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Crown House
Cnr Theunis and Sovereign Streets
Bedford Gardens 2007
PO Box 140
Bedfordview 2008

Tel: (011) 622 4770
Fax: (011) 615 6108

Editor: Peter Middleton
E-mail: peterm@crown.co.za

Advertising: Peter Middleton
E-mail: peterm@crown.co.za

Managing Director: Karen Grant

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Kevin Xaba, product manager for filler metals at ESAB Southern Africa, presents the case for adopting the "remarkable" OK 55.00/OK 55.00L low moisture absorption (LMA) electrode range, which stand out as a testament to ESAB's commitment to excellence.

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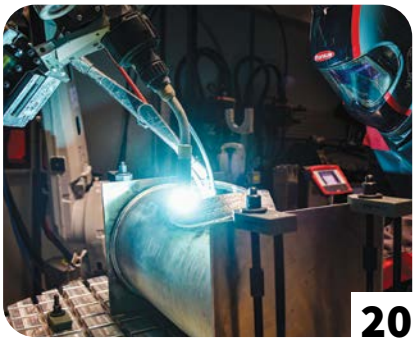
FEATURES

REGULARS



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Since 2008, the Southern African Institute of Welding (SAIW) in association with the leading global authority on welding The International Institute of Welding (IIW) has been ensuring and verifying compliance with international ISO 3834 standards.

SAIW / IIW ISO 3834 Certification is good for mining.

SAIW
Certification

As announced last year, we have been taking a very thorough look at all operational aspects of the SAIW's business with a view to mapping out a long-term and sustainable recovery plan. We are pleased to announce the Section 189 process of the South African Labour Law has now been concluded.

The SAIW has undergone internal evaluations and corrective action to streamline our operations and fill strategic positions with skilled candidates who align with our values of speed and customer centricity. We have appointed an acting managing director, Confidence Lekoane, while we seek a permanent replacement and we have appointed a general manager, Shelton Zichawo, to take on the day-to-day running of the Institute as from February 16.

We are still seeking to recruit SHEQ officers (ISO 3834 auditors) and a Qualification & Certification manager, practical training personnel as well as to fill other welding technology lecturing and NDT positions, but these processes are now well underway.

I understand the importance of serving the industry and have thus pulled in other board members who are qualified and highly competent IWEs and IWTs to take on ISO 3834 audits on a temporary basis. These specialists include Morris Maroga, Johan Kruger, and Kevin Xaba. In addition, Hartmut De Wet has been added to the team.

Dr Peter Petersson and Professor Nthabiseng Maledi will assume temporary roles in technology development and lecturing. Carel van Aswegen and Dawie Olivier will take on roles in the NDT and inspection department as well as overseeing quality and certification verification for our IPE and CP programmes supporting the sub committees. Lastly, Johan Pieterse will support the practical training department while I oversee this renewal process.

The beauty of the change we are implementing is that we are now moving towards being a modern fit-for-purpose service provider for the welding and inspection industry. We are going to engage software developers to help us to digitalise operations: writing programmes to handle everything from student applications to coursework programmes, marking of papers, releasing of examination results and sending certificates. As far as possible, the intention is to automate our administrative processes.

Some learning can also be done using virtual technologies, both at the Institute and at home. In addition, when examinations need to take place, many can be designed to be completed online and, once submitted, the results can be processed and credits issued immediately.

Related to this, we are looking to bring in young talent familiar and comfortable with AI and digitalisation. This can bring huge advantages and efficiencies in terms of record, qualification and personnel certification management. We expect to be able to respond far more quickly to the needs of our students and companies, and to save money. As promised last year we are also on a mission to make our services more affordable. By adopting this digital approach, we are sure we are going to be able to do that.

We also intend to introduce tailor-made training courses to directly meet client needs. These will be developed by going out to meet clients, understand their issues, develop custom training courses and then deliver them to help our clients meet their direct and immediate needs.

We remain committed to quality, though, of SAIW training, audits and certification. The SAIW has a responsibility for compliance to systems such as ISO 3834. When we issue any certification to a person or company, their clients or employers need to be sure that the certified party is taking responsibility and ownership of that certificate and is truly working in compliance with their accreditation. So we need our audits to be rigorous, to raise their true value and their effectiveness.

We are determined to create transparency and accountability by employing innovators who will ensure the SAIW grows, remains sustainable and becomes a significant part of the South African Welding industry's ongoing success.

Joseph Zinyana, SAIW president

SAIW Board and Management Team

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Kevin Xaba – ESAB

Managing director
Confidence Lekoane (acting)
Tel: (011) 298 2101
confidence.lekoane@saiw.co.za

General Manager
Shelton Zichawo
Tel: (011) 298 2102
shelton.zichawo@saiw.co.za

Executive secretary
Dimitra Kreouzi
Tel: (011) 298 2102
dimitra.kreouzi@saiw.co.za

Factory fresh electrodes straight from the pack

Kevin Xaba, product manager for filler metals at ESAB Southern Africa, presents the case for adopting the 'remarkable' OK 55.00/OK 55.00L low moisture absorption (LMA) electrode range, which stand out as a testament to ESAB's commitment to excellence.

"Not all stick welding electrodes are created equal. For over a century, ESAB has been at the forefront of welding innovation, providing cutting-edge solutions to industries worldwide," begins Kevin Xaba of ESAB South Africa.

Founded in 1904, ESAB revolutionised welding technology with the introduction of the first coated electrode. Building on this legacy, the company continues to set new benchmarks in quality and performance. "Among its many remarkable products, OK 55.00/OK 55.00L low moisture absorption (LMA) electrodes, which are classified as AWS A5.1 E7018-1 H4R, still stand out as a testament to ESAB's commitment to excellence, offering advanced features that address the challenges of modern welding applications," he adds.

"When it comes to achieving superior weld quality in demanding applications, the choice of welding electrode is critical. Among the top contenders in the field, OK 55.00 from ESAB are a most reliable and efficient solution for professional welders. This low-moisture absorption electrode offers a host of benefits that make it a preferred choice across various industries.

Key benefits

Outlining the benefits of using OK 55.00 consumables from ESAB, Xaba first lifts out the outstanding weld quality: "One of the primary benefits of OK 55.00 is its ability to produce high-quality welds consistently," he says, adding that the low moisture absorption/low hydrogen content of this electrode minimises the risk of hydrogen-induced cracking, a common challenge when working with high-strength steels.

This type of cracking starts with hydrogen atoms (H) dissociating in the high-temperature arc from the moisture in the air (H_2O). Being the smallest element, atomic hydrogen can diffuse through solid metal and into the heat-affected zone of the parent material. On cooling, these atoms combine to form hydrogen gas (H_2), which has a much larger volume than individual atoms. This raises the internal pressure, and If the microstructure is brittle and already under stress, this can cause very high localised stress in the metal that, if not safely dissipated, results in cracking.

"The danger of hydrogen cracking, which is sometimes called cold cracking, is that it often only occurs after the weld has cooled to near room temperature. By using ESAB's OK 55.00 LMA electrodes, the moisture that initiates the problem is significantly reduced, which helps to overcome this welding challenge," explains Kevin Xaba.

On the weldability and visual side, he adds that the OK 55.00 range delivers smooth and clean weld bead appearances, which reduces the need for extensive post-weld cleaning.

ESAB OK 55.00 LMA electrodes are ideal for high humidity worksites and positional-welding projects.

LMA means no re-baking, no holding ovens and no quivers

LMA OK 55.00 welding electrodes in VacPac can be used straight from the package without the need to re-bake them. Laminated, multi-layer aluminium foil is vacuum sealed around a strong plastic inner box to effectively protect the electrodes against moisture re-absorption from the air. Upon breaking the vacuum, fresh and dry electrodes are guaranteed.

ESAB welding electrodes in VacPac are all low moisture absorption (LMA) types with a coating that only slowly re-absorbs moisture from the atmosphere. The safe exposure time is typically 12 hours after opening the VacPac, if the foil is left in place. And for optimal security, it is best to take out only one electrode at a time, he advises.

The LMA OK 55.00 range exceeds industry norms for moisture pick up at between 0 and 100°C, which specifies moisture pickup of less than 0.4% after nine hours at 27.4 °C in 80% relative humidity. Since electrodes exposed beyond above limits usually need to be re-baked, convenient VacPac sizes have been established – 2.5 mm/350 mm long electrodes in packs of 73 rods; 3.2 mm/350 mm long electrodes in packs of 83 rods; and 4.0 mm/450 mm long electrodes in packs of 58 rods – to enable

LMA OK 55.00 welding electrodes in VacPac can be used straight from the package without the need to re-bake them.

OK 55.00/OK 55.00L low moisture absorption (LMA) electrode range stands out as a testament to ESAB's commitment to excellence.

Right: OK 55.00 LMA is a reliable, high-quality, low-hydrogen electrode particularly suitable for welding high strength low-alloy steels.

welders to finish an open pack of electrodes before their shift finishes.

"This gives the assurance that, if cooling rate recommendations for crack-sensitive materials are properly implemented, these ESAB electrodes will deliver crack-free welds with tough mechanical properties in high or low temperature environments – at high humidity worksites or the most challenging positional-welding projects."

Versatility in applications

The OK 55.00 LMA range is designed to be versatile, making it suitable for a wide range of applications. It works effectively on carbon steels and low-alloy steels, catering for diverse industrial requirements. Additionally, it performs reliably in all welding positions, ensuring adaptability in different working conditions.

These electrodes also offer superior re-strike capabilities that few competitors can match. This means that the full length of the electrode can be used without having to restrike or, in some cases, throw away a partly used electrode due to the arc being extinguished multiple times. This raises the net deposition efficiency, which is already at 125% compared to only 110% for many alternatives.

This efficiency advantage reduces the true cost of the OK 55.00 by at least 15%, and significantly more of you consider that the entire length of the electrode can almost always be used.

Superior mechanical properties

"The electrode is renowned for its exceptional mechanical properties. It produces welds with high toughness and strength, even under low-temperature conditions. These properties make it ideal for structural applications and projects that demand durability and resilience," Xaba continues.

OK 55.00 carries the EN ISO 2560-A E 46 5 B 32 H5 classification, which means the product will deliver a minimum yield strength (YS) of 460 MPa in the as-welded condition. This expands the operational window of the electrode range, allowing ASTP Grade 70 and Grade 80 steels (YS: 482 and 551 MPa, respectively) and API X65 (YS: 450 MPa) to be welded using these electrodes.

Ease of use is another hallmark of OK 55.00. Its stable arc characteristics provide better control during welding, even for operators with less experience. Moreover, the electrode offers easy slag removal, simplifying the post-weld cleaning process and enhancing productivity.

Compliance with industry standards

OK 55.00 meets or exceeds the requirements of globally recognised standards such as AWS and ASME. This ensures that welds made with this electrode are compliant with stringent quality and safety regulations, providing peace of mind to engineers and inspectors alike. "Every batch of OK 55.00 Class C5 or OK 55.00L Class C5/ OK 55.00L Class C3 purchased comes with a 3.1 test certificate and 3.2 testing can be done if required," Kevin Xaba assures.

Ideal for critical applications

OK 55.00 LMA is a reliable, high-quality, low-hydrogen electrode particularly suitable for welding high strength low-alloy steels. The good, low-temperature impact strength of the weld metal should also be noted. It is widely used in industries such as shipbuilding, pressure vessel fabrication, structural steelwork and construction; along with other sectors such as oil and gas where weld integrity is of utmost importance.

In summary, OK 55.00 from ESAB is a top-tier choice for professionals seeking exceptional performance, versatility, and reliability in welding. Its combination of outstanding weld quality, ease of use, and compliance with industry standards makes it a trusted solution for a variety of demanding applications.

"Whether you're working on structural projects, pressure vessels, or other critical tasks, OK 55.00 LMA in VacPac ensures a level of performance that meets and exceeds expectations. ESAB South Africa and its distributors are fully stocked up on all sizes of OK 55.00 to suit every need," says Xaba.

"And All ESAB products are backed by our commitment to superior customer service and support. Our skilled customer service department is prepared to quickly answer any questions, address problems, and help with the maintenance and upgrading your machines. And our products are backed with the most comprehensive warranty in the welding industry.

"With ESAB, you can be sure the products you purchase will meet your needs, today and in the future. Product and process training is also available. Just ask your ESAB sales representative or distributor for a complete ESAB solution," Kevin XABA concludes.

www.esabsa.co.za

Meet SAIW's acting Executive Director

African Fusion talks to Confidence Lekoane, currently acting Executive Director of the SAIW, about her history and hopes for the Institute's future.

Confidence Lekoane has been appointed to the role of active Executive Director of the SAIW.

Confidence Lekoane grew up in Thembisa on the East Rand of Gauteng and spent her high school years at Rhodesfield Technical High School near Kempton Park. "I never really knew what a technical high school was before I started, but I thoroughly enjoyed it. I enjoyed the practical aspects of being in a technical school, working with my hands to take things apart and putting them together again. It is part of my character," she tells *AF*.

Having matriculated in 2006, Confidence went to the University of Johannesburg (UJ) to study metallurgical engineering and was awarded her National Diploma in Engineering Metallurgy. "During my undergrad studies, I got industrial exposure in production quality control, which included looking at the accuracy of the casting alloys," she says, adding that it was here that she first gained experience of mechanical and metallurgical testing.

"In 2011, while studying for my B-Tech in Engineering Metallurgy from UJ, I was employed by SCAW Metals on its Graduate Training Programme where I was conducting research on new methodology to enhance product quality in the foundry, characterising steel microstructures and managing heat treatment trials to improve wear resistance – for vertical spindle mills, for example," she tells *AF*.

Confidence joined the SAIW in February 2012 and was instrumental in establishing the Institute's newly formed mechanical testing lab. "After setting up the laboratory, I was responsible for managing and coordinating day-to-day laboratory operations and ensuring adherence to ISO/IEC 17025 quality management standards; operating and maintaining all the testing equipment; interpreting test results; and issuing reports in line with client specifications and regulatory standards," she says.

"I also provided mentorship to in-service training students and ensured the laboratory maintained a high level of organisation and efficiency," she adds.

Confidence Lekoane also found the time and energy to continue to study while managing the SAIW Mechanical Testing Laboratory, and she was awarded an IIW International Welding Technologist (IWT) Diploma by the SAIW in 2017.

This led to a promotion within the SAIW's Technical Services Department, where she became a welding consultant, doing qualifications for welding procedures and personnel, and assisting clients

IIW Annual Assembly and International Conference 2025

In June 2025, The Italian Institute of Welding (IIS) will host the IIW Annual Assembly and International Conference, an event of global importance, in the wonderful atmosphere of Genoa, Italy, giving attendees a chance to visit Italian industry and experience Italian culture, hospitality, arts and food.

The 78th IIW Annual Assembly & International Conference on Welding and Joining will take place from June 22 to 27, 2025 in the Genoa, Italy.

The history of Genoa is a mixture of democracy, commerce and finance: it was one of the first Republics in the world; Genoese merchants sailed across the world; and the first bank was established there in 1407. So the city has always been open to influences from different cultures. In the modern age, the city has been promoting the industrial culture in Italy, which originated in Italy's industrial triangle: Milan-Turin-Genoa.

Nowadays Genoa is a dynamic city aspiring at becoming the cradle of new technologies, with the highest quality of life as a result of its size, climate, environment and atmosphere.

The Italian Institute of Welding (IIS) has selected the old harbour district for the Assembly and Conference venue, which has been renovated to create a unique working and leisure environment, right on the seafront. IIS has also designed a set of wonderful events to accompany the IIW ceremonies, including concerts and a visit to the biggest aquarium in Europe.

Assembly and Conference participants and companions can enjoy the city, where all the main attractions are at walking distance: old palaces, small shops, fine arts and local food and wines. At short distances by train or bus, the most beautiful attractions of the 'Riviera' can be easily reached, such as Portofino, '5 Terre', consisting of five villages almost uncontaminated by modernity, as well as the many pleasant beaches and seaside villages.

