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Journal of the Southern African Institute of Welding

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On Friday June 2 Air Liquide held a Customer Demo Day at its Head Office in Alrode South Africa. *African Fusion* attended, and Mwali Kawawa, national business developer for Air Liquide South Africa, explained.

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July 2023

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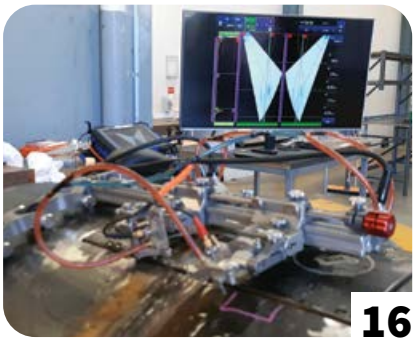

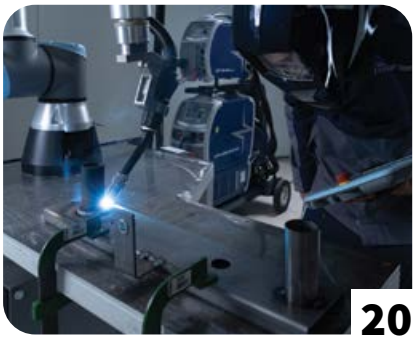

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Southern African Institute of Welding

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Having just returned from the 76th IIW Annual Assembly and Conference in Singapore, I am pleased to be able to report some very good news for the SAIW and for South Africans with IIW Welding Inspector qualifications.

For several years now, we have been negotiating with the IIW for the supply of South African-manufactured plastic weld replica samples for use in the IIW's International Welding Inspection Personnel (IWIP) programme. These harmonised replica samples, which are copies of real metal samples, are important in ensuring that consistent standards are upheld for training being delivered by IIW Authorised Training Bodies (ATBs), and examinations conducted by IIW Authorised National Bodies (ANBs).

We have already dispatched weld training samples to some 15 IIW ATBs delivering training around the world, and at this year's IIW Annual Assembly, it was agreed that the examinations for all IWIP qualifications will use the test samples exclusively, with SAIW being responsible for supplying examination sample sets to all ANBs.

The agreement between the IIW and the SAIW has now been signed for the supply of these samples and their use will become mandatory from January 2024. This is an ongoing long-term contract, so all the 41 current and any new ANBs that want to offer the IWIP will have to buy their examination samples from us. While bringing in some additional income, this is an important statement about the credibility of our IIW programmes and the contributions we have made over the years in developing courses and raising the global status of SAIW-trained Welding Inspectors and other personnel.

A path has also been identified and agreed for the introduction of a Certification Scheme for IIW Welding Inspectors. This has been an ongoing topic for many years and it will now happen through ISO 17024, the international standard for conformity assessment for bodies operating certification programmes for personnel.

The IIW will start the process through Accredia, the Italian accreditation body, which is the equivalent of SANAS, South Africa's system. The IIW, through the Italian Welding Institute (IIS), will establish the IIW Certified Inspector Programme and get the scheme accredited by Accredia. That opens the path for the scheme to be recognised by all national accreditation bodies, so in South Africa, SANAS will recognise the scheme and this will allow the SAIW to begin offering certification for appropriately competent welding inspectors.

Fabrication companies and individual welding inspectors have a lot to gain: companies because certified personnel are already vetted in terms of the skills they can offer; and for welding inspectors, IIW Certification will offer enhanced global credibility and a licence to work almost anywhere in the world.

In terms of upcoming events, I would like to draw your attention to the SAISI Steel Summit, with SAIW and Sassda as contributors. This will take place at Emperors Palace on Wednesday, August 30. Also, the next TWF Africa Conference is to be held in Lagos, Nigeria in March 2024. The call for papers has now been sent out and I urge our academics and researchers to submit and attend.

For the first time since 2019, we will again be hosting our Gala Dinner and Awards Ceremony. It is a long time since we last recognised the key people, companies and students in the welding industry and we have missed it. We will be recognising the Best ISO 3834 Company, the Best Welding Coordinator, the Best Welding Inspection and NDT Students. We will be presenting our Gold Medal Award, along with Fellowships and Life Memberships for loyal service over the years from two outstanding people.

