 m of 70 mm^2 welding cable per side.

The Air Vantage 600-i is ideal for onsite use for heavy equipment repair; energy utility repair; construction and general fabrication.

"We at Lincoln Electric manufacture and sell high quality welding equipment, consumables and cutting equipment that meet our customer's needs and exceed their expectations. Our Air Vantage generator-driven welding solution offers a high-end solution to local onsite welding needs. It will not disappoint," says Thulani Mngomezulu, technical manager of Lincoln Electric South Africa.

www.lincolnelectriceurope.com

www.crown.co.za

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TORCHMATE® 4800
Advanced Plug & Play System for plasma cutting

25 YEARS OF EXCELLENCE
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Highlights

- Complete cutting system with high-end **SINGLE-SOURCE** components
- 2-year manufacturer's warranty
- Cutting high-quality metal parts
- For mild steel (up to 25 mm)
- **Maximum cutting range:** 1,250 x 2,500 mm
- Mobile cutting system requiring little space
- **FLEXCUT 125A** air plasma power source
- **ACCUMOVE** controller incl. **CAD/CAM Software** and 20 inch touch-screen control
- Water cutting table
- Fast installation with minimal learning curve for operators

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