The IIS has selected the old harbour district for the venue of the 78th IIW Annual Assembly & International Conference in June 2025.

The International Conference will be held in conjunction with the Italian national welding days (GNS), an event that gathers more than 1 500 participants every other year from all over the country. This is also a unique opportunity to get in in touch with the Italian industry related to joining and to expand perspectives for the world of welding.

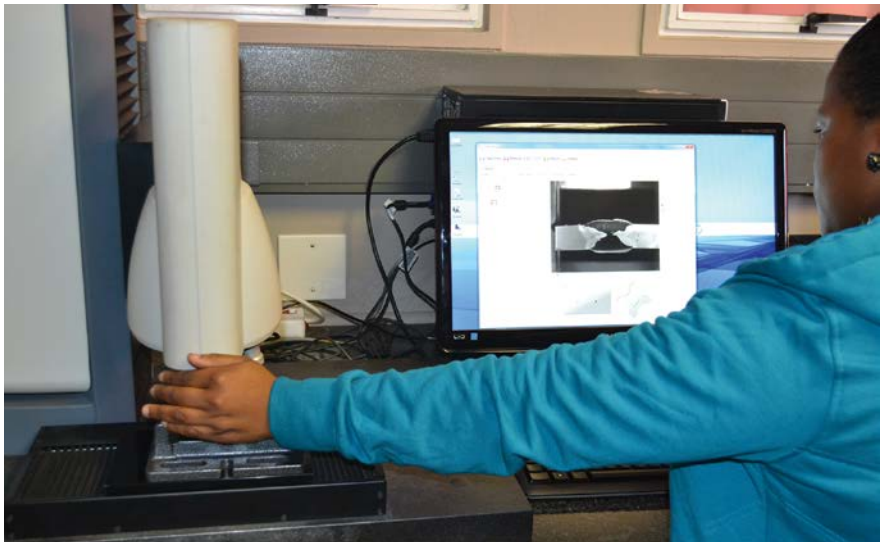
The deadline for Early Bird registration has been extended to March 31, 2025. For those planning to submit a technical contribution, submissions remain open, but if attendance depends on securing a presentation slot, presenters are encouraged to submit their contributions as soon as possible through the designated submission portal.

https://online.aristea.com/event/iiw2025

and SAIW members with welding related problems. “I was helping clients towards compliance with international standards such as ISO 15614-1 for welding procedure specifications (WPSs); ISO 9606-1 for the qualification testing of welders; and the ASME IX, and AWS D1.1 welded construction codes for pressure vessels and structures, respectively.

“This work is at the core of the SAIW’s national role in raising and upholding industry standards,” she points out, adding that her Technical Services role at the SAIW also included coordinating welder performance qualification, ensuring adherence to quality standards, leading the development of welding procedures, troubleshooting and resolving welding problems for clients, managing client relations, and developing tailored solutions to meet individual client needs.

In April 2023, Lekoane was promoted again to become the SAIW’s Technical Services and Practical Welding Manager. Now in 2025, she has again been chosen – this time in the roll of acting Executive Director – to lead the Institute through a difficult transformation. “It’s a big job, but I am a hard working person,” she comments.



Confidence Lekoane joined the SAIW in February 2012 and was instrumental in establishing the Institute’s newly formed mechanical testing laboratory.

“The SAIW is evolving, focusing on digitalising systems, programmes and automating company processes. We are moving with the times to become increasingly relevant to the industry. I am looking forward to being instrumental in delivering this vision, which is being made possible under the leadership and guidance of our President, Mr Joseph Zinyana.

“The SAIW should be the home of the welding Industry, where people come to find solutions. My hope is we can again become the preferred partner for our membership and the wider welding community.

“My management style is collaborative: I want to cultivate a culture where our staff feel happy, energetic and proud when they come to work. “Most importantly, all our services need to be highly valued by customers, members and the South African welding industry. We need to put them first,” Confidence Lekoane concludes.

www.saiw.co.za

ABLE Synergy: From maintenance services to full turnkey EPCM solutions

***African Fusion* meets Lizane Espach – a director at ABLE Synergy, a leading provider of piping, structural engineering, maintenance services, and ISO 3834-2 certified fabrication solutions – to discuss the company's recent successes and its vision to expand into a comprehensive turnkey EPCM solutions provider.**

Founded on May 16, 2023, ABLE Synergy was created to build upon the foundation laid by Lizane Espach's father, Johan Espach, through his engineering and design company, SIS. Based in Sasolburg, SIS delivers expertise in mechanical, electrical, instrumentation and piping (MEIP), as well as structural, civil, building and project work.

"We founded ABLE Synergy to bring my father's vision to life. Before his passing in 2021, he had started developing a manufacturing and fabrication workshop alongside his engineering design business. Although he could not complete the project, we carried his vision forward by acquiring a new facility and securing the necessary registrations and accreditations," Lizane Espach explains.

"With ABLE Synergy and SIS working in tandem, we can now seamlessly transition an engineering design, such as replacement piping, across to one of our fabrication shops for production to exact specifications. This integration allows us to offer both design and fabrication services under one umbrella," she adds.

ABLE Synergy's independent status allows for clear separation of liabilities, while also enabling the company to take on standalone design or fabrication projects. Elaborating on the company's typical operations she highlights the maintenance support services provided to Henkel, Air Products and Omnia's local plants. "For instance, when complex piping needs replacement, we use laser scanning technology to capture the precise routing and connections for the new system. At SIS, we draft the piping design and then hand it over to ABLE Synergy for fabrication. This collaboration enables our installation teams to complete the work swiftly and efficiently," she explains.

Comprehensive maintenance services

ABLE Synergy offers a broad range of maintenance services, including:

- Preventative maintenance, scheduled inspections and upkeep to prevent costly breakdowns and extend asset life.
- Efficient shutdown management to minimise operational downtime.
- Maintenance for critical systems such as HVAC, plumbing, and electrical.

ISO 3834 certification, says Lizelle Espach, is a 'must have' accreditation for ABLE's client base and the types of work it wants to do.

- Utilisation of advanced diagnostic tools to identify issues early, avoiding expensive failures.
- Rapid repairs and system upgrades to optimise performance and compliance.

Left: Setting up a precision piping component and, right: the weldment prepared for TIG/GTAW welding.

Welding and fabrication at ABLE Synergy

A key part of ABLE Synergy's ISO 3834-2 certified offerings is its piping and structural fabrication services. The company operates two fabrication workshops, equipped with a 10-ton and a 3.5-ton crane, enabling direct loading and offloading from the shop floor to trucks. "Our fabrication focuses on precision piping and structural steel components, which are often transported for installation by our onsite teams, who also handle welded assembly and quality assurance," she explains.

ABLE Synergy has also become a trusted coded-welder certification provider for Swift International Recruiters, a pan-African agency specialising in recruiting

Above: Able Synergy's ISO 3834-certified offering involves the fabrication of precision piping and structural steel components, which are manufactured in one of the workshops and often transported for installation by onsite teams.

labour. Espach highlights the company's investment in developing in-house skills to meet client requirements. "Currently, we employ six welders, but our partnership with Swift allows us to recruit hundreds of welders for large projects or maintenance shutdowns," she says.

The company received its ISO 3834-2 certification in late 2024, demonstrating its capability to weld pressure piping, equipment, tanks, lifting equipment, structural steel, and sheet metal. "While we haven't yet ventured into manufacturing pressure vessels, we possess the engineering and fabrication capabilities to do so when needed," notes Lizane Espach.

In terms of welding processes, ABLE Synergy uses manual welders skilled in MMAW/stick, GTAW/TIG, or GMAW/MIG, depending on the project's quality standards. The company maintains strong relationships with local suppliers, such as EWS, to ensure access to the necessary equipment, consumables, and PPE.

Lizane Espach, in addition to her role as a director and engineering designer, also manages the company's ISO 9001 (quality management), ISO 45001 (health and safety), and ISO 14001 (environmental management) certifications.

Turnkey Projects and the Future of ABLE Synergy

"We take immense pride in seeing projects through from start to finish. Having worked in design and engineering for 15 years, it is a rewarding experience to watch our own designs come to life in our fabrication shop," she says.

SIS and ABLE Synergy recently secured a major local construction project, which involves structural fabrication, onsite construction, and the electrical infrastructure for the plant's control room and offices.

ABLE Synergy uses manual welders skilled in MMAW/stick, GTAW/TIG or GMAW/MIG, depending on the project's quality standards.

Reflecting on ABLE Synergy's ISO 3834 certification, she underscores its importance to the company's client base: "ISO 3834 certification is essential for the types of projects we pursue, and we see it as a critical accreditation for our growth. My goal is for ABLE Synergy to evolve into a full turnkey EPCM solutions provider, expanding from our base in Sasolburg and establishing a national and international presence."

ABLE Synergy's recent project in Botswana, involving various welding related activities for Hannom – an expert in turbo and high-speed rotating equipment – exemplifies the company's ambition.

"This is the type of project we aim to replicate, where clients rely on us for comprehensive EPCM services, with SIS handling design and ABLE Synergy turning those designs into reality. Our proven expertise in maintenance ensures that we can also extend the operational life of the plants we serve," concludes Lizane Espach.

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Laser Welding Workshop Heralds a new era

Sassda hosted an enlightening Laser Welding Workshop at the Southern African Institute of Welding (SAIW) last year, bringing together experts, industry professionals, and welding enthusiasts to explore cutting-edge advancements in laser welding technology.

Factory Smart's John Owen Welgemoed underscored the efficiency of laser welding: "With laser welding, you can work two to three times faster than conventional methods, depending on the material."

Through insightful presentations and hands-on demonstrations, a Laser Welding Workshop held at the SAIW last year highlighted how laser welding is set to revolutionise industries ranging from manufacturing to aerospace.

Laser welding, though a relatively recent development, has made remarkable strides since its inception in 1960. Rob Lawrence, one of the key speakers at the workshop, emphasised how quickly this technology has evolved. "Laser welding technology was only invented in 1966, making it relatively new. Over time, the technology has continued to improve. Torches are becoming smaller, machines are getting lighter, and the need for water-cooled heavy systems has disappeared."

From its initial applications using ruby lasers to today's advanced systems, laser welding has come a long way. Lawrence highlighted futuristic advancements, such as a flexible torch head, which provides more flexibility in welding applications. This continuous evolution makes laser welding not just a current industry trend but a technology that promises long-term growth and innovation.

Lawrence also emphasised the potential business opportunities laser welding presents for South African industries. This against the backdrop of significant growth projected for the global laser market. "The laser cleaning market alone was valued at US$685-million in 2022, with rapid expansion expected. As laser welding becomes more widespread, it will revolutionise various sectors, offering a chance for South African businesses to stay competitive in the global market," stated Lawrence.

One of the major topics discussed at the workshop was the numerous benefits laser welding offers over traditional welding methods. Factory Smart's John Owen Welgemoed underscored the efficiency of laser welding: "With laser welding, you can work two to three times faster than conventional methods, depending on the material. It produces neat, precise welds with very small heat-affected zones, especially on stainless steel. This significantly reduces distortion and resolves many manufacturing challenges."

Welgemoed shared examples from his own experience, including a customer in Paarl who had drastically reduced production times. "A job that previously took him eight hours to complete with traditional welding, now takes just two hours using laser welding.

"This improvement has opened doors for more work, new projects, and even the possibility of exporting. By speeding up production times and minimising finishing work, businesses can save costs on labour and materials, making laser welding a more efficient and economical choice," he explained.

Overall, Welgemoed explained: "Laser welding will drastically improve production efficiency and reduce labour costs. The future of manufacturing will be shaped by this technology. By adopting laser welding, businesses can expect to increase their output and reduce waste, while also contributing to the overall industrial growth of the country.

Laser welding's versatility was another highlight of the workshop. Whether it's used for cutting-edge aerospace components or intricate jewellery making, this technology is applicable across numerous industries.

One particularly compelling demonstration at the event showcased the ability of laser welders to work with tricky materials such as aluminium and stainless steel, delivering high-quality results.

"These materials can be tricky no matter the method, but with a laser welder, it's easier. You simply place the torch, and the wire pushes the weld along smoothly. With a 1.5 kW laser, you can achieve three to four millimetres of penetration," Welgemoed pointed out.

In addition, laser applications go beyond welding. The technology is being used for laser cleaning, laser bending, and even laser dentistry, showcasing its incredible range. Lawrence pointed out that industries such as aerospace and food processing are set to benefit greatly from these advancements.

The need for training and certification

As laser welding technology continues to advance, the importance of proper training and certification cannot be overstated. SAIW's Confidence Lekoane, announced that the institute will be introducing a laser welding courses starting in 2025 to meet the rising demand for skilled laser welders.

"Our new course will introduce laser welding, covering the fundamentals of the process, the equipment used, and essential safety precautions. Participants will learn about quality control, how to eliminate and prevent defects, and they will get hands-on training," she said.

Lekoane added that given the precision and high-energy output of laser welding equipment, safety protocols are a top priority. Factories using laser systems must have specialised safety zones, and operators need to be well-trained to prevent accidents. "For instance, improper handling of a laser cleaning system could result in unintended damage to the surrounding area, making education a crucial component of laser technology adoption," she said.

The Laser Welding Workshop hosted by Sassda at the SAIW Campus was a resounding success, providing participants with valuable insights into the future of laser welding technology. As Lawrence, Welgemoed, and Lekoane all emphasised, laser welding is not only more efficient and versatile than traditional methods but also easier to learn and implement. This makes it an attractive option for industries looking to modernise.

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Technologies at the service of CCUS

Enrico Zuin, Nazmi Adams and Herbert Abbott of voestalpine Böhler Welding present their company's welding solutions in support of carbon capture, utilisation and storage (CCUS).

Carbon dioxide (CO_2) emissions resulting from human activities, particularly from the combustion of fossil fuels, have led to atmospheric CO_2 concentrations in the earth's atmosphere rising from pre-industrial levels of around 280 ppm to a current average of 420 ppm. While this may not sound like much, anthropogenic emissions have increased by 67 %, with a sharp acceleration since the 1970s.

The development of renewable energy sources in recent years has failed to compensate for humanity's growing demand for energy. As a result, total CO_2 emissions have grown over time to approximately 37-billion tons (37 Gt).

To reach carbon neutrality, the point at which CO_2 concentration in the atmosphere stop rising, carbon capture, utilisation and storage technology (CCUS) has emerged as a promising solution to mitigate CO_2 emissions and combat climate change. CCUS prevents CO_2 from industrial processes and power generation facilities being released into the atmosphere. This helps mitigate climate change while enabling continued use of fossil fuels during the transition to renewable energy sources.

Principles of carbon capture

CCUS is an acronym that groups together all the carbon capture related technologies – available or under development – that can prevent CO_2 from entering the atmosphere.

Captured CO_2 can be transported via pipeline or transported in its liquid state by ship; it can be utilised in some industrial applications as a raw material to create other products, and excess captured CO_2 can be injected and permanently stored in deep geological formations or depleted oil and gas reservoirs, which may be on land or offshore.

Today, only 45 Mt of CO_2 are captured every year in about forty operational plants. Most of the captured CO_2 is used in enhanced oil recovery (EOR) processes to improve oil and gas extraction.