It will be most pleasing to meet, greet and reconnect with our welding colleagues, to celebrate our successes and share our hopes. I look forward to seeing you at the Indaba Hotel on October 19.

John Tarboton

ISO 3834, the PER and the safety

African Fusion talks to SAIW's Renier Mostert, ISO 3834 Company Certification manager, about the ongoing success of the SAIW's ISO 3834 Welding Fabricators Certification scheme; and its extended role in driving up weld quality and safety standards in the power, petrochemical and, more recently, mining industries of Southern Africa.

ISO 3834 certification was first introduced into South Africa in 2008, with DB Thermal becoming the first company to be certified according to the SAIW's ISO 3834 Welding Fabricators Certification Scheme in that year. "As the local representative of the IIW, the SAIW is the custodian of weld quality for the Southern African region, and ISO 3834 is the ideal scheme to help companies to implement proper weld quality management systems into their operations," says Renier Mostert, manager for ISO 3834 Company Certification at the SAIW.

"The scheme has since gone from strength to strength, and we now have 288 South Africa companies certified according to our scheme. ISO 3834 certification has become a requirement for fabrication contractors bidding on contracts in the power industry and in the chemical and petrochemical industries. SAIW Certification also recently certified a company in Lesotho under our ISO 17021 certification as Lesotho falls outside our IIW scope of certification.," he adds.

"For centuries, welding was left to skilled welders, with no one on a higher management level taking the necessary responsibility required by construction codes to ensure the welding was performed to the proper safety and quality requirements.

Welding fabricators and OEMs are becoming certified to ISO 3834 for the welding that they do on products for mining.

"After non-destructive testing (NDT) following welding was completed, welding defects were often found and located, which would then require repair work, which typically costs three to five times more than the initial cost of manufacture.

Part 3 of ISO 3834 (ISO 3834-3) defines the standard quality requirements for welding and covers manufacturers of steel structures, non-critical piping, and mining equipment, for example.

ISO 3834: Quality Requirements for fusion welding of metallic materials specifies the quality requirements for how welding should be done in workshops and for onsite field installations and maintenance.

"This ensures that quality is built into a fabricated product from the beginning and throughout construction. It helps welders to produce quality welds, preventing defects and poor-quality welds from arising in the first place," Mostert informs *African Fusion*.

"ISO 3834 Certification tells customers and users of fabricated equipment that the manufacturer has agreed to comply with all the requirements necessary to ensure the product or component won't fail during service because of insufficient built-in quality. This quality comes from every stage and every welding related process involved in the manufacturing phase, which is far better than trying to inspect quality into the component during the inspection phase after the manufacturing has been completed," he explains.

Statutory requirements and the PER

From a legal standpoint in South Africa, 'SANS 347: Categorization and conformity assessment criteria for all pressure equip-

critical mining industry

ment' specifies the safety-related quality requirements for all pressure vessels manufactured and used in the country. "This document is coupled to another document known as Pressure Equipment Regulations (PER), which governs the legal requirements for pressure vessels under South Africa's Occupational Health and Safety Act.

"The PER specifies the legal requirements for all pressure equipment, piping and assemblies that are specified to contain pressure greater than 0.5 bar gauge. This is a relatively low-pressure threshold, which means the statutory code applies to the majority of pressure vessels, tanks, containers, cannisters and accumulators that are manufactured in or imported into South Africa.

"Most relevantly for South African fabricators, the PER refers to SANS 347, which specifies that all the pressure equipment covered by the PER is fabricated according to the quality requirements of ISO 3834-2 or its local equivalent SANS ISO 3834-2. Simply put, this means that anyone manufacturing pressure equipment to contain more than 0.5 bar pressure, with some exclusions, must comply with the ISO 3834-2 quality requirements for welding," notes Renier Mostert.

ISO 3834-3 for less critical equipment

For equipment not covered by the PER, such as, steel support structures and machines, there is still an advantage for fabricators to adopt ISO 3834 certification. "Part 3 of ISO 3834 (ISO 3834-3) defines the standard quality requirements for welding and covers manufacturers of steel structures, non-critical piping, and mining equipment, for example.

"During service, most welded components are subjected to environments and in-service processes that can cause them to fail, potentially with dangerous consequences, including the loss of human life. While the welds on a conveyor support structure, for example, may not seem safety critical – and we can often not see a defect in a weld caused by poor manufacturing quality – any risk of a failure should be investigated and identified, because harm or loss of life can easily occur.