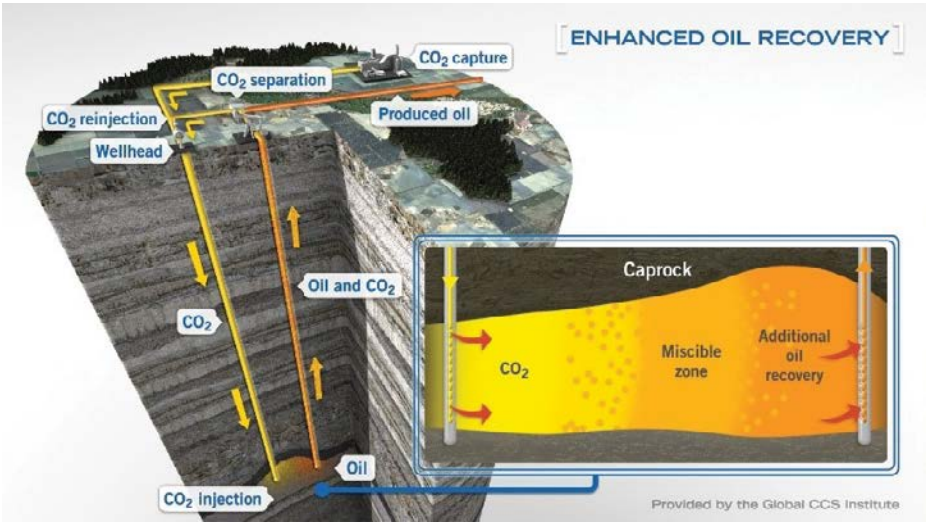
Fifty new capture facilities are set to be operating by 2030, increasing the total capture capacity to 383 Mt/CO_2/y. To be on track with the net zero emissions (NZE) scenario by 2050, however, the total capacity by 2030 should be at least 1 100 Mt/CO_2/yr.

Carbon capture technologies

Carbon capture technologies can be classified into four main categories: pre-combustion capture, post-combustion capture, oxy-fuel combustion capture and direct air capture (DAC).

Pre-combustion carbon capture

Pre-combustion carbon capture allows for the removal of CO_2 from a gas mixture before it is used, typically from syngas. Purified syngas can subsequently be burned to produce electricity using suitable gas turbines. This process can also be used to produce blue hydrogen or for natural gas sweetening after extraction.



Most of the captured CO_2 is used in enhanced oil recovery (EOR) processes to improve oil and gas extraction.

Principle author: Enrico Zuin, Head of Global Welding Technology for voestalpine Böhler Welding.

Proprietary physical solvents used to capture the CO_2 include Selexol and Rectisol, which work well at high concentrations of CO_2 and can tolerate the presence of residual oxygen. The CO_2 is then desorbed and released from the solvent by decreasing the pressure in a stripper vessel.

In an integrated gasification combined cycle (IGCC) power plant, coal, petroleum coke and other feedstocks can be used to produce electricity via a gasification process. The feedstock is first converted to syngas in a gasifier. After cooling and desulphurisation, the syngas is subjected to the shift reaction to convert the CO to CO_2, which produces a gas mixture composed of H_2 and CCO_2, which is used as a syngas with a high H_2 content in a gas turbine for power generation.

In the steam turbine phase of the combined cycle, a heat recovery steam generator (HRSG) then uses the waste heat from the hot exhaust gas to generate steam, while the CO_2 from the combustion phase is captured, compressed and sent to its destination.

To produce blue hydrogen the steam methane reforming (SMR) process is used, where natural gas is used to produce hydrogen with CO_2 as a by-product. This CO_2 can be captured and separated from the hydrogen.

Most of the world's sources of natural gas (CH4) also contain CO_2 and H2S that must both be removed before shipping natural gas via pipelines or liquefying it to produce LNG. This process, known as NG sweetening, is very well established in the oil and gas sector.

Post-combustion capture

To separate and capture CO_2 from the flue gas of a combustion system, oxygenate compounds, NOx, SOx, metal dust, and

other contaminants must be removed from the exhausted flue gas. After cooling, the CO_2 is separated from the flue gas by passing the gas through a continuous scrubbing system consisting of an absorber and a stripper.

Amine-based solvents are typically used. The release of CO_2 is obtained by using heat to break the chemical bond between the CO_2 and the solvent. The greater the energy required to release CO_2 from the solvent, the lower the overall efficiency of the process. This is why research is focusing on developing capture mechanisms that are more efficient than first-generation MEA (monoetha- nolamine) and more tolerant of the impurities associated with this process.

Carbon capture from industrial processes

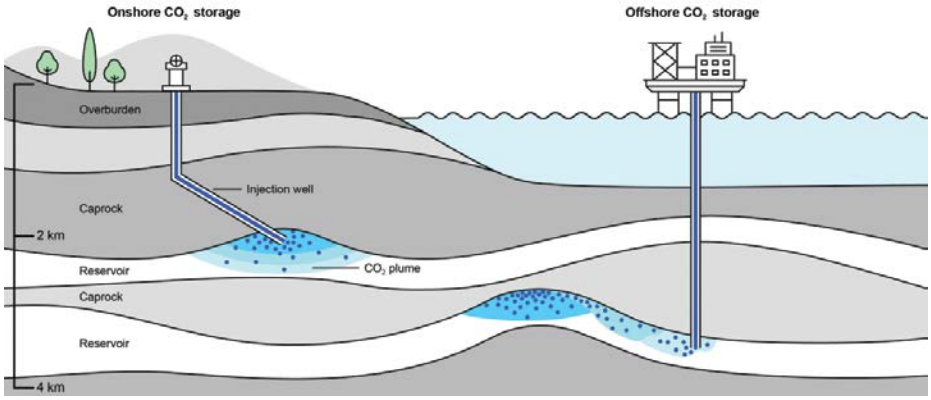
At gas- or coal-fired power plants, a carbon capture facility is coupled with a fossil fuel power plant to separate the CO_2 from the flue gas. The cleaned flue gas released into the atmosphere is composed of nitrogen and water vapor. The separated CO_2 is compressed and dehydrated for transport to storage or utilisation sites.

In the oxy-fuel combustion process, also known as the Allam cycle, coal or natural gas fuel is burned in almost pure oxygen instead of air. When using air to burn coal, the CO_2 concentration in the flue gas is about 15%. If N_2 is removed from the air, the CO_2 concentration increases to more than 90%.

Since flue gas is now composed of only CO_2 and H_2O, which can be easily removed by condensation, high purity CO_2 is easy to capture from this process, making it ideal for use as a working fluid in a supercritical CO_2 power cycle – and the low-cost of the electricity produced compensates for the air separation unit needed to extract the N_2.

The first utility scale power plants based on this Allam cycle are under construction in Permian region of Texas and will begin operation in 2027/2028 [Source: https://netpower.com/first-utility-scale-project].

If using coal with an air separation unit operating in front of a coal-fired power plant to separate O_2 from the air, the flue gases need to be further treated to separate SOx, NOx and other impurities, before the



Permanent onshore and offshore solutions for storing CO_2. [Source: IEA]

CO_2 processing unit removes the water by dehydration and the CO_2 is compressed for storage or transportation purposes.

Direct air capture (DAC)

Direct air capture (DAC) of CO_2 from the air is more energy intensive – and therefore more expensive – than capturing it from a point source. This is because CO_2 in the atmosphere is much more dilute than, for example, in the flue gas of a power station. One way to provide the DAC system with the energy it needs could be to combine it with a clean power generation system, such as solar or wind, but the intrinsic discontinuity of these power generation technologies could be a limiting factor.

At present. two start-ups possess the most promising technologies for DAC.

- Carbon Engineering is a Canadian company that uses a capture technology on an aqueous hydroxide liquid-solvent solution. The most common alkalis used are potassium hydroxide (KOH) and sodium hydroxide (NaOH). The KOH solution reacts with the CO_2 in the air contactor to form K_2CO_3 that is subsequently converted to solid $CaCO_3$. The calcium carbonate is then heated in a calciner to around 900 °C to release the captured CO_2 and the solvent is regenerated in a closed chemical loop. [Source: CarbonEngineering.com]
- Climeworks is a Swiss company that bases its capture technology on a solid sorbent filter. Air is drawn into the collector with a fan. Carbon dioxide is captured on the surface of a highly selective filter. Once the filter material is fully loaded with CO_2, the collector is closed. The filter material is then heated to approximately 100 °C to release the carbon dioxide. [Source: Climeworks.com]

Dozens of other companies are involved in researching DAC methods that can reduce the amount of energy required to support the process. Some of the most promising capture technologies include electro swing adsorption; zeolites; highly selective ion membranes; and metal organic frameworks (MOF).

A very promising solution to provide carbon-free energy to a DAC system consists of integrating three different systems together: BIGCC (biomass integrated gasification combined cycle); CCS (carbon capture and storage); and DAC. This combination that can be defined as BECCS (bio energy with carbon capture and storage).

The conversion of biomass into energy is considered carbon neutral because the CO_2 released during energy conversion has been previously absorbed from the atmosphere by the biomass thanks to the photosynthesis during the growing process. The CO_2 absorbed from the atmosphere during photosynthesis is simply released back. Together, therefore, these integrated systems can achieve compound negative emissions.

Biomass, such as wine lees, crop waste, livestock manure, municipal garden waste or kitchen waste, is converted into syngas by the gasification process. This syngas is moved to a combined cycle power plant to be combusted highly efficiently by gas turbines to produce electricity. The excess heat from the turbines and the gasification reaction is then captured, converted

Base material	SMAW	FCAW	SAW
P355NL2 or P355ML2	Bohler FOX EV 50	Diamondspark 53 RC	Union S3Si UV 418TT
P460NL2 or P460ML2	Bohler FOX EV 65	Diamondspark Ni1 RC-SR	Union S2NiMo1 UV 420TTR-C
SA537 Cl.2	Bohler FOX EV 65	Diamondspark Ni1 RC-SR	Union S2NiMo1 UV 420TTR-C
SA738 Gr.B	Bohler FOX EV 65	Diamondspark Ni2 RC[1]	Union S3NiMo1 UV 418TT

Table 1: Examples of vaBW filler materials typically used in the construction of cryogenic storage tanks for CO_2 storage. 1: only for as welded condition. Note: If PWHT has been requested, consult the vaBW Global Welding Technology team.

pipeRunner® is designed for pipeline and process piping girth welds for carbon steel to corrosion resistant alloy (CRA) materials.

into steam and sent to a steam turbine to produce additional electricity.

The carbon capture unit sequesters the carbon dioxide from the combustion of the syngas (post-combustion technology) and stores it for future transportation, use or permanent storage. Part of the electricity and heat produced by the BECCS unit can be used to drive a DAC unit that captures additional CO_2 from the atmosphere and transfers it to CO_2 storage.

This new concept power plant technology can produce energy and at the same time contribute to removing CO_2 from the air. In addition, it offers an important contribution to waste management.

Permanent storage and utilisation of CO_2

Once the CO_2 has been captured using one or more of the techniques described above, it can be stored permanently or used as raw material to produce other valuable products. In the IEA Net Zero Emissions by 2050 Scenario about 5.9 Gt of CO_2 will be captured and stored by 2050. This will require a considerable expansion of CO_2 storage capacities.

A typical option for permanent storage is to inject the captured CO_2 into a suitable geological reservoir where remains trapped. Suitable examples of geological reservoirs include depleted oil and gas fields, and saline formations.

The alternative to permanent storage is to use the captured CO_2 as a raw material for the manufacture of valuable products. The creation of a CO_2 value chain will help to expand the opportunities for the use of CO_2 and will make this new market financially viable and attractive.

Some potential utilisations are:

- Methanol production, for direct used as a liquid fuel for internal combustion engines and direct methanol fuel cells (DMFC).
- Methane production: Synthetic methane is a readily exportable fuel that is supported by existing infrastructure for storage, transport and use.
- Methanol synthesis via CO_2 hydrogenation: $CO + 3H_2 \rightarrow CH_3OH + H_2O$.
- Methanol synthesis via CO_2 hydrogenation using a specific catalyst: $CO_2 + 4H_2 \rightarrow CH_4 + 2H_2O$.
- Urea production via the reaction of carbon dioxide and ammonia. $2NH_3 + CO_2 \rightarrow NH_4 + NH_2COOH \rightarrow CO(NH_2)_2 + H_2O$
- Building materials production: CO_2 can be used in the production of building materials such as concrete for permanent sequestration.

Solutions from voestalpine Böhler Welding CO_2 storage and transportation

Captured carbon dioxide must be transported from the point of capture to the point of permanent storage or use. Intermediate storage vessels will sometimes be necessary, especially in the case of intermittent production/shipping. The two most relevant means of transportation are pipeline and maritime transport using large CO_2 carriers.

vaBW welding experience gained from the maritime transport of LNG is significant for developing CO_2 transport solutions.

Intermediate storage solutions

Immediately after liquefaction, the CO_2 must be stored in cylindrical tanks, spherical tanks or bullet type tanks. Operating temperatures vary according to the tank pressure design, with typical storage conditions being 6-7 bar at temperatures of -50 to -52 °C.

Base materials used for the welded construction of these tanks include boiler and pressure vessel steels such as 355NL2 or P355ML2; P460ML2 or P460NL2; SA537 Cl.2 and SA738 Gr.B.

voestalpine Grobblech and voestalpine Bohler Welding can offer different package solutions for plates and welding consumables for these vessels. Table 1 gives an example of filler materials typically used in the construction of storage tanks. This selection was made assuming a PWHT of 580 - 600°C for three hours.

For large volume pipelines, transporting CO_2 in dense and/or gaseous phases may be the preferred solution. The transportation of pure CO_2 (>99%) in dry or wet form and free of impurities is not a major problem. On the contrary, however, pipeline transportation of CO_2 captured from industrial emitters – pre-combustion, post-combustion or oxy-fuel methods – must take into account the presence of contaminants such as: N_2, O_2, H_2, CH_4, SOx, H_2S, NOx, CO, chlorides and H_2O.

No matter how low the concentration of these contaminants may be, even a few hundred ppm can lead to problems of phase stability and corrosion. The possible formation of dry ice must also be considered, which is why a high priority must be placed on low temperature toughness.

International standards such as ISO 27913 and DNV-RP-F104 can support the design of new pipelines. Depending on the corrosion risk assessment, the material selection may include carbon steel pipes such as API 5L X65 – X70, with internal CRA cladding or with a corrosion allowance.

voestalpine Grobblech and voestalpine Bohler Welding offer various solutions for pipeline plates and welding consumables, either for manual or mechanised welding processes. The wide range of electrodes – basic and cellulosic – solid and flux cored wires fulfil the welding requirements in various positions.

Most notably, pipeRunner® – the orbital welding system for FCAW – is designed for pipeline and process piping girth welds for carbon steel to corrosion resistant alloy (CRA) materials. Advantages of using this system include:

- pipeRunner® is designed for girth welding in the vertical up position with flux cored wires.
- Being one of the lightest systems on the

market makes it easy to handle.
- All the components are premium products designed in Germany.
- No need for site bevelling machines and internal clamps.
- Very easy to operate as the remote control has puts all the functions in the palm of the welder's hand.
- It is suitable for welding high strength pipeline steels, but also ideal for clad piping and high-alloy pipes.

Liquid CO_2-cargo vessel

Depending on the pressure and temperature conditions required for these vessels, suitable material can range from carbon steel with improved toughness properties to high-strength steels.

voestalpine Grobblech has launched two new steel grades for LCO_2 transportation that have been approved by all renowned classification societies.

- F550 TMCP Toughcore for medium pressure storage design.
- F460 TMCP Toughcore for low pressure storage design.

Nickel-based welding consumables meet the high toughness requirements for these vessels, while low-alloy solutions are under development.

Corrosion and material selection for CCUS

Typically, the CO_2 used for enhanced oil recovery (EOR) comes from a clean source, such as natural reservoirs, with well-controlled water content. For CCS, the CO_2 can originate from a variety of industrial sources and/or CCS-hubs, so it can therefore contain a mixed variety of impurities.

Complete removal of these impurities may not be cost-effective or technically feasible. Therefore, it is advisable to select materials that can withstand potentially unfavourable conditions at the extreme limits of the expected impurity and temperature levels.

Depending on the capture process and the origin on the CO_2 the environment may be more reducing or oxidising. For example, the CO_2 stream coming from a pre-combustion capture plant is likely to contain more H_2S, a reducing agent, while the CO_2 stream coming from post-combustion and oxycombustion is expected to be more oxidising in nature due to the presence of O_2, NO_2, and/or SO_2.

Considering that many planned projects are based on the CCS hub concept, the material selection must mitigate the corrosion risk posed by all the potential impurities and mechanisms. Water must be present

voestalpine Böhler Welding has solutions for CO_2 liquid cargo vessels applications. Photo: HB Hunte Engineering

for corrosion to occur. The CO_2 dissolves in the water and forms carbonic acid. SOx, NOx, H_2S, and other contaminants can also react with each other to form strong acids, including nitric acid (HNO_3) and sulfuric acid (H_2SO_4), and possibly, elemental sulphur.

The low pH of the condensed water can also lead to the depassivation of corrosion-resistant alloys, resulting in localised corrosion and stress corrosion cracking. Oxygen, H_2S and chlorides are also triggers for SCC. When selecting materials, it is important not to forget what has been learned in the processes of the oil and gas industry and the performance of materials in flue gas desulphurisation plants and in amine treatment units.

We can analyse the following components for the CO_2 capture process:

Scrubbers and dehydration include all the necessary treatment processes to remove most of the impurities and water before CO_2 capture takes place. These are associated with corrosion risks from impurities such as: N_2, O_2, H_2, CH_4, SOx, H_2S, NOx, CO, chlorides in the presence of H_2O. The possible material selection includes carbon steel or low-alloy materials clad with CRA such as 22Cr, 25r, Ni-base alloy or solid-wall parts made of stainless steel.

Absorber Vessel & CO_2 stripper/desorbers present corrosion risks from amine/oxygen interaction, glycol and residual impurities. The possible material selection includes carbon steel or low-alloy materials clad with a CRA such as 316L, 904L, 6Mo grades and Ni-based alloys.

Materials for high corrosion risk process piping includes 316L, 22Cr, 25Cr and Ni-based alloys, while for low corrosion, carbon steels with an adequate corrosion allowance be acceptable.

Compressors may also need to use carbon steel/low-alloy steel with corrosion resistant cladding to cover condition when condensation may occur.

The AMPP Guide 21532 ed. 2023 "Guideline for Materials Selection and Corrosion Control for CO_2 Transport and Injection proposes upper concentration limits for several impurities in the CO_2 stream. voestalpine Böhler Welding can offer a complete range of filler materials for welding and cladding, including stainless and Ni-based material.

In addition, voestalpine Grobblech offers a wide range of roll-bonded clad plates with excellent corrosion resistance, which offer an intelligent and cost-effective alternative to solid stainless steel. This very efficient solution has been successfully used for decades in oil and gas plants as well as in food grade facilities. These clad plates are particularly suitable for the construction of absorbers and strippers for amine scrubbers.

Conclusion

The goal of decarbonisation can only be achieved through a mix of current and future technological possibilities. Without the successful implementation of CCUS, achieving this goal is difficult to imagine. What is special about this group of technologies is that they are applicable to both existing industrial plants and future constructions.

As a provider of Welding Solutions, voestalpine Bohler Welding will once again be alongside our customers to help them build the infrastructure necessary for this energy transition.

www.voestalpine.com/welding

Voestalpine Bohler Welding contact
Enrico Zuin:
enrico.zuin@voestalpine.com
Herbert Abbott:
herbert.abbott@voestalpine.com
Nazmi Adams:
nazmi.adams@voestalpine.com

Scan the QR code opposite to view the original white paper and references:

Polysoude: the Rolls-Royce of orbital welding

African Fusion **talks to Renttech Product manager, Johan Bester, and the company's specialist application engineer for orbital welding, Melvin Gibbs, about the Polysoude orbital TIG welding range, the modern automation benchmark for consistency and control in high integrity tube-to-tube, tube-to-tubesheet and pipe welding applications.**

Specialist application engineer for orbital welding, Melvin Gibbs, develops a Polysoude orbital welding solutions in Renttech's Application Centre in Wadeville.

"As part of our drive to bring the latest welding technologies to the Southern African market, we have partnered with Polysoude to offer high quality pipe and tube welding solutions with the necessary infrastructure to support specialised customer projects. Melvin Gibbs has been appointed as the custodian of this product range within the Renttech organisation. With over 20 years of physical welding experience as a contractor using this equipment, Gibbs has a wealth of knowledge on the applications best suited for this equipment," begins Renttech Product manager, Johan Bester.

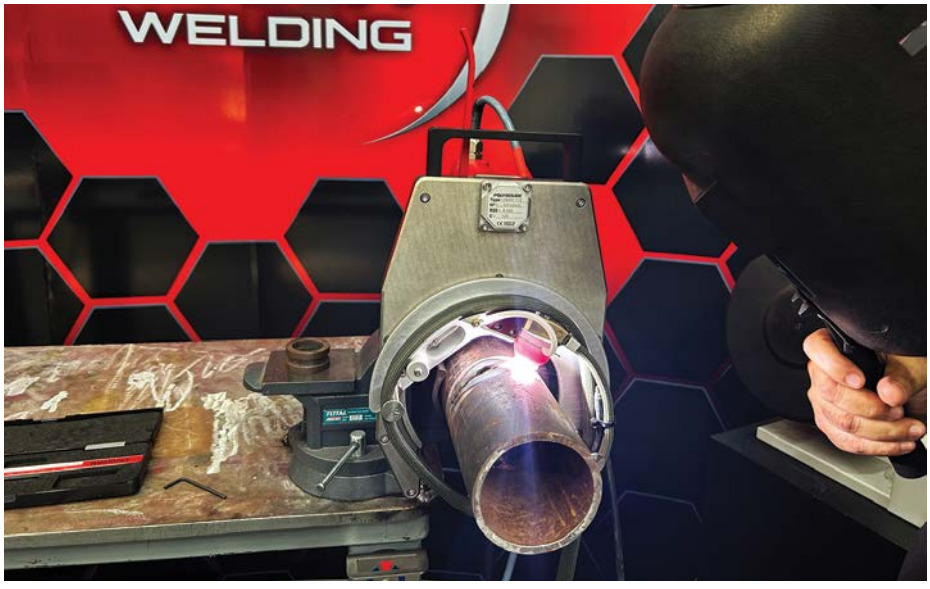
Describing orbital welding, Gibbs says it is an automatic and preprogrammed welding solution that involves mounting a rotating TIG welding torch around a stationary workpiece. "Basically, the TIG arc is set to do a 360°orbit around the joint, at an optimised and preprogrammed speed, and with ideal welding parameters saved and locked into a program. This enables perfect repeatability from joint to joint, across the various sectors of rotation, because the orbital system takes absolute control of all the welding parameters required to deliver that perfectly flat and smooth inside seam," he explains.

Ideal for high integrity tubing

Factories producing high purity pharmaceutical ingredients such as vaccines and medicines must ensure that the inside surface of every connecting tube is perfectly flush and smooth. "This is essential to avoid bacterial growth on the inside surface of a tube, which will inevitably occur wherever a burr or any surface roughness provides an anchor for organisms to latch onto and grow.

"This also true for the food and beverage industry. Renttech was recently invited to demonstrate these solutions at the Food science department of the University of Stellenbosch, speaking to the specific welding needs and pitfalls for this industry," Gibbs tells *AF*.

Other applications include automotive paint plants, where the piping must have perfectly smooth root seams for a different reason: "Every time a painting booth changes colour, every single droplet of the previous colour must be flushed out so that it does not taint the new colour. This is an area that is often dominated by European contractors, but it can be done by South African companies if they have the right equipment and technical support.



Orbital welding is an automatic and preprogrammed welding solution that involves mounting a rotating TIG welding torch around a stationary workpiece.

"The processing of human blood for the medical industry is another area where manual welding is not permitted, as well as some nuclear applications. It is in critical applications like these that orbital welding comes into its own," Gibbs tells *AF*.

For the tubes used by plants such as these, an orbital head with a closed chamber containing the shielding gas is typically used. "The wall thickness of the tube is typically 1.5 to 2.0 mm, and we can offer closed-chamber systems for welding tube diameters of between 6.0 mm and 115 mm.

"High currents are not often needed for these applications, particularly when welding stainless steels, because the heat input needs to be tightly controlled to prevent depleting the nickel content and destroying the corrosion properties offered by these materials. Having a welding program specifically set for the ideal heat input is a great value-add for fabricators of stainless-steel tubing, because it offers much better control of the heat, penetration and root bead consistency," he says.

Achieving a perfect root seam inside a stainless tube also requires the inside of the tube to be purged with an inert gas such as argon to prevent oxidation around the heat affected zone. "We are the distributor for Huntingdon Fusion Techniques (HFT), which specialises in purging and oxygen

monitoring systems," he adds.

Another area that is critical to the success of the orbital weld is the quality of the weld preparation. "Here we have partnered with PROTEM as they have a vast array of prepping and cutting solutions that cover challenging automated as well as manual welding tasks. Joint preparation as well as fit-up, is a critical step that cannot be ignored as it is often the difference between success and failure," notes Gibbs.

Open welding heads for thicker pipe

On the power side, for manufacturers of OEM package boilers, heat exchangers and pre-fabrication pipework components, fabricators may need to do over thousands of tube-to-tube butt welds – in a workshop at ground level. "In these high volume, well controlled environments, we can really see orbital welding shine," continues Gibbs.

Where the tubes have thicker walls with larger diameters, Polysoude offers open welding heads, which travel around a ring clamped onto the pipe. "These are available for diameters from 8.0 mm to 275 mm (10-inch). Wire feeding is available for the fill and capping runs where multiple passes are required to complete the joint; and advanced features such pulse and double pulse TIG are part and parcel of the offering," says Gibbs.

In addition, he says Polysoude offers a full tube-to-tube-sheet portfolio for use on heat exchangers.

Technology that makes a difference

"There is this international perception that these advanced solutions take away jobs; cause strained relationships with labour; and that they are difficult to implement. For us it is very important to close that loop, so that both the operator on the shop floor, company owners, and their clients are part of the solution," Gibbs continues.

Everyone involved needs to understand the value and see the progress that these systems can deliver. These technologies also open up markets both locally as well as abroad, ensuring local fabricators can diversify their customer base across various sectors and economies, whilst growing the South African manufacturing offering. "Just think about the oil and gas in neighbouring countries such as Angola and Nigeria, Tanzania, Mozambique, and Namibia to name but a few. Most of these countries are currently serviced by non-South African firms when it comes to orbital solutions," he points out.

Renttech is putting the right systems and infrastructure in place to support Polysoude orbital systems, so that South African fabricators are able to successfully use the equipment. "The South African market tends to look for European assistance when having to use technologies such as these, but we now have the infrastructure to offer a complete range of Polysoude solutions, including procedure development, training, technical support, and after sales services from our applications centre in Wadeville – and through our 12 branches across South Africa.

"Renttech and our customers also have full access to the Polysoude group of technical engineers as well as welding specialists based in Nantes France for establishing a best solution for an application," Gibbs assures.

"While it is easy to imagine the advantages of orbital welding, the feasibility of using the technology is also vital. People who have never used it before do not know the limitations or the full capabilities of orbital welding," he continues. "We have that experience in-house, so it is very easy to zero in on areas of concern and/or exciting application possibilities. Advanced technology is expensive, so those who buy into it need to clearly understand where it is feasible and where is not," he adds.

Application development steps

Johan Bester goes on to outline the steps involved in developing and proving an orbital welding solution: "The first step is for us to have a look at the application to prove that the product can be successfully welded using a Polysoude orbital system. If it is, then we can organise a demonstration, either in our applications centre or at a client site depending on the complexity of the project. If the application is outside our area of expertise, we get the relevant specialists at Polysoude involved.

Factories producing high purity ingredients must ensure that the inside surface of every connecting tube is perfectly flush and smooth.

"After that, we need to involve the operator, which is not necessarily the buyer of the equipment, to become familiar and comfortable. If this is successful, we will do specific application development, putting together formal qualification requirements (PQRs) and welding procedures (WPSs) for the specific tasks the equipment will be doing.

"We then follow through with after sales support: supporting the users in applying the technology during the first few weeks of operation – and we will continue to pop in until we are sure the client is self-sufficient. Over time, consumables and spare parts are likely to be needed and, if something does go wrong, it is important for us to respond quickly to address the problem so that production can be resumed without delay.

"Once people become comfortable with the technology, they are likely to recognise new orbital welding applications," continues Gibbs. "And because of the versatile modular approach adopted by Polysoude, it is easy to modify an existing system, perhaps with different orbital heads, so that it can be used for the next project, and the next," he says, adding: "Several customers have installed additional systems because they realised where orbital welding can add value and have therefore taken on more of this type of work.

"Polysoude is without a doubt the global leader in orbital welding solutions, and we are proud to be able to bring this product range to South Africa and to localise this state-of-the-art technology for the benefits of our customers and the industries we serve.

"This is an exciting product range with a lot of suitable applications in the Southern African market," concludes Melvin Gibbs.

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APOLLO

ULTRA MIG 350A SERIES 500A

CONFORMS EN ISO 60974 CONFORMS

THERMAMAX FLAGSHIP RANGE

The Thermamax APOLLO ULTRA MIG Series features two heavy-duty synergic welding inverters in a 350A and a 500A version. Their **synergic capabilities** enable the Ultra MIG to carry out high-precision welding by detaching identical molten wire droplets using unit current pulses. The size of these droplets, along with other welding parameters, can be pre-set using the multi-functional digital display. These powerful and advanced machines are TÜV certified, and conform to the IEC60974 International safety standard.

SPECIFICATIONS

	Model	Ultra MIG 350A	Ultra MIG 500A
Input	input power	3~AC380 +/-15% 50Hz	
	Rated input capacity(KVA)	15.6	26.7
	Power factor	0.88	0.88
Output	Rated no-load voltage	DC75V	DC80V
	Rated max output	350A/34V	500A/40V
	Welding voltage range	10-40V	15.5-50V
	Welding current range	MMA:30-350A MIG/MAG:60-350A	MMA:30-500A MIG/MAG:60-500A
	Wire feeding speed range	2-22m/min	2-22m/min
	Output features	MMA-CC MIG/MAG:CV	
Working Temp. Range		-10~+40℃	
Storage Temp. Range		-25~+55℃	
Protection Class		IP23	
Cooling way		Air cooling	
Rated duty cycle(40℃)		65%	50%
Efficiency		85%	
Insulation Class		F	
Size(L*W*H)(mm)		625*386*575	625*336*670
Weight		45KG	53KG

INCLUDES:

- Trafimet MEGA 4 MIG Torch
- Wire Feeder
- Earth Cable
- Interconnecting Cable
- Trolley
- Flowmeter
- Auto-darkening helmet





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Modern shielding gases and mixtures for fabrication

Air Products welding specialist, Sean Young, outlines the extended range of welding, cutting and purging gases available to the welding and metal fabrication industries to better meet niche fabrication needs.

Gases and gas mixtures have several vital role to play in the metal fabrication industry. They are at the heart of all of the gas shielded welding process: GMAW/MIG/MAG, GTAW/TIG and shielded FCAW, for example. In fact, self-shielded flux-cored wires and even stick electrodes and submerged-arc welding fluxes are designed to produce CO_2 gas to shield the hot weld metal from oxidation while welding.

Flame, plasma and laser cutting processes all depend on gases, be they fuel gases for oxy-fuel cutting; compressed air, oxygen and/or nitrogen for plasma cutting; and either pure oxygen and/or pure nitrogen for laser cutting, depending on the cut quality required.

As a gas specialist, Air Products manufactures and distributes a very wide range of standard and custom-designed gas mixtures to improve the performance of fabrication processes, with some of the less common mixes offering significant advantages in terms of finished quality for niche applications.

Argon: the go gas for shielding

Wherever a welded material or process requires oxygen to be completely excluded, such as when using the GTAW/TIG welding process, which must exclude oxygen to protect the tungsten electrode and the weld metal; or using GMAW or GTAW for non-ferrous materials that oxidise easily, including aluminium, copper, magnesium or titanium, then pure argon gas is usually the first choice. It is the least expensive of the inert gases and forms an excellent shield to keep air/oxygen away from solidifying metal.

Many argon-based mixtures are now available, however, to give fabricators the best possible weld performance and quality. Standard mixtures containing argon with small additions of carbon dioxide and/or oxygen are commonly used for GMAW of steels, for example. And for stainless steel welding, smaller percentages of 2.0% CO_2 or less in argon is used to stabilise the arc and improve penetration.