"Also though, if you look at the current state of the power generation industry infrastructure, which is under severe pressure, even a failure of non-critical structures or components can have an impact on loadshedding, and therefore the economy. The implementation of an ISO 3834 system for the manufacturing of these welded components will lower the risk of in-service failures," argues Renier Mostert.

There are also cost advantages for the adoption of ISO 3834-3 for fabricators of non-critical equipment, from reduced rework, lower risks of failure and/or lawsuits, he suggests. "Like any other quality system, it will cost some money for the initial implementation and certification, as well as the ongoing maintenance of SAIW ISO 3834 Certification. However, if implemented correctly and managed the way it should be during production or manufacturing of any welded component, certification is sure to deliver a cost advantage in the medium to long term.

"And if the system prevents just one major mistake during a project with a tight budget, the ISO 3834 system will already have paid for itself from savings on rework costs or delivery delay penalties," he says.

ISO 3834 and mining

As a safety critical activity in South Africa, the safety of the welded equipment on mines is also vital. "Mining houses should be doubling down on efforts to raise safety standards," Mostert continues. "In terms of current mining health and safety regulations, if there is a safety incident in a mine owing to a weld defect, for example, the mine can be held liable.

"They therefore should be insisting that contractors implement ISO 3834 for all welded structures: Part 3 at least, and Part 2 for anything critical. Many have started to realise this and are now asking their contactors to comply with the standard.

"This is a welcome and overdue development in the South African mining industry. Welding fabricators and associated suppliers are now becoming certified to ISO 3834 for the welding that they do on products for use on the mines, which will better ensure the quality and safety of these products in service.

ISO 3834 also applies to the quality of welding done during maintenance work in industry, and with the high-maintenance needs of significant amounts of mining and other plant infrastructure in South Africa, the implementation of a welding quality control system such as ISO 3834 can assist in stabilising safety and equipment reliability, ultimately contributing towards economic recovery.

"In principle, all fabricators dependent on welding should be adopting, at the very least, the principles of ISO 3834. These basic principles will be of much more value in terms of the actual quality than most of the checks that a very large part of the construction and manufacturing industry are currently relying on to 'inspect' the quality of welding," concludes Renier Mostert of the SAIW.

www.saiw.co.za/saiw-certification

With the high-maintenance needs of significant amounts of mining and other plant infrastructure in South Africa, the implementation of a welding quality control system such as ISO 3834 can assist in stabilising safety and equipment reliability.

ND Engineering: SA's exotic materials

African Fusion talks to Elvis Green and Mark Ackerman of ND Engineering about their company's comprehensive fabrication capability, which ranges from state-of-the art fabrications using modern and exotic alloys to cost-saving repairs of plant equipment for a multitude of industries.

ND Engineering has developed a skills set in exotic materials, which enables the company to service the high-end needs of industries in the chemical, petrochemical and mining sectors.

ND Engineering, according to the company's GM, Mark Ackerman, is now operating out of a huge purpose-built facility with 10 000 m^2 of under-roof fabrication space. "Back in 2018, we were extremely fortunate to find this property, which we developed and then built into a state-of-the-art workshop facility, customised to suit our fabrication needs. We have been here for close on five years and have already run out of space. So, we are in the process of developing the property next to our existing facility to build another, again customised to suit our expanding fabrication needs. Soon we will have two shops of almost the same size, which will enable us to separate carbon steel fabrication work completely from the stainless steels and the exotic alloy-based materials we are now routinely using," he tells *African Fusion*.

The new facility will be on the land currently being used as a lay down area for the large vessels and equipment going into Africa, as a staging area for loading the trucks that come into the property. "We now want to develop it into a workshop for CNC plasma coating and all carbon steel heat exchanger refurbishments," Ackerman explains.

"Our heritage as world-class fabricator began in the mid-1970s in South Africa's pulp and paper industry, where we pioneered the use of cold stretched 316 stainless steel vessels in SA. Later, SAF 2205 duplex stainless steel materials were used for their greater strength, allowing for thinner materials to be used in manufacturing pulp digesters. A typical vessel made of 316 with a shell thickness of 32 mm could be reduced to 24 mm by cold stretching, but by using duplex stainless, we were able to deliver vessels with wall thicknesses just 18 mm," recalls Elvis Green, the company's MD.