Hydrogen and nitrogen gas can also be used in small percentages for some materials. Hydrogen, when added to an argon shielding gas, delivers deeper penetration and faster welding speeds, particularly when welding stainless steel or nickel alloys. It acts as a 'heat booster' by increasing the arc energy and the molten metal volume of the weld pool. This can deliver better penetration: but it must be used wisely, as excessive hydrogen can lead to porosity and cracking in certain metals, most notably carbon steels.

Nitrogen mixed into an argon shielding gas mix can also be beneficial for welding some stainless steels. The nitrogen enhances the weld metal's strength and corrosion resistance, while also improving weld penetration. Nitrogen, dissolves into the weld pool and, on solidifying, it forms a solid solution that strengthens the austenite phase of the stainless material. It is a particularly beneficial gas for duplex stainless steels, where nitrogen also helps to prevent pitting corrosion.

Again, its use and percentage composition needs to be carefully managed, however, to avoid issues such as porosity.

Helium a hotter gas for niche applications

As a world-leading helium producer and supplier, Air Products has a diverse array of helium sources and a strong global supply network, offering safe and reliable supply to meet the increasing demand around the world.

While globally in short supply, helium gas is used in many industries, including space exploration, medicine, manufacturing, and scientific research. In the welding industry, helium is used as an alternative for argon to create an inert gas shield during arc welding.

Helium generates a hotter arc compared to argon, which can allow for faster welding speeds and better penetration when welding non-ferrous materials such as aluminium, copper, magnesium, and titanium. While it can be used as a pure gas, it is often mixed with argon to improve arc instability and reduce costs.

Compared to argon, helium has better thermal conductivity, which results in a broader and shallower penetration pattern in welds, along with improved wetting on the side walls of a joint. The gas tends to be favoured when working with very thick non-ferrous metals that conduct heat easily and require higher heat input for deeper penetration and/or faster welding speeds.

For the same reasons, helium and argon-helium mixture can also the gas choice for specialized GTAW welding applications.

With the ongoing global helium shortage, however, the welding industry faces challenges in growing the market for this gas.

Essential working habits

No matter what shielding gas is chosen for a welding and cutting, its effectiveness will be compromised by any contamination. The presence of moisture, oils or any other potential contaminants on or near the welding surfaces can introduce unwanted hydrogen, carbon, oxygen and other gases into the weld pool.

Inadequate shielding gas flow, leaking gas connections and partially blocked gas shrouds can disrupt any gas shield during welding, allowing atmospheric oxygen, nitrogen and hydrogen – from the atmosphere and/or from water vapour in the air – to contaminate the weld.

In addition, the welding parameters need to be optimised, since incorrect welding parameters, such as excessive heat input, can increase gas absorption into the weld metal creating porosity.

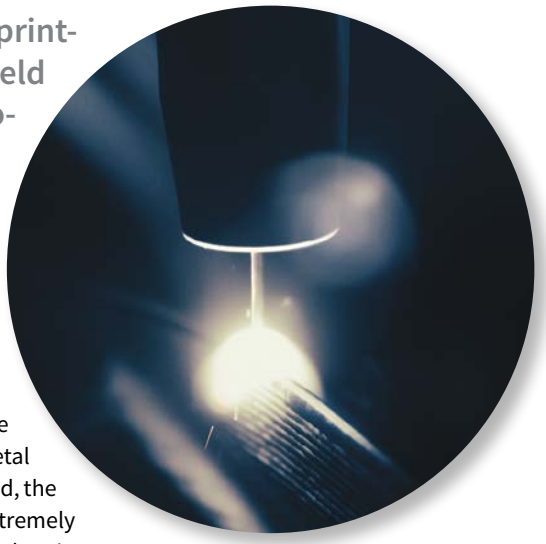
Welding surfaces and equipment should always be thoroughly clean and dry before welding. Then, if using the most appropriate recommended shielding gas for the material being welded, you can be sure of clean high-quality welds.

The use of exotic gases and gas mixtures can be expensive, but poor or inconsistent quality will usually far outweigh the additional cost of using a purpose designed gas mix. "It is always worth considering and testing the best possible gas for the task at hand, no matter what the cost is. That way you can be sure that your eventual choice is the most suitable one, in terms of the end quality of the fabricated product and the total costs or that weld," concludes Sean Young.

https://airproducts.co.za

CMT Additive Pro enhances Fronius' additive manufacturing capability

Wire-based additive manufacturing is an arc-based 3D printing method that builds-up a component in layers of weld metal, allowing for a high degree of flexibility in component geometry. The new CMT Pro Additive from Fronius fulfils the key quality requirements of components produced using this additive process.



The reversible wire electrode used in the CMT welding process promotes precise spatter free droplet detachment. Short circuit times are therefore prolonged, which reduces the heat input, creating a 'cold 'but very stable welding process.

Additive production methods, also known as 3D printing, generate components by building up material layer by layer. Wire-based additive manufacturing, which is based on the arc welding process, produces metal parts using this layer by layer process, with the layers formed by melting a wire with a welding arc.

This generative manufacturing method is particularly advantageous when complex component geometries have to be produced, as the design options are virtually limitless. Parts can be manufactured at low cost and extremely quickly, which makes this process a very attractive option for prototype construction and/or small production batches. Comparative processing time, tool wear and material loss for conventional machining processes – especially if milling out a workpiece from a solid metal block – are all significantly higher.

What is additive manufacturing?

There are a number of generative production methods for metal components. Essentially these can be divided into two fundamental types: powder-based processes and wire-based processes.

In powder-based processes, the layers are built up using molten metal powder. The most common method, the powder bed process, produces extremely precise results, but is somewhat slow in production. Wire-based processes, on the other hand, build up the component by melting a wire-shaped filler metal, requiring the use of a laser, electron beam or arc. These processes have high deposition rates and therefore help to cut production times.

Fronius' wire-based additive manufacturing solution uses the gas metal arc welding (GMAW) process and offers high deposition rates – up to four kg/h with steel materials, with multi-wire solutions potentially giving rise to even higher deposition rates. In addition, using GMAW and wire offers a number of other advantages: equipment and material costs are minimal – all that is needed is a suitable welding system – and there are no requirements for costly peripheral equipment, such as the vacuum chambers needed for the electron beam processing.

In comparison to powder-based processes, wire additive manufacturing also benefits from the immediate availability of a range of certified wire types. Since the use of metal powder is a relatively new technology, there are relatively few powder-based materials to choose from, as it can take years to acquire the necessary certification and to produce data sheets,

The Fronius CMT Additive Pro makes wire-based additive manufacturing a flexible alternative for conventional metal component production.

'Cold' CMT welding for strong layers

A stable welding process and effective heat dissipation are essential for large-scale 3D-metal printing. The welding process needs to deliver sufficiently low heat input so that when a new layer is applied, the existing layers does not remelt. In other words, the process needs to be as 'cold' as possible. Furthermore, the weld layers need to be continuous, spatter-free, and consistent. If any flaws were to occur, these would be replicated in each subsequent layer.

The CMT GMAW process from Fronius and its process control variants meet these requirements. They produce a stable arc and a controlled short circuit with prolonged short circuit times. This means that the heat input is lower, and the material transfer is practically spatter-free, which helps to prevent flaws.

Two process control variants of CMT

With wire-based additive manufacturing, components are welded layer by layer to near right size geometry before being mechanically machined and polished.

are particularly well suited to metal printing using wire. One is the CMT additive process characteristic, which has been optimised for large-scale 3D-metal printing. It achieves high deposition rates while transferring very little heat into the component.

The new CMT Cycle Step variant reduces the arc power even further by producing a series of spot welds, with the exact number of droplets deposited per spot as well as the pause time between spots being precisely controlled. Deposition spots of any size can be produced and precisely reproduced, offering a new level of energy control to the process. This particularly 'cold' process, however, does need more time to build up the layers, as the deposition rate is lower.

Real applications

Countless additive manufacturing components have already been produced using CMT welding technology from Fronius in a variety of sectors. These include fan impellers for the electronics industry, which are made from high-grade materials. Milling the workpiece is very expensive due to the high rate of material consumption, while casting is not always able to meet the critical metallurgical properties required for walls just 1.5 mm thick. With wire-based additive manufacturing using the CMT Cycle Step innovation, these fan impeller blades can be produced from a nickel-based alloy using the additive approach. It is even possible to repair components using this additive manufacturing technique.

Fronius has also implemented a solution with a partner in the aviation sector. Titanium is a frequently used material in aircraft construction, thanks to its tensile strength, resilience, corrosion resistance and low weight. A majority of titanium components are manufactured using subtractive methods, however, whereby up to 90% of the material is milled away. This causes high costs, long machining times, and costly tool wear.

CMT welding solutions can be adopted with ease, making wire-based additive manufacturing a much more accessible alternative to metal machining.

Titanium components produced using wire-based additive manufacturing, on the other hand, only need machining to produce a polished surface. The components produced using CMT do not exhibit any signs of lack of fusion and have impressive metallurgical properties. Tool costs, machining times, and wear can be reduced, bringing overall machining costs down significantly.

Key factors determining the quality of a component produced using wire-based additive manufacturing include arc stability of the welding process and low heat input. Fronius' CMT process fulfils these requirements.

The new Fronius CMT Additive Pro

Successful metal additive manufacturing is associated with a set of specific challenges, which include achieving the target geometry; adequate material properties; heat dissipation and distortion; process stability and feedback. The new CMT Additive Pro from Fronius includes some very specific features help to overcome these challenges.

- Firstly it includes a new deposition rate stabiliser. This enables the wire feed speed to remain almost constant throughout the process, allowing the exactly required build up to be maintained despite varying external influences.
- A Power correction feature now enables the wire feed speed and power to be varied independently of each other. This allows the reinforcement to be reduced for improved layer height consistency at connecting points. It improves control of the weld seam flow at the and enables the energy input to be reduced as interpass temperatures increase.
- CTWD measurement: This is an additional sensor signal for manipulator control and position correction. It enables the contact tip to workpiece distance (CTWD) to be varied while welding to maintain the correct balance between resistance heating and arc heating.
- Pulsed HotStart: Like the hot start function in TIG welding, this function uses synergic pulsed arc welding at the start to guarantee sufficient penetration and adhesion: without adjusting the operating point and while keeping the layer height almost constant in the weld-start area.

"The new features of the Fronius CMT Additive Pro make wire additive manufacturing an even more cost-effective and flexible alternative for component production. All the new additive manufacturing features are available on the iWave AC/DC Multiprocess Pro with the CMT welding package and the new additive manufacturing (AM) interface," says Edric van der Walt of Fronius South Africa.

"The CMT welding solution can be adopted with ease, making additive manufacturing a much more accessible alternative to metal machining," he concludes.

www.fronius.com

D&L and Yaskawa collaborate to deliver world-class solutions

Gavin Walter, director of D&L Engineering Solutions, and Rudi von Fintel, branch manager for Yaskawa Southern Africa's Durban branch, talk about their collaboration and the delivery of state-of-the-art robotic welding solutions for South Africa's automotive industry.

D&L Engineering Solutions is a Durban based family business run by Gavin Walter and his brother-in-law, Dirk van der Merwe. Founded in 1993 as a small engineering facility doing breakdown support in the FMCG market in the Durban area, the company has grown into a turnkey engineering and robotic solutions provider.

"On the FMCG side, we have the likes of Unilever, Tiger Brands and Pioneer as key longstanding clients and we have grown into also supporting local Tier 1 automotive suppliers with tooling and robotic automation solutions," says D&L Engineering's Gavin Walter. "From our engineering facility we design machines and reverse engineer components; we then do CNC and conventional machining, and a large portion our work is fabrication and welding of steel, stainless steel and aluminium components.

"In addition, for Tier 1 local distributors of automotive tools and machinery such as L&J Tools, we design and manufacture bespoke tooling and robotic welding cells for local automotive OEMs," he tells *AF*.

On the collaboration with Yaskawa, he says that goes back to 1991 when Gavin Walter was working for Toyota South Africa. "Terry Rosenberg and I go back a very long way. I did my apprenticeship at Toyota in electronic engineering and started dealing with Terry on the installation of Motoman robots.

"I met Rudi in 2002 when I joined a company called Design Group, a company that builds full body shop production lines for the automotive industry. When we started working there, there were about 30 people. Today, they have over 600 employees doing work all over the world," he says.

"I saw the need for a smaller line builder in the Durban area, so I joined D&L. Rudi joined Motoman as the Durban branch manager, so about four years ago we started collaborating. Our first enquiry came on a Friday from L&J Tools, an urgent request for a MIG/MAG welding robot because the installed one could not keep up with their customer's demands. So, I contacted Rudi and asked him if he had a MIG welding robot to spare, and he pulled a new one out of his training cell. By the following Friday, L&J were running successfully with that robot on their production line. That is where our relationship kicked off and we have since done numerous projects together," he adds.

Giving Yaskawa's perspective, Rudi von Fintel says that arc welding robots have been the bread and butter for Yaskawa in South African for many years. "We've installed hundreds into the local automotive industry. The Toyota chassis plant, alone, has roughly 300 arc welding robots installed," he says, adding that Yaskawa can fully integrate its welding robots with power sources from any OEM, including Fronius and OTC, to give customers the solution that best meets their needs.

Five or six years ago, Yaskawa started to specialise in spot welding equipment as well. "Spot welding guns have changed from being pneumatically driven to using a servo drive system, which makes them easier to integrate with our robot controllers. This enables far more accurate control and synchronisation of the key parameters: the contact pressure, current, arc time and hold time," he explains.

"Yaskawa's servo-driven spot welding actuators are mounted onto the end of the robot arm, and they fully integrate into the robot as a seventh control axis. This allows all aspects of a spot welding sequence to be optimised and synchronise from the Yaskawa robot controller," von Fintel explains.

Yaskawa's new robotic spot welding solution is far easier to implement as it offers a one-stop solution. Cycle time can be reduced drastically, because the opening angles of the gun can be synchronously manipulated while the robot is moving between spots.

A manufacturing line for safety critical automotive components

The latest collaboration project between D&L Engineering Solutions and Yaskawa Southern Africa is a component production line for the assembly of a safety critical component for an OEM brand associated with very high quality and toughness.

"We are currently building a line for L&G Tools for a multi-stage welded assembly process, which starts with some manual spot welding of brackets onto C-channel sections. From there, the component travels through a robot arc welding cell; and then a robotic spot welding cell; before a final component is added manually at the end of the line.

"So, it's a whole production line facility for a safety critical component," Gavin Walter explains, before unpacking the line in more detail.

For all the robotic spot welding, Yaskawa

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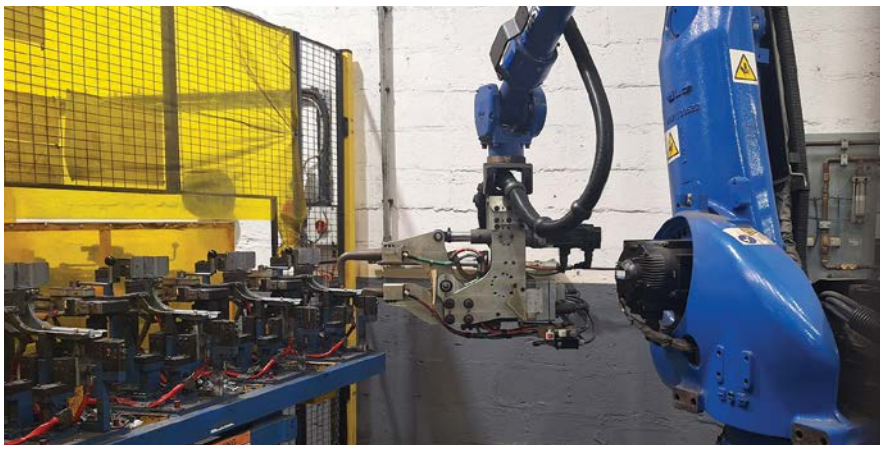

Yaskawa's servo-driven spot welding actuators are mounted onto the end of the robot arm, and they fully integrate into the robot as a seventh control axis.

servo technology is being used, although a mixture of manual and robotic spot welding is used to make good use of labour and to reduce the total automation costs. "We are good at customising our solutions to meet South African circumstances. And it often makes sense to have an operator doing a couple of simple spots, particularly for non-safety-critical welds," he adds.