"We quickly developed a skills set in exotic materials, which enabled us to begin servicing a much wider range of industries: chemical and petrochemical industries, for example, where we are specialists in acid and leach applications, as well as the mining, power, petrochemical, sugar and fertiliser sectors. We have been blessed to have a good spread of work, locally and internationally, with several global suppliers using us to manufacture their OEM products. We even build equipment directly for some OEMs, which is exported back into Europe with CE markings," Green adds.

Ackerman says that ND Engineering has become particularly well-known for its heat exchangers, some of which are exceptionally large, while others operate in highly corrosive environments at the upper reached of material capabilities. These high-end systems/units are subjected to helium leak testing and undergo eddy-current testing of the tubing after installation and welding, which is now almost all done using fully automatic orbital welding with Polysoude tube-to-tube sheet welding machines," he says, adding that some of the most exotic materials are routinely being welded with this equipment.

This capability has created a steady workflow for the company. "We have also explored and developed other opportunities, such as pioneering and development work on the extremely complex rotary distribution systems that manage the distribution of the process streams for ion-exchange processes that use resins.

For the mining industry, Ackerman cites the pioneering work the company has done on modern leaching autoclaves being constructed using newly developed alloys: "We have been working very closely with a couple of the mining houses to put fully alloyed autoclaves into areas where they have never been used before – and this is proving very successful!" he exclaims.

Leaching involves boiling crushed minerals to dissolve out the mineral products: in acid solutions at high temperatures and pressures. "Autoclaves are usually brick- or lead-lined, but with the mining houses we have managed to use alloys that can better resist the extremely corrosive conditions, replacing the need for lining with a more efficient and more environmentally friendly solution that results in less downtime for repairing linings, and a much longer life," he explains.

ND Engineering's six 100 to 120 t Gas-to-Gas radial-flow heat exchangers for the acid industries in North Africa.

fabrication specialist

Elvis Green adds: "We have seen our units running without any major maintenance for 12 to 15 years, while traditional lined units must typically be replaced every five years, and then only if they are properly maintained. This is a massive boon for the mining industry and we are proud to be a part of it.

"Over the years, we have extended our footprint to all corners of the globe. We are manufacturing systems for a global OEM with the only HRS (heat-recovery system) boiler technology in the world for sulphur/sulphur dioxide processing plants, for example, " he says.

For the sugar industry, Ackerman cites work on some giant calandrias for UAE. "Most people don't even know the region has a sugar industry, but we've done some novel work there." A calandria is a vital part of sugar processing. The sugar juice is heated under pressure to evaporate off the moisture to a specific level. The pressure is then released, which causes the sugar to crystalise. "The largest units we are manufacturing will soon be shipped out of this facility and, once installed, will be the largest calandrias in the world," says Ackerman.

On the material side, he says they were manufactured from electropolished 316 stainless steel for the tubes, while the tube sheets were polished by hand. "We have also done a few of these calandrias in duplex stainless steel for the local sugar industry.

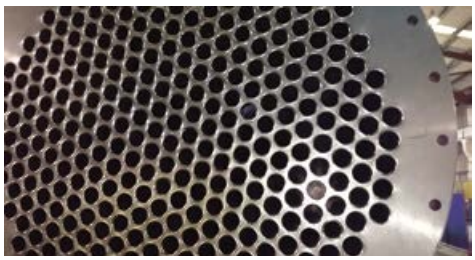
"The autoclaves involve mostly super duplexes, with the latest ones being manufactured in modified super duplexes with specific alloying elements added to impart resistance to issues such as pitting corrosion. And we have considerable experience with the LR 800 HTs; C276s, Alloy 20, Alloy 31 and B2s, which are pure alloys with combinations of alloying elements for enhanced performance in specific applications, typically for some of the acid coolers and autoclaves.

"We also manufactured a first-of-its-kind heat exchanger vessel for the mining industry that required the tube-sheet to be made from titanium explosion-bonded onto SAF 2507 super duplex stainless steel, so the product would be in contact with titanium on one side of the tube sheet, while the cooling circuit on the opposite side would be in contact with super duplex.

"In addition, for acid manufacturing plants, we are involved in manufacturing ducting that is subjected to extremely high corrosive levels, particularly during startup and shutdown periods. Alloys such as Alloy 20, Alloy 800 HT and C276 are used for the ducting. These are used in high temperature corrosive environments where the equipment surfaces see high temperature acids in both wet and vapour form," Ackerman explains.

On the welding side, he says ND Engineering is exploring handheld laser welding as a substitute for TIG welding. "But we are in the early stages. We are trialling the process to see how and where it can be best adopted. Our key automation focus is on the orbital side," he affirms, adding that the very latest Polysoude technology with AVC (automatic voltage control) is being used. "We now have over 120 different orbital welding procedures to draw on, for welding tube sizes from 12 mm right up to 50.8 mm in a variety of different materials."

On the manual welding side, he says ND Engineering is big user of flux-cored wires, having been an early adopter of flux-cored welding for duplex materials. "But our welders have skills and knowledge in every process, from submerged-arc and flux-cored all the way down to the different types of line welders running pulsed TIG, STT using Lincoln Electric's surface tension transfer process, and pulsed MIG.



Welding of the tubing for heat exchangers is now done using fully automatic Polysoude tube-to-tube sheet welding systems.

"We have a family of about 29 permanent welders at this facility with a further 10 available to us for site work. We are also strong on the training side. We always have a minimum 10 welders going through apprenticeship training, which we do in house and which stands us in good stead because we have developed a solid pool of experienced artisan welders who can now help with supervision and mentoring of new trainees," says Green.

"It is important to note that we can accommodate the full spectrum of fabrication work, from the simplest repair to the most complicated heat exchanger. We will never turn work away because it is too simple," Elvis Green assures. "We repair anything from spiral heat exchangers all the way down to oil coolers, and we are currently manufacturing 3 000 bubble caps for ion exchange resin columns in Australia.

"We have world-class credentials, but we are 100% service driven, so we are willing to help out on any fabrication issue, no matter how small or how big. We strive to be a reliable company partner that anyone can depend on for support and end product quality," Green concludes.

ND Engineering can also accommodate simpler fabrication work, such the current manufacturer of 3 000 bubble caps for ion exchange resin columns in Australia.

South African Steel Summit: golden opportunity to showcase welding prowess!

The SAIW is proud to partner with the South African Iron & Steel Institute (SAISI) and the Southern African Stainless Steel Development Association (Sassda) on the first South African Steel Summit, which will take place on 30 August 2023 at the Emperors Palace Convention Centre in Kempton Park, JHB.

The focus of the event will be the current state of the South African steel industry and the need for it to consolidate its competitive advantage. This is against the backdrop of the steel industry's intense distress during the prolonged Covid-19 pandemic and the resulting financial fallout, where many companies downscaled while others were forced to close, resulting in job losses.

Pressing questions

However, with the introduction of trade remedies, the question now is whether steel manufacturers can consolidate for a competitive advantage, or should the industry accept that the recent improvement in trading conditions was more of a fleeting event? Another pressing question is whether technology advancements are changing the landscape for steel and steel applications?

SAIW Executive Director John Tarboton, explains; "A core focus of the conference will be growing downstream industries, something of particular interest to our members and ISO 3834 clients. The focused panel discussions and technical presentations will allow for an NDT and welding-specific focus and the event will also give NDT and welding equipment and consumable suppliers the opportunity to showcase their products amongst a top tier audience."

The SAIW, in partnership with SAISI and Sassda, will be hosting the first South African Steel Summit on 30 August 2023 at the Emperors Palace Convention Centre in Kempton Park, JHB.

Conference format

To address these questions, the fact-driven one-day Southern African Steel Summit (SASS) will explore key inputs and topics influencing the competitiveness of the Southern African steel sector, demand and supply, cost implications for the next three years, and innovation.

The goal of this information-packed event is to provide conference attendees with an understanding of the Southern African steel market and the near-term outlook for steel. This will enable steel industry stakeholders to make informed decisions, build realistic budgets and forecasts, assess risks and investments, etc.