Once the brackets have been added at the start, the C-channels get loaded onto the turntable of the robotic arc welding cell. "The operators do this while the component is being welded on the other side of the cell. As soon as welding is completed, the cell rotates the new component in for welding, while the now welded component is removed and a new one loaded. "This station has to do 52 arc welds, each 50 mm long," he informs *AF*.

From there, the component is loaded into one of Yaskawa's robotic spot welding cells, which also uses a turntable for simultaneous welding and loading: the operator loads the channel and the additional components so that, as soon as a part is completed, a new one can be rotated into place and welded without delay. "There are 30-odd spot welds that need to be done by each robot at this station, and there are two robots in this spot welding cell," he adds.

"Finally, one more part is welded on manually, although we are now looking at automating this last part as well, depending on the productivity improvements we can achieve compared to the additional cost implications," says Gavin Walter.

"Successful manufacturing of safety-critical automotive parts depends on the quality and consistency of the welding. Robotic welding delivers repeatability. It does the same thing every time, so it tends to be worth the cost of investing in robots for any safety-critical component line," notes Rudi von Fintel.

We have been working really closely together for the last four years and we have become quite dependent on each other "Our clients have realised this as well. If they want to use Yaskawa robot solutions, then D&L are going to be able to do the tooling, jigging and the process studies: and vice versa: for a robotic production line, we are going to use Yaskawa's equipment.

"We have created a reputation for ourselves as team that can deliver very effective solutions," he concludes.

www.yaskawa.za.com

AWC offers a complete range of gases, welding solutions, safety solutions and related consumables to cover every aspect of your gas and welding needs. Providing quality service and products you can trust is at the centre of what we do.

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B.E.D. announces surface engineering win

Bolt And Engineering Distributors (B.E.D.), a leading supplier of engineering products and services, proudly announces a significant B.E.D. CMT win with a surface engineering customer, one of South Africa's leading providers of thermal spraying and coating technology.

A collaboration that underscores B.E.D.'s dedication to providing top-quality welding solutions and exceptional customer service, began a year ago when one of the customer's team members was introduced to Kevin Jenkins, the newly appointed B.E.D. Area Sales Manager (ASM) for the Vaal region. The customer – already acquainted with the high standards of Fronius's welding machines – had a unit which required service and calibration.

Leveraging its expertise as a longstanding and experienced Fronius distributor, B.E.D. efficiently managed the repair process, returning the machine to optimal performance. This success was pivotal in building trust and demonstrating B.E.D.'s capability to meet the customer's high expectations.

"We are very pleased to announce our collaboration with this valued customer! This is a testament to B.E.D.'s unwavering commitment to quality and customer satisfaction – and to the excellence of our supplier Fronius's welding equipment and solutions," says Mike Giltrow, CEO of B.E.D.

Fronius's modern CMT welding process can be tailored for surface engineering using many special alloys.

Addressing customer requirements

Following the repair and return of their welding machine, the customer encountered an operational issue regarding the selection of the correct settings for a specific welding application. Demonstrating dedication to customer satisfaction, a specialist from B.E.D.'s welding division accompanied the ASM to the customer's site. The hands-on support and training provided speedily resolved the issue, again showcasing B.E.D.'s commitment to ensuring optimal operational performance for its customers.

Recognising the need to remain competitive in the market, the customer then expressed interest in the Fronius TPS400i Cold Metal Transfer (CMT) machine, driven by their requirement to offer advanced welding processes to their clients. B.E.D.'s welding specialist provided comprehensive insights into the CMT machine, initiating the quotation and purchasing process.

Expertise and confidence

"The customer's expertise in surface engineering, and the variety of welding processes required for this – including, for example, their familiarity with the cold metal transfer welding process – combined with their confidence in B.E.D. and in the Fronius brand – played a crucial role in their decision-making process," Jenkins explains.

He adds that throughout the discussions, B.E.D.'s welding division's extensive industry knowledge was very evident: "Our welding team addressed all the technical queries raised by the customer, providing detailed explanations on materials, machine capabilities and optimal welding settings. This technical support was instrumental in securing the order of the new CMT machine."

B.E.D.'s welding division's in-depth technical experience and understanding of Fronius's products and solutions assured the customer of the quality and reliability of their purchase.

The promise of ongoing support and backup service, along with training for the machine operator post-commissioning, further reinforced the customer's confidence in their decision. "In addition, our welding division team ensured that all potential issues were promptly addressed, providing robust operational support to the customer," Jenkins advises.

Successful implementation

Upon delivery and commissioning of the CMT machine, B.E.D. also conducted thorough training sessions, ensuring that the customer's welding team was well-versed in the use of the new equipment.

"This guaranteed that the customer could maximise the machine's capabilities from the outset. Since automating their CMT process, the customer has reported outstanding results, reaffirming their satisfaction with Fronius's welding technology - and the sterling support received from B.E.D.," Jenkins enthuses.

"Our collaboration with this market-leading customer exemplifies the synergy between our technical expertise and their commitment to excellence. By providing comprehensive support and high-quality solutions, we have strengthened their operations and affirmed our dedication to customer satisfaction. B.E.D. is proud to have facilitated this customer's enhancement of their welding processes, enabling them to maintain a competitive edge in their market. Our collaboration exemplifies B.E.D.'s ongoing commitment to delivering high-quality engineering solutions and fostering strong, supportive relationships with our customers," Mike Giltrow concludes.

https://bolteng.co.za

Unique Welding's Impact in SA and beyond

South Africa's largest independent distributor of gas and welding products, Unique Welding has grown exponentially since its inception, not only through sheer scale but also through innovation and quality. Director, Gaetano Perillo, highlights the company's achievements.

With 14 branches and an expansive network of independent distributors across South Africa, Unique Welding is now a key player in the country's welding industry, pushing boundaries in ways that have a profound impact on businesses, industries and communities alike. "In the competitive world of welding and gas distribution, few companies have managed to carve out such a commanding position as Unique Welding," suggests Gaetano Perillo, the company's Director.

At its core, Unique Welding is a fully integrated solutions provider, delivering a comprehensive suite of products and services that cater to the diverse needs of its customers. From the automotive sector to mining, construction, manufacturing, energy, and beyond, the company has positioned itself as an indispensable partner for businesses in a variety of industries that rely on welding and gas technologies to thrive. "What sets us apart, though, is not just the scale of our operations but the innovative solutions and specialised services we offer," says Perillo.

At its core, Unique Welding is a fully integrated solutions provider.

Unique Welding does not simply supply products—its mission is to offer customised welding and gas solutions tailored to meet the specific needs of each client. With an understanding that no two businesses are alike, the company focuses on providing flexible, efficient, and cost-effective solutions, reducing operational costs for its clients and helping them boost productivity. "Whether through bespoke welding machines, consumables, equipment, or gas, Unique Welding ensures that its clients have access to cutting-edge technology and world-class service at every turn," Perillo adds.

One of the key reasons Unique Welding has gained such a loyal customer base is its unwavering commitment to delivering high-quality products and services. The company works closely with a select group of leading global manufacturers to create its own brand of welding machines and equipment. The Thermamax range, a flagship offering from Unique Welding, is a testament to this dedication to excellence. These products stand at the forefront of the welding industry, celebrated for their advanced technology, durability, and exceptional performance.

The Thermamax range includes a variety of products tailored for different welding applications. From MIG, TIG, and MMA welding machines to plasma cutting and gas cutting equipment, the Thermamax brand has set a new standard in the South African welding industry. In addition to premium welding machines, the range also comprises high-quality consumables and welding accessories, all designed to ensure seamless operation and to deliver superior results.

What makes the Thermamax brand stand out is its unmatched value. The brand represents a balance between superior technology and affordability, offering an exceptional product without compromising performance. Additionally, the range meets industry and safety standards, making it a preferred choice for many businesses.

Strategic supply chain management

Unique Welding's success is also underpinned by a robust and strategic supply chain that ensures smooth operations from sourcing to delivery. The company focuses on effectively managing the full product cycle – from sourcing and product development to procurement, forwarding, warehousing and delivery. By collaborating closely with its key suppliers, Unique Welding ensures that shipments from international manufacturers are managed seamlessly and delivered on time.

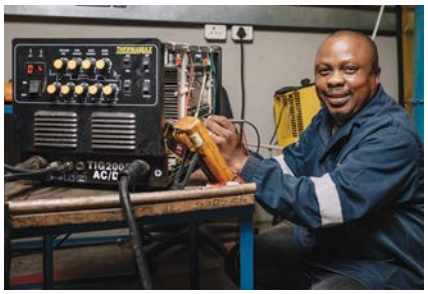
The careful attention to the logistics and supply chain allows Unique Welding to consistently meet customer demands for products, reducing lead times and increasing efficiency. With a team dedicated to overseeing this critical aspect of the business, Unique Welding is able to maintain a steady flow of products to its customers, ensuring that their welding and gas needs are always met on time.

Commitment to training and support

At Unique Welding, we understand that the success of our salespeople directly impacts the company's overall performance. That is why we prioritise comprehensive training, ensuring our sales teams are well-equipped with in-depth product knowledge. Our dedicated training centre plays a key role in providing sales staff with technical expertise, enabling them to effectively communicate product benefits to customers.

Beyond staff development, we offer on-site technical training for customers, delivered by experienced technicians. This hands-on guidance ensures users can confidently operate their Thermamax machines and maximise their benefits.

Customers and sales teams have access



Unique Welding is committed to delivering high-quality products and aftersales services.

With the acquisition of Weldamax by Air Products South Africa, Unique Welding became a proud subsidiary of the global industrial gas leader.

to a fully equipped demonstration centre at our head office. Here, live product demonstrations take place, and new product launches are introduced, offering invaluable first-hand experience. “This practical exposure empowers our sales team to provide clients with a thorough understanding of the equipment, enhancing their ability to sell with confidence. Our on-site capabilities also ensure that clients receive timely, professional support, reducing downtime and optimising equipment performance,” he says.

Empowering communities and upholding social responsibility

Unique Welding, a division of Weldamax and a subsidiary of Air Products South Africa, is proud to be a certified BBEEE Level 4 contributor. This certification reflects the company’s dedication to empowerment, transformation, and uplifting communities. Unique Welding works with its stakeholders – employees, customers, suppliers, and the broader community – to foster an environment of shared growth and opportunity. The company believes in the importance of giving back, and this is evident in its initiatives designed to promote social responsibility and community development.

In addition to its focus on empowerment, Unique Welding’s ownership structure further highlights its commitment to growth and development. In 2022, Weldamax was acquired by Air Products South Africa, making it a proud subsidiary of the global industrial gas leader. This acquisition brings a wealth of expertise, resources, and strategic support to Unique Welding, strengthening its capabilities and expanding its potential for continued growth. Air Products South Africa’s involvement in the governance and strategic direction of Unique Welding ensures that the company is well-positioned for the future, both within South Africa and beyond.

South Africa’s diverse economy, with its varied industrial sectors, requires a welding solutions provider that can adapt and innovate in response to the demands of different industries. From energy and chemicals to food, transport, and construction, Unique Welding has developed a reputation for being a trusted partner.

In the energy and chemicals industries, where precision and safety are paramount, the company has built a strong presence by providing top-tier welding solutions that meet the industry’s stringent quality and safety standards. Similarly, the company’s products and services are highly regarded within the food and beverage industry, where hygienic and efficient welding processes are essential for maintaining product quality and safety.

For industries such as construction, manufacturing, and transport, where large-scale operations and high-volume production are the norm, Unique Welding offers robust, reliable solutions that help ensure efficiency and uptime. The company’s dedication to providing products that help businesses optimise their operations has earned it the trust of major players in these industries.

In addition to offering world-class welding equipment, Unique Welding has also played a pivotal role in the mining industry, a key sector of the South African economy. The company’s ability to deliver tailored solutions that enhance productivity while meeting the demanding conditions of the mining sector has further cemented its reputation as an industry leader.

From its humble beginnings to its position as the largest independent distributor of gas and welding products in South Africa, Unique Welding’s journey is a testament to the power of innovation, dedication, and customer focus. The company’s commitment to excellence in both products and services has allowed it to build a loyal customer base and expand its operations, while its investment in people and relationships has fostered a culture of collaboration and mutual growth.

“Unique Welding stands as a beacon of excellence within the South African welding industry, driven by a passion for quality, innovation, and service. As the company continues to grow and evolve, we will, undoubtedly, play a key role in shaping the future of welding and gas solutions in Africa, delivering unparalleled value to customers and communities alike,” Gaetano Perillo concludes.

https://uniquewelding.co.za

The flagship Thermamax equipment range from Unique Welding.

Reeflex Welding machines: made in SA for African mines

***African Fusion* visits the Randburg manufacturing facilities of Reeflex Welding (Pty) Ltd and talks to the company's founder and managing director, Dr Philip Theron, and marketing manager, Mike van den Berg, about this pioneering local manufacturer of IGBT-based inverter welding machines.**

With a significant presence in Africa, Reeflex welding has manufactured and sold around 50 000 inverter welding machines since its inception in Randburg, South Africa in 1996. "We focus on expertise, making better machines for use in the harsh conditions of African mines," begins Philip Theron, who joined Reeflex Welding nearly 30 years ago.

"In South Africa today, there are many different inverter-based welding machine brands. The better ones such as Fronius, Miller, Kemppi, ESAB and Lincoln are now very reliable, but this comes at a cost, while the cheaper brands are typically unreliable and poorly supported, which leads to losses.

"We offer ruggedised machines designed to be ultra-reliable in local African conditions, which we know and understand. And these are simple and affordable machines, mostly for stick welding, but we also do MIG/MAG, TIG and multi-process units with advanced processes features," adds Mike van den Berg.

"Philip's designs have allowed us to create unique markets in mines all around Africa. In spite of the fact that all of our welding machines are inverter based, ours are as reliable as any premium brand in the world," he adds.

Philip Theron began designing power inverters while still at university in the early 90s. He completed an MSc degree on AC-drives/frequency converters, using IGBTs for soft switching at high frequency. He then went on to add a PhD degree on the use of the new technology for battery chargers, using DC to DC conversion to accurately vary and control charging current levels.

"With my first MMA welding inverter, I won the 1994 Schneider Electric Design Award for being an early adopter of the use of power electronics and IGBTs (integrated gate bipolar transistors) in high frequency transformers.

"In power electronics at that time, most notably for battery chargers and welding machines, IGBTs were beginning to offer the high-speed switching abilities closer to those of MOSFETs, along with the high-voltage and current handling capabilities of bipolar transistors. They can handle very large currents with a very low gate current drive," Theron explains, adding that he became involved in the design of IGBT-based inverters at an early stage of the technology evolution, which has since significantly reduced the size, improved the efficiency and the added advanced functionality to almost all welding machines.

In the early years, Theron recalls the introduction of an EWS inverter from Italy into the South African Market. "These used IRFP450 MOSFETs (metal oxide semiconductor field effect transistors), and I used to repair EWS machines for Afrox. I learned a lot about what breaks an inverter and the good and the bad aspects of welding machine designs through this process," he tells *AF*.

The power side of an inverter is just the engine, he explains. It takes the 50 Hz ac mains supply, converts it into high-voltage dc using diodes and a capacitor bank, then, via the inverter, it 'switches' this dc power to create a high frequency ac signal. This enables a much smaller transformer to be used to change the high voltage, low current mains supply into the high current, low voltage power needed for welding. This high-frequency transformer also provides electrical isolation.

In addition, changing the gate on time of the IGBT, allows the welding power to be accurately controlled: the longer the gate time per cycle, the more power is delivered. This enables the delivered arc power to responsively react to arcing conditions to improve welding performance, Theron explains.