It will also provide an opportunity to interrogate challenges hindering sector growth, hear from policymakers, producers, buyers, suppliers, analysts and investors, and unpack the drivers presented by

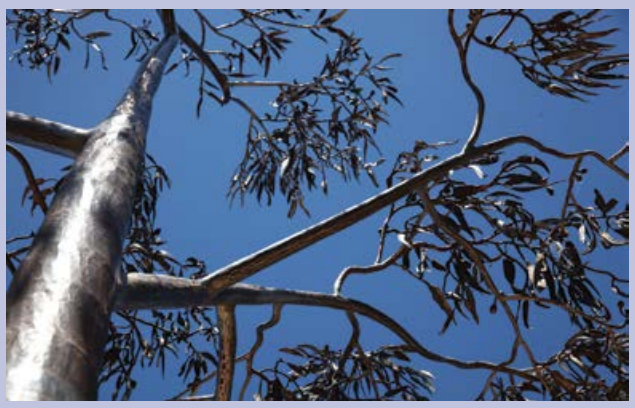
IIW launches 4th Digital Collection of Welded Art

The IIW's 2023 Digital Collection of Photographic Welded Art, which has the UNs 17 Sustainable Development Goals as the underpinning theme, has now been published and is available for viewing. The Collection involved the cooperation and collaboration of 36 artists and 36 exhibits from 16 countries.

"I would like to thank the artists for their valuable contributions to the Collection, which we hope will have positive effects around the world by helping to highlight some of the big issues that are at the forefront of our consciousness," said the Exhibitions coordinator, Chris Smallbone.

"This subject is very close to my heart. In line with fundamental humanitarian principles, any plan for improving the SDGs must have, as a main objective, the improvement of the quality of life and biodiversity in the country. A common purpose links people throughout the world: employment, security and health for their families, a decent roof over their heads, education for their children, food in their stomachs and a sustainable positive environment around them," he added.

iiwelding.org/2023-Digitalcollection



The Blacksmiths' Tree, developed by a collaboration of volunteer blacksmiths from all over the world under the leadership of the Australian Blacksmiths Association. Inset: Gumnuts & Leaves by Henk Welton. Photos: Amanda Grant.

industry experts. There will also be a focus on the advancements in technologies and applications that are guiding global and African development.

The Southern African Steel Summit will bring together decision makers from government, manufacturing companies, distributors, trading, steel mills, wholesalers, toll processors, and logistics from the Southern African region. Attendees will learn from experts in the fields of economics and market analysis, banking, commodities, international trade and regulation, and the auto, construction and energy markets, about topics critical to the Southern African steel market.

A Dual Programme format will be followed. The first stream will focus on steel supply and demand constraints in an ever-changing market environment, while the second stream will focus on the Technical Developments in welding and non-destructive testing techniques and the Development of Steels suited for developing applications.

"We are calling for relevant and compelling NDT and welding-focused submissions to be considered as presentations at the event, as well as exhibitors who would like to showcase their product and service offerings," says Tarboton. "Please contact me if you are interested."

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SAIW accredited training for Malawi's NDT sector

To enhance their technical capabilities and establish a testing and training centre, experienced professionals from Malawi have completed an intensive training programme provided by the Non-Destructive Testing (NDT) division at the Southern African Institute of Welding (SAIW).

The training initiative, supported by the International Atomic Energy Agency (IAEA), aimed to equip the students with the necessary skills and certifications in NDT techniques. The SAIW has been involved with the IAEA since 2000 as part of the African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA)

The SAIW, as the AFRA Anglophone Regional Designated Centre (RDC) for NDT, has been involved in the direct training of more than 160 NDT personnel in four methods up to Level 3 from more than 17 English-speaking countries in Africa.

Malawian expertise

The Malawian delegation was made up of Stephen Chalimba, Bill Gwaza and Christopher Kasonga from the Malawi Bureau of Standards, and Barness Mphande from the Malawi University of Business and Applied Sciences (MUBAS).

Chalimba highlighted the support received from the IAEA and the proximity of South Africa as major factors in choosing SAIW for training. He mentioned the potential for tapping into South Africa's expertise and specialised services after the training.

Gwaza also emphasised the significance of international welding accreditation for Malawi's welding sector. "Local Malawian industries are increasingly seeking experts with international qualifications for key new build and renewal/maintenance projects in key economic sectors, including the hydropower, agro-processing and mining industries. The establishment of international qualifications will provide Malawi with a competitive edge and meet industry demands," he explained.

A comprehensive curriculum

The SAIW training programme, which began in January 2023, covered a wide range of non-destructive testing techniques under the guidance of the SAIW's in-house NDT experts, including Personnel Qualification and Certification Manager Harold Jansen and Senior Lecturer Jan Cohen, who have provided valuable insights and instruction throughout the training sessions.

The students received theoretical and practical training in liquid penetrant testing, magnetic particle testing, radiography testing, ultrasonic testing, visual testing, and eddy current testing. The comprehensive curriculum enabled them to gain hands on experience and enhance their theoretical knowledge.

The Malawian students also completed exams for the Visual Testing Level 2 and Eddy Current Testing modules before concluding their training programme. The knowledge and skills gained during their time at SAIW will be instrumental in their future endeavours to enhance welding and testing capabilities in Malawi.

Forging future growth

Upon completion of the training programme, the students returned to Malawi and will now focus on establishing an NDT testing and training hub of excellence. The testing centre will be located within the Malawi Bureau of Standards, while the training centre will be located at the Malawi University of Business and Applied Sciences. This collaborative effort aims to ensure a seamless integration between the two facilities and cater to the growing demand for international welding accreditation and non-destructive testing services in Malawi.

Looking at the broader significance of the programme, the SAIW's Harold Jansen comments; "The collaboration between the SAIW and the Malawian institutions, supported by the IAEA, marks a significant step towards strengthening technical expertise and promoting international standards in welding and non-destructive testing in Malawi. With the establishment of the testing and training centre, the country is poised to meet the increasing demand for skilled professionals in key industries such as agro-processing, power generation, and petroleum.

"The acquired expertise and certifications of the Malawian students will also play a pivotal role in driving economic growth and ensuring the longevity of critical infrastructure projects in the country," he concludes.

www.saiw.co.za/saiw/ndt-courses

The NDT testing centre will be located within the Malawi Bureau of Standards.

Air Liquide SA showcases its total welding and cutting offering

On Friday June 2, Air Liquide held a Customer Demo Day at its Head Office in Alrode South Africa. *African Fusion* attended, and Mwali Kawawa, national business developer for Air Liquide South Africa, explained.

"At the core of our business at Air Liquide is a customer centric approach. We value our customers and have put in place several initiatives to measure and improve services to our customers. This Customer Demo Day is, first and foremost, to connect with you, our esteemed customers, and to introduce you to the wide range of welding and cutting products, solutions, and technologies we have on offer," began Mwali Kawawa, who is the company's National Business Developer, metallurgist and welding engineer.

He related a story about a visit to an irate customer in Durban, who was reluctant to switch to Air Liquide's ARCAL™ Speed welding gas. "When my colleague and I arrived on site, the customer said his welders did not want to use the proposed gas and wanted to keep using the existing gas. We reiterated that we had travelled from Johannesburg, and eventually convinced him to let us have a look at the entire welding operation to see if we could resolve the problem. We were assigned to one of his production managers and went into the plant to start investigating," Kawawa said.

"Without going into too much detail, by the time we left the welding application showed improvement. The whole production team was convinced that the measures we had put in place, which included the use of our ARCAL™ Speed shielding gas, were an ideal fit for the operation.

"As with any gas-shielded arc welding process, the shielding gas is just one of the welding process variables. Using our welding expertise, we were able to demonstrate changes to optimise welding. In doing so, we proved that Air Liquide is not simply selling gas and gas mixtures, we strive to deliver the solutions our customers need," Kawawa pointed out.

From a welding perspective, he said that the four 'simply high performance' shielding gases in Air Liquide's ARCAL™ New Generation range: ARCAL™ Prime; ARCAL™ Chrome; ARCAL™ Speed; and ARCAL™ Force, offered excellent value, since over 80% of the welding applications that required gas shielding could be successfully performed using one of these four gas mixtures. "This supports our approach to consider the total cost of ownership, which we call 'unlocking the hidden costs of welding' or UHCW™.

"We also have a simpler version of UHCW™ where we audit gas utilisation to improve production costs. As well as our extensive range of gas mixtures, we can offer three different supply modes for welding applications, including cylinders and bundles from our packaged gas range; dynamic onsite mixers for bulk installations; and over the fence supply through on-sites and pressure swing absorption technology. An Air Liquide audit can identify which of these options unlocks the hidden costs," he added.