"The design is the critical starting point, though, as is the choice of the critical power components, most notably the IGBTs and the capacitors. We tend to buy the best IGBTs we can get. Where most machines might prefer 400 V capacitors, we go for the 450 V and our preferred temperature rating is for 105 °C, where many other

Single phase 200 A ARC Inverter Welders being manufactured at Reeflex's Randburg manufacturing facility

A key design decision was to continue to use through-hole PC boards for the electronics, which makes it easy for anyone to find a fault and repair it.

The transformers used for Reeflex welding inverters are manufactured onsite using a winding machines and techniques developed in-house.

machines will go for a temperature rating of 85°," he says.

And because these components in our design are interchangeable, we are constantly on the lookout for a better option for reducing our costs without compromising the reliability of the design," he adds.

Welding, Theron continues, involves regular dead shorts of the electrical power, so it is a really good test for the control electronics used. "Our control system is faster than many others. When a welding electrode first strikes or gets stuck onto the plate, the control system can react within 100 nanoseconds, so from a 200 A current, the output might shoot up to 240 A in that short time, but it will quickly be brought back down again and, should the short circuit continue, the control system will drop the current down to about 30 A.

"Even given a lightning strike on the mains supply or an electromagnet pulse, the control side will react to protect the welding machines critical components," he assures.

Describing Reeflex's flagship welding products, Van den Berg cites the single phase 200 A ARC Inverter Welder as the best seller. "And for us, 200 A means a 100% duty cycle at 200 amps. As Philip has already suggested, the unit is built with high quality, mostly European components and the best available IGBTs. Additional features include arc force adjustment and Lift TIG and, being a very popular machine in the mining and industrial sector, a key feature is the VRD, a built-in voltage reducing device that limits the machines open circuit voltage until just before the arc is struck," he informs *AF*.

Although lightweight and fully portable, ARC welders are heavy duty industrial machines that are ideal for welding repair work using coated electrodes or TIG welding wires. Precise control of the output current and optimised striking voltage ensures easy starting, low spatter and very smooth running. Also available in this range is a 220 V single phase version and 380 or 525 V three-phase options.

"The aluminium used for our heatsinks all comes from Hulamin, our local supplier, and the sheet metal we use for the chassis and casing is all South African steel. We paint and powder coat the casings in-house, and we assemble the welding cables using locally manufactured cabling from Alvern Cables," says Van den Berg.

The aluminium used for heatsinks comes from Hulamin, and the sheet metal used for the chassis and casing is all South African steel.

Philip Theron adds that all the copper wire for the transformers comes from Wilec, and the transformers themselves are manufactured onsite using winding machines and techniques developed by Reeflex. "Even the small transformers on our PC boards are locally manufactured by AC/DC in Germiston," he informs *AF*.

"As a result, all Reeflex welding machines comfortably meet the local content requirements of the South African Mining Charter.

For ongoing development, Reeflex actively pursues feedback from customers to upgrade its designs and features. We are now up to Version 6 on our control boards, and changes are ongoing. There is always something that can be improved and as welding process knowledge changes, we can easily add new features to improve the arc stability or to make welding more comfortable for the welder," he adds.

"Going back to the 1990s, though, nothing drastic has had to be changed to reduce repair rates, which have always been very low. We typically only get to repair very old machines or those that have been damaged in accidents. With 50 000 units in operation, months can go by where we don't have to replace a single IGBT," notes Mike van den Berg.

Theron adds that another key design decision was to continue to use through-hole PC boards for the electronics, which makes it easy for anyone to find a fault and repair it rather than have to replace the whole board with a new one. "We could perhaps make the PC boards smaller by switching to surface mount technology, but there is not much point. It wouldn't allow us to reduce the machine size by much and it would make repair much harder," he says, adding that even Reeflex's shop floor team are able for find a PC-board fault and fix it on the current PC-Board design.

Typically offering two-year warranties, Van den Berg says that Reeflex's warranty claim rate is less than 1.0%. "And if a warranty does come in, we often ask the customer to please wait at the counter while we either repair or replace the machine. That's the sort of service that we can and strive to offer," concludes Mike can den Berg.

The full range of Reeflex Welding products are available and supported in South Africa by Bolt and Engineering Distributors (B.E.D.), including: 160 A to 500 A inverters, dual inverters, water-cooled inverters and dual voltage inverters. B.E.D. is also an approved welding repairs centre for Reeflex welding machines, cables and torches.

https://reeflex.co.za

Best fit and bespoke multi-brand solutions

AWC has the ability to combine packaged gas products with multi-brand consumable and welding and cutting equipment into customised best-fit solutions for industry, while offering an added-value Safety Advisory Service to customers. Johann Pieterse explains.

"We can now configure a wide range of premium welding brands, including packaged gases, to develop and deliver bespoke service offers," says AWC's technical manager for manufacturing industries (MI), Johann Pieterse. "And our offers come with an ongoing supply and service support commitment to see any project to successful fruition. In other words, AWC can offer a full spectrum solution to meet customer needs."

"We had a recent success with a contractor assembling a packaged steam boiler for the paper industry. The project involved a considerable number of long weld seams that need to be done at different levels of the boiler. We are talking about a relatively small steam boiler compared to typical Eskom boilers," says Pieterse, "but still with welding work needing to be done at height, simultaneously at 40 m, 60 m and 80 m levels."

A big ask, admits AWC's MI technical manager, adding that the start point was to use the proven GasReach™ and ArcReach™ technology developed only a few years ago.

GasReach™ meets the challenge of transporting full gas welding cylinders up into a boiler and empty ones back down again. "This is a huge disincentive to using gas shielded welding processes in restricted access places such as boilers," says Pieterse. "With GasReach, a multi-user pressure panel (MUPP) is installed at these hard-to-reach welding locations to completely overcome this problem.

"A single and well-protected high-pressure braided gas hose is connected to the MUPP and dropped to ground level. There it is connected to a manifolded cylinder pack (MCP) of the shielding gas required for welding," he explains. "This gas source can be hundreds of meters from where welding is taking place, in a safe, secure and delivery-accessible environment."

At the point of welding, each welder simply connects their own welding hose to the MUPP, and each gas connection can then be separately set to deliver the exact amount of shielding gas needed, and up to eight welders can connect to the same panel without cross interference.

With GasReach, a multi-user pressure panel (MUPP) is installed at hard-to-reach welding locations to completely overcome the problem of transporting full and empty gas cylinders to and from the working area.

Similarly, ArcReach™ technology removes the need for transporting welding machines up and down a construction site. A combined power and control cable links each power source on the ground to the wire feeder, torch and a remote pendant at the point of welding. This gives the welder control of the welding parameters without the need for a nearby power unit.

Says Pieterse: "In this example, the welding contractor for the paper mill boiler project chose to adopt AWC's semi-automatic metal-cored welding procedure, also developed for use by AWC in the power industry."

Originally, this procedure involved the use of Miller Welding machines, with the Regulated Metal Deposition (RMD) mode being used for the root weld, and ProPulse mode for capping runs, he explains. Both welding procedures were optimised for use with an Ar/CO_2-rich shielding gas, to enhance root penetration, sidewall fusion, and to significantly reducing weld rejection/rework rates.

He adds: "This total solution delivered substantially shorter weld-completion times compared to traditional techniques, which typically involves a TIG/GTAW root weld and the use of manual stick/MMAW welding for the fill and capping runs.

"In addition, the whole process has been requalified for use with different equipment. So, we are no longer restricted in terms of which power sources or metal-cored consumables we use," says Pieterse.

ArcReach™ technology removes the need for transporting welding machines up and down a construction site, and if used together with GasReach, completely eliminates the associated logistics and safety nightmare.

This solution has now been successfully implemented at all three levels of the steam boiler project introduced above.

Ideal for shipbuilding

As well as being ideal for construction and shut-down services in the power generation and chemical processing industries, Pieterse says that this remote approach is also attracting interest from South Africa's shipbuilding and refurbishment industry. "The southern tip of Africa is strategically well situated for ship building and repair, and we are about to start projects to show how we can contribute to a safer and more productive on-board welding environment.

"Similarly to the welding at height issue, loading and offloading gas cylinders and welding machines onto and off a ship is a logistical and safety nightmare. There are waiting times and safety procedures to consider, cylinder securing issues at the point of welding, and so on. By keeping the shielding gas cylinders and welding power sources onshore and connecting appropriate hoses and power cables to MUPPs and portable welding peripherals onboard, welding can become far more continuous, productive and safe," explains Pieterse.

"And our welding procedures are now proven solutions that we know will work well wherever access to the point of welding is difficult."

The multi-brand provider approach gives AWC much more freedom with respect to the specific equipment and consumables used in the development of other bespoke solution.

"Along with our comprehensive PGP gas offering, AWC has partnerships with Miller, with voestAlpine and, through Oerlikon, with Lincoln Electric, along with many other leading welding equipment and consumable brands. So we have much more freedom to develop fit-for-purpose welding solutions based on customer preferences, product and support availability, and pricing constraints," he points out.

AWC's safety solutions value add

AWC is also now investing in a Safety Solutions Programme, which is designed to help customers using gas, welding, cutting, and heating equipment in their production environments to comply with related SANS safety requirements.

"We are retraining our sales and solutions experts on all aspects of safety to equip and up-skill them to be able to offer an advisory service," says AWC's technical manager for (MI), Johann Pieterse. "Our MUPP was actually developed with safety as the starting point, but a new level of productivity was the end result."

AWC strives to make it easier for our industries to use up-to-date consumables, equipment and procedures to deliver better quality and to become more competitive.

By implementing sound safety practices and working habits – whether it be for choosing the correct SANS accredited flashback arrestors for oxy-acetylene cutting or for regularly checking for leaking gas pipes – the safety and efficiency of an operation improves.

"And our representatives, who visit sites regularly, are in a prime position to identify risks and make recommendations as a value-added service to our customers," Pieterse tells *AF*.

Eugene de Villers, a regional manager for Afrox, says there are two aspects to this safety training investment in AWC expertise. "First, for our reps who have been in the gas and welding sector for many years, this is a brilliant refresher course because we all tend to forget things.

"Also it is an effective way to introduce new reps to AWC and to help them understand what we are offering, what the benefits and the features are, and to take them through the vital safety-related issues that our reps and customers must be aware of.

"When looking at a cylinder store at a customer site, for example, few people know that the flammable and non-flammables gases must be stored separately, with a fire wall between the two," De Villiers explains. "Simple knowledge like this helps our people to serve as first-line safety consultants, giving customers safety critical assistance."

Says Johann Pieterse: "Comprehensive solutions and customer safety go hand in hand. At AWC we strive to make it easier for our industries to use up-to-date consumables, equipment and procedures to deliver better quality and to become more competitive.

"And that goes hand-in-hand with making it easier for welders and workers in our manufacturing industries to remain productive and safe," he concludes.

www.africanweldingco.co.za

By keeping the shielding gas cylinders and welding power sources away from the worksite and connecting appropriate hoses and power cables to MUPPs and portable welding peripherals, welding can become more continuous, productive and safe.

The S.A.T. flux system: a game-changing brazing innovation

First Cut's gas safety subsidiary, Gas Safety International (GSI), is revolutionising traditional industrial brazing with cutting-edge technology that enhances safety, quality and efficiency.

GSI's innovative fuel gas safety solution is game-changing for industries reliant on high-performance brazing, including the automotive, white goods, storage (racking and shelving), fabrication and engineering sectors.

Brazing is a crucial process in manufacturing sectors such as these, allowing for the secure joining or bonding of similar and dissimilar metal components: for example, copper to copper, or copper to brass. However, traditional brazing methods come with inherent risks, including gas leaks, inefficient fluxing, and safety risks due to high-pressure systems.

Recognising these challenges, gas safety stalwart GSI has added its revolutionary S.A.T. regulator, valve and torch to the innovative liquid fluxing system known as the D69. The S.A.T. flux system significantly reduces gas contamination risks and enhances gas welding and brazing efficiency, optimising operational productivity.

GSI has achieved extensive traction with the S.A.T. flux system in the nationwide branches of a well-known white goods manufacturer, as well as with national wheelchair and motorcycle frame manufacturers.

Peter Rohlssen, Managing Director of GSI, highlights the importance of safety in brazing operations: "Our goal is simple: to make brazing safer and more efficient – without compromising performance. Traditional brazing systems are often negatively impacted by pressure-related hazards, contamination, and downtime issues. The S.A.T. flux system tackles these challenges head-on, by ensuring a safer working environment while improving productivity."

The D69 fluxing unit enriches flammable gas, for example, acetylene, with liquid flux by passing the gas through a reservoir, where it absorbs the liquid before reaching the torch for brazing. This process enhances brazing efficiency, improves joint quality, and operates under negative pressure to increase safety by preventing backflow and reducing explosion risks.

The negative pressure approach not only minimises workplace hazards, but also ensures compliance with international safety standards, making it a preferred choice for manufacturers which prioritise worker safety and operational excellence. The system is further validated by American quality assurance institute UL (Underwriters Laboratories) approval, and its sister institute, ULC (Underwriters Laboratories Canada), which are globally recognised marks of product safety and quality assurance.

The GSI S.A.T. flux system also adheres to stringent industry compliance regulations, including ISO 2503, which governs gas pressure regulators for gas welding, cutting and allied processes; ISO 5175-2 which governs the valve; ISO 5172, which sets standards for blowpipes used in brazing and gas welding applications; and SANS 3821, ensuring the integrity and safety of the flexible hoses used in gas applications.

Reducing downtime and Increasing efficiency

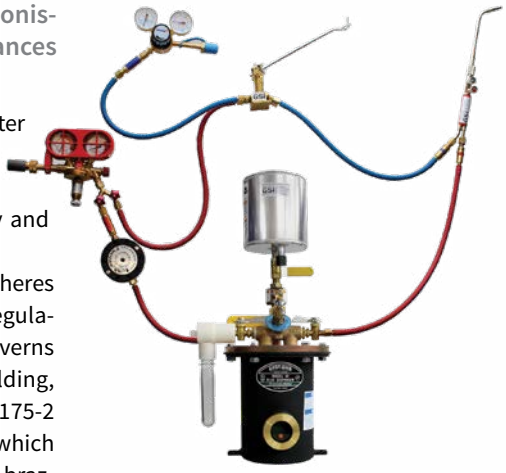
The S.A.T. flux system addresses one of the most pressing concerns in modern industrial manufacturing –downtime. In traditional brazing operations, equipment often needs to be de-pressurised for maintenance or reloading, leading to a halt in production and lost operational time. The S.A.T. flux system eliminates this obstacle, by offering a continuous operation model, ensuring that manufacturers can achieve peak efficiency without interruptions.

The S.A.T. flux system furthermore features a gas economizer with a pilot flame, which ensures that the flow of gas and liquid flux to the torch stops when it is not in use, thereby saving product and time – and crucially, ensuring operator safety. "Economiser contamination is also prevented, substantially reducing the amount of maintenance required, from once every two months to once a year," Rohlssen says.

"In manufacturing, time is money. Every minute of downtime translates to lost revenue. GSI's innovative S.A.T. flux system is about delivering a brazing solution that not only enhances safety but also optimises quality and operational efficiency. This is a game-changer for manufacturers requiring reliability and precision in their production lines," says Ian McCrystal, CEO of First Cut.

Training, service and support

GSI is an authorised service centre for the D69 fluxing unit. With the exception of the gas fluxing unit itself, which is US-manufactured and imported, the heart of the S.A.T. flux system, the S.A.T. valve, is 'proudly local', and manufactured by GSI in Johannesburg. In close co-operation with Messer Cutting Systems small, medium and large gas welding and brazing torches are used.



GSI has added its revolutionary S.A.T. regulator, valve and torch to the innovative liquid fluxing system, known as the D69. The S.A.T. flux system significantly reduces gas contamination risks and enhances gas welding and brazing efficiency.

GSI can also offer a full repair service, exchange units and spare parts as required.

Beyond the technology itself, GSI is committed to providing comprehensive training and support for customers adopting the new system. Understanding that new technology adoption requires knowledge and hands-on experience, GSI offers tailored training programmes, ensuring that businesses can seamlessly integrate the solution into their operations.

"Implementing new technology is not just about the equipment; it is about ensuring that teams understand how to use it effectively," Rohlssen adds. "That is why we offer in-depth training and support, helping companies to transition smoothly to a safer and more efficient brazing process."

As manufacturers worldwide seek to improve safety, quality, reduce costs and enhance productivity, the demand for innovative solutions continues to grow. By setting new industry benchmarks with their forward-thinking approach to gas welding and brazing safety and efficiency, First Cut and its subsidiary GSI are set to redefine industry standards, offering manufacturers in a broad range of sectors a superior solution which prioritises both worker safety and operational excellence.

"We are always looking for ways to push the boundaries of what is possible in industrial cutting and joining technologies. Bringing this next-generation brazing solution to market truly addresses the needs of modern manufacturers," McCrystal concludes.

www.firstcut.co.za

Advanced welding techniques revolutionising repair practices

According to Roman Mornau, General Manager of the ACTOM subsidiary, MetalPlus, welding technologies can play an increasingly vital role in optimising resource utilisation and enhancing sustainability for capital-intensive industry assets.

Beyond traditional methods, advanced welding techniques such as Submerged Arc Welding (SAW), Cold Metal Transfer (CMT), and Laser Welding are revolutionising repair practices, enabling precise interventions with minimal material removal. This shift from replacement to repair extends the service life of critical equipment, reduces waste, and minimises the environmental impact associated with the production of new components for the power generation, petrochemical, mining, electrical machines, locomotives, and manufacturing industries.

Prioritising repair over replacement in high-cost industries offers numerous advantages. By extending the life cycle of components, it is possible to reduce the environmental footprint while providing industries with reliable, rapid, and cost-effective local repair services. This approach aligns with the principles of a circular economy, where materials are effectively reused and repurposed.

Consider the stark contrast between the disposal of a smartphone and the decommissioning of an industrial machine. Smartphones are often replaced prematurely due to fashion trends, even when fully functional. In contrast, industrial machinery, frequently comprising massive components such as 20-30 t shafts, demands a more sustainable approach. Scrapping and replacing these components necessitates significant energy and resources for smelting, manufacturing, and transportation, which must often be imported.

Conversely, repair often involves adding only a few kilograms of welding material, extending the service life of the component by another decade or more.

A prime example of the success of this approach in South Africa can be seen in the repair of locomotive crankshafts. Once the crankshafts are excessively worn, these critical large components, up to 4.0 m long in a 16-cylinder engine producing up to 3 000 hp, were previously replaced entirely, typically with imports from the United States.

MetalPlus engineers developed and tested a submerged arc micro-welding (SAMW) technique in the early 2000s, that minimised heat input and distortion to successfully repair these crankshafts with phenomenal proven reliability and a zero-failure record.

Notably, the original equipment manufacturer initially resisted this repair method, fearing loss of revenue. However, the rail operator, Transnet, recognising the value and functionality of the repaired crankshafts, approved the process. This successful venture has not only reduced repair costs for the rail industry but also fostered local expertise and reduced reliance on imports.

Building on this success, welding repair techniques have expanded to encompass a wide range of industries, from repairing small pumps to refurbishing massive turbines for the power generation sector. The key lies in selecting the most appropriate welding technique for each repair, minimising invasiveness and ensuring the repaired component will function as effectively as the original.

Historically, welding was perceived as an aggressive process, with high heat input leading to distortion and potentially rendering components inferior. However, advancements in welding technology have mitigated these challenges. Techniques such as submerged arc micro-welding, which minimise heat input and distortion, have enabled the repair of previously deemed irreparable components. “At MetalPlus we have welding techniques that render the component stronger with the same fatigue life after the weld repair. Such innovation has not only reduced repair costs but also empowered South African industries to localise critical maintenance tasks previously reliant on imports,” says Mornau.

The integration of robotics and automation further enhances accuracy and efficiency, while minimising associated operational risks as well as minimising waste.

The emergence of CMT and laser welding, with even lower heat inputs, has further expanded the scope of repairable components. These technologies enable precise repairs with minimal heat-affected zones, minimising the risk of embrittlement in the material, further reduction in distortion and ensuring the integrity of the repaired component.

Alongside extending equipment lifespan and reducing material costs, these advanced welding techniques also contribute to improved operational efficiency. In high-value rotating equipment, conventional welding methods can introduce stresses and distortions that lead to premature failures but by employing more refined techniques, industries can minimise downtime and ensure the continued reliable operation of critical machinery.

The environmental benefits of this repair-focused approach are significant. Replacing a large component necessitates the extraction, processing, and transportation of raw materials, resulting in a substantial carbon footprint. In contrast, repairing often involves minimal material usage and significantly lower energy consumption, which reduces the overall environmental impact.

Looking ahead, laser welding technology holds immense promise. With its extremely low heat input, laser welding enables highly precise repairs with minimal distortion, further expanding the range of repairable components. The integration of robotics and automation further enhances accuracy and efficiency, while minimising associated operational risks as well as minimising waste.

“Advanced welding techniques are not just tools for repair; they are critical enablers of resource conservation and sustainability for capital-intensive industrial machines. By embracing a repair-oriented approach and leveraging innovative technologies, South African industries can enhance their operational efficiency, reduce environmental impact, and contribute to a more sustainable and resilient industrial landscape,” concludes Roman Mornau.

https://actom.co.za/ACTOM/Metalplus

LTA Autecon celebrates World Quality Week

Late last year, teams across LTA Autecon's Oil & Gas coastal region celebrated World Quality Week with the theme 'Quality: From Compliance to Performance'. This theme emphasises the shift from merely meeting compliance standards, to driving performance through a strong and entrenched culture of quality.

Assistant Site Manager Fadiel Meyer, who participated along with many of his colleagues, supports World Quality Week as it helps to embed a mindset of innovation, collaboration and improvement. This echoes and reinforces the company's own operational ethos and motto 'Home without harm, everyone everyday'.

"It is vital to ensure that our teams are constantly sensitised to the need for quality in all that they do. It is also important to utilise these initiatives to celebrate the work our teams do, and to show them our appreciation. Our people take these initiatives to heart!" he enthuses.

At LTA Autecon, the practice of celebrating World Quality Week began in 2020. In 2024, it became a uniquely coastal initiative at four of the LTA Oil and Gas sites, in which teams were encouraged to proactively contribute ideas, take ownership and drive quality performance across all projects. The initiative was driven by two of the company's Quality Co-ordinators: Dean Pierce in KwaZulu-Natal and Randal Jacks in Cape Town.

During weekly alignment sessions leading up to World Quality Week, teams were asked to recommend quality-related initiatives. Management and staff buy-in ultimately resulted in many exceptional projects.

Standout examples included:

- A collaborative pledge noticeboard, where both employees and management made personal commitments to quality improvements. This helped to reinforce a shared dedication to maintaining the highest standards across all operations.
- Custom hard hat stickers designed by the Island View site team to commemorate World Quality month. These were a fun and impactful way to show the team's commitment to quality on-site.
- Digital awareness displays were rolled out digital across various workstations to serve as constant reminders of goals and achievements.
- A real-time digital tool was created for team members to share complex quality issues and collaborate on solutions. This tool allows teams to address concerns quickly and efficiently on a shared platform, connecting employees across various locations.
- Individuals who went above and beyond in maintaining high-quality standards were recognised and celebrated with special awards. These awards highlighted their exceptional contributions to quality and their impact on project successes.

LTA Autecon's safety slogan, 'Home without harm, everyone everyday' featured prominently during the company's World Quality Week celebrations. Meyer explains: "A quality project has a core safety aspect to it, and a safe project is always of high quality. After all, we never forget that in the oil and gas sector, we work in a volatile environment, with little room for error," he points out.

Meyer says that ensuring the safety of clients and their staff is closely aligned with ensuring the safety, longevity and sustainability of oil and gas production plants: "This is the foundation of everything we do on a daily basis – and have done as

Siya Dlamini, Senior Planner and Abraham Jina, Site Manager at LTA Autecon Cape Town branch, participated along with their LTA Autecon coastal region colleagues in World Quality Week celebrations.

LTA Autecon for more than 40 years. Our clients know that we do not compromise on safety."

To make the World Quality Week initiative even more impactful, key stakeholders from client partners were invited to join the celebrations. Their presence underscored the importance of collaboration and shared responsibility in achieving quality excellence: "Our clients set the benchmarks and targets, and we work with their guidance. When we invite them, we are celebrating achieving or exceeding their targets. During times like this, we discover commonalities with clients and can align our goals: not only when it comes to day-to-day production, but for the long term."

An example of how LTA Autecon Oil & Gas coastal region has met clients' operational targets is its impressive welding rejection rate. which is maintained well below internal and client key performance indicators (KPIs) across the country.

"Celebrating Quality Week remains a priority for us, demonstrating that LTA Autecon is constantly evolving to meet the needs of a changing environment," he concludes.

https://1taautecon.co.za

LTA Autecon Durban branch, Island View site team.

Dekra's Industrial's holistic NDT and training services

As Dekra Industrial and its adult-based education and occupational skills training division, the Institute of Learning (IOL) embark on a new year, the company reaffirms its commitment to offering a truly holistic service across many different sectors. "By seamlessly integrating non-destructive testing (NDT) inspections together with adult-based education and occupational skills training, Dekra Industrial provides a comprehensive, value-driven solution which supports clients, making a tangible difference across multiple industry sectors," says Managing Director Johan Gerber.

The companies are also physically co-located in key centres including Sasolburg, Lephalale, Secunda, Middelburg and Cape Town. Dekra Industrial and the IOL have strategically aligned their services, ensuring that where inspections and NDT services are provided, adult-based education and occupational skills training opportunities are also available.

"With this fully integrated approach, we are effectively positioned as more than just another industrial service provider – but as a strategic partner to our clients," says Gerber. "Our co-located offices in key industrial regions also mirror and reinforce this strategy, ensuring that we offer an accessible and complete service portfolio to our clients."

Together, DEKRA Industrial and the IOL offer a wide range of services, including non-destructive testing (NDT) inspections, vendor inspections, vehicle mapping, welding inspections, safety consulting, and adult-based education and occupational-based skills training.

This holistic service portfolio caters to a wide range of key sectors such as mining, power generation, petrochemicals, construction and manufacturing, ensuring that clients meet stringent safety, compliance and quality standards.

Enhancing safety, compliance and industry expertise

The combined expertise of Dekra Industrial and the IOL ensures that companies can meet stringent regulatory requirements, while equipping their workforce with the necessary skills to maintain high safety and quality standards.

Christopher Mörsner, Head of Training and Consulting at Dekra IOL, explains: "By

Dekra Industrial and the Institute of Learning (IOL) have strategically aligned their wide range of NDT and training services.

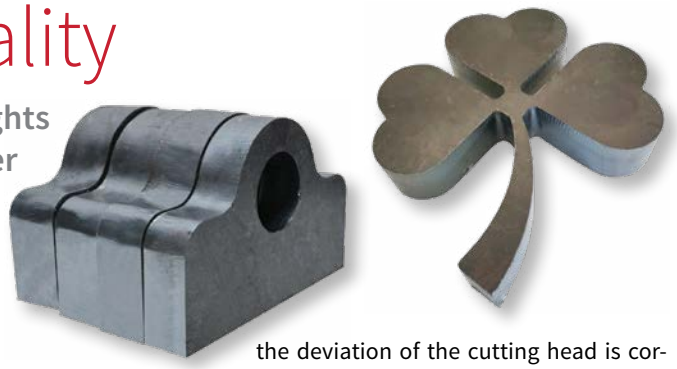
providing comprehensive training alongside NDT and inspections, we address our clients' immediate compliance needs, but also contribute to the long-term sustainability of their businesses.

This 'dual benefit' approach supports industry safety, regulatory compliance and staff development, and also extends to vendor inspections, ensuring that quality control measures are seamlessly integrated across supply chains. "Our goal is to build on our competitive advantage by refining our offerings and reinforcing our brand as a holistic solutions provider," Gerber points out.

https://dekrarsa.com

Automatic laser cutting for increased productivity and quality

Petrus Pretorius of the Cosmo Group highlights the key features of the ACME LP-3015D laser cutting solution that the company has recently launched into the South African fabrication industry.



The ACME LP-3015D is a 3 KW automatic fibre laser cutting system with a 3×1.5 m bed for medium-power metal processing.

Cosmo Group has recently begun introducing the ACME range of laser-based welding equipment into South Africa, which includes solutions from hand-held laser welding and cleaning systems through to fully automated laser cutting systems. "We have already successfully installed a state-of-the-art 6.0 kW ACME LP420H fibre laser cutting machine with interchangeable 2×4 beds, into a metal processing service company in Boksburg. Off the back of that success, we decided to import more products in the range," says Cosmo Group GM, Petrus Pretorius.

The latest of these is the ACME LP-3015D laser cutting system, a 3 KW automatic fibre laser cutting solution for medium-power metal processing with a 3×1.5 m bed that offers a cutting accuracy of within ±0.03 mm/m.

Environmentally friendly and highly efficiency, this cutting system comes with an intelligent FSCUT2000 laser cutting control system and a strong and durable bed with excellent shock resistance, rigidity and stability. "This is a complete solution that is easy to install and can deliver easy debugging and excellent performance. Five levels of perforation are supported, including any combination of segmented or progressive perforation. The system supports starting, closing, and fine cutting processes; air-moving of obstacles; leapfrog intelligent judgment for obstacle avoidance; simple automated scheduling, and much more.

The FSCUT2000 controller's open-loop motion algorithm offers a trajectory accuracy 0.03 mm and a positioning accuracy 0.001 mm, with repeat positioning accuracy 0.003 mm. The maximum cutting speed is 80 m/min, while the maximum idle speed is nearly twice that at 150 m/min.

While cutting, all blind spot areas can be monitored at any time to control the cutting process via the high-definition intelligent monitoring system, enabling safe remote operation. In terms of servicing and fault diagnosis, remote monitoring and diagnostics is embedded into the system, with remote connectivity to specialist engineers that can both send alerts and help resolve maintenance issues.

The LP-3015D offers automatic optimisation of imported graphic and simple and clear cutting process settings. After importing the graphics, the cutting sequence can be quickly set up, and a floating or workpiece coordinate system can be used to suit both flexible and batch production.

For accurate edge finding, support for photoelectric edge finding and capacitive edge finding is supported to quickly correct any deviation angle to the plate. A gantry synchronisation function also ensures that the deviation of the cutting head is corrected every time the system is returned to the origin.

Advanced nesting software is also included to minimise material waste. This software makes importing, drawing and sheet layout processes efficient, with drawing recognition, automatic identification and efficient modification of drawing errors, with support for DWG, DXF and several other drawings formats. There is no upper limit to the number of nesting plates that can be stored; and support for automatic and manual nesting of special-shaped plates is available.

Cutting path optimisation can be used to minimises machine downtime as much as possible, and a variety of cutting-edge tool path generation modes have been developed to adapt to different customer scenarios.

LP-3015D ACME is also fully compatible with the HypCut/CypCut nesting and production management solutions for high power laser cutting processes.

Installation and training

Before the delivery of the equipment, the customer needs to provide the installation floor plan, and take responsibility for any civil works, water, electricity, gas, piping and interfaces. "With our partners ACME in Jinan, who will send a dedicated engineer, we will then take responsibility for equipment installation and commissioning.

"Once commissioned, we will also conduct comprehensive training covering equipment maintenance, operation, laser protection, metal processing technology, graphic editing, common troubleshooting, and all aspects of day to day cutting operations.

"We at Cosmo also take charge of after sales service, with remote guaranteed support from ACME when it is needed. These machines come with a one-year guarantee, and the assurance maintenance support for life," Petrus Pretorius concludes.

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COSMO AUTOMATION®

PTA: 449 Pretoria Road, Silverton, Pretoria, 0184
012 846 3300 • sales@cosmowelding.co.za
JHB: Unit D3 The Palisades, 39 Kelly Road, Jet Park, 1459
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