Kawawa concluded his opening address with a quote from South Africa's human rights lawyer, George Bizos, who said that customers are like guests invited to a party and we are their hosts. "It is our job, every day, to make every important aspect of the customer experience a little bit better".

Willie Burger, National Hardgoods Business Developer for Air Liquide SA, demonstrates a high-tech TIG welding system on thin stainless steel plate.

Demonstrations in Air Liquide's Welding Room

From a house brand consumables perspective, Air Liquide offers its Ultra Arc brand of GMAW welding wires and Gemini SMAW electrodes. This is supported by premium brands for quality sensitive applications in the oil and gas and power generation industries, for example. Other key brands on display were Tyrolit cutting and grinding discs; and TBi GMAW and GTAW welding torches.

Customers had the opportunity to test the gas arc welding machines using Air Liquide's house brand Ultra Arc filler materials and the ARCAL™ shielding gases for the GMAW and GTAW processes. The Gemini SMAW range of electrodes was also used with the welding inverter machine on display. The Ultra Arc range consists of GTAW and GMAW filler materials used on aluminium, mild steel and stainless steel base materials whilst Gemini is for the

SMAW process and includes a cast iron and hardfacing range.

Showcasing Air Liquide's Connected Store

Developed locally, the idea underpinning Air Liquide's Connected Store is to couple Air Liquide's New Generation range of welding gases with a carefully selected range of welding consumables and equipment that can be made available on demand to construction and shut-down projects.

"The key benefit is customer convenience. Our Connected Store offers a mobile, one-stop-shop to welding contractors and fabricators. It is also ISO 3834 compliant with regards how we store and handle welding consumables to minimise moisture pick-up, most notably, submerged arc fluxes and stick electrodes," Kawawa said, adding that the Connected Store includes temperature and humidity controls and an electrode baking oven.

Earmarked mainly for maintenance work in the oil and gas, power generation, mining and railway industries, the store can be housed in a 20- or 40-ft shipping container, which is stocked with the welding supplies identified by the onsite contractors. "Our gas will typically be kept in an enclosed area, while the store itself will be stocked with a customised range of required welding and cutting brands and consumables" explained Mwali Kawawa.

Shelving inside the store can take up to 15 tons of product at a time, including welding and gas cutting equipment, torches, nozzles, regulators and flow meters; as well as welding filler metals and consumables, such as electrodes, wires and fluxes. Protective equipment (PPE) including gloves and welding helmets are also included, as are cutting and grinding abrasives for preparing weld edges and for cleaning up joints after welding.

In terms of brands, the Connected Store can typically be stocked with Harris gas equipment and consumables; Hypertherm plasma cutting equipment; a wide range of premium Oerlikon & ESAB welding equipment and consumables as well as TBi MIG/TIG torches and spares.

Kawawa went on to demonstrate the connected aspects of this supply solution. "First, we need contractors to register an account on the online system. We then allocate the consignment stock to each different contractor that wishes to use the Connected Store on that particular site. Once the account is registered, contractors can enrol any number of employees under the contractor's account, authorising them to take whatever they need from the store to complete their onsite work," he explained.

Air Liquide's Connected Store is a mobile, onsite and ISO 3834 compliant one-stop-shop for welding contractors and fabricators.

As well as shielding gas and arc welding consumables, Air Liquide's welding offering includes several brands of welding power sources for to suit every process and budget.

In the role of store manager, Kawawa logged himself into the system to demonstrate the transaction process. "The Connected Store is typically staffed by several store managers working on a rotational basis across a 24 hour-shift, each logging in at the start of a shift and out at the end. At any given time, enrolled onsite personnel will typically come to the store to purchase the equipment and consumables they need for the day.

"Using a fingerprint or a pin-ID, customers are authorised to draw what they need from the store for that day's work. The items are systematically traceable to the unique purchasing individual, which enables real time tracking and reporting accessible through a mobile phone or PC. Every item is linked to a job or shift number, and the specific batch or certificate numbers on consumables can be recorded before being handed over.

"The contractor also has access to an online portal, where the flow of resources onto the jobsite can be tracked and managed from anywhere using any web-connected device. This is for keeping track of costs and preventing overspending, which can be prevented by establishing historical records of what specific projects should cost," he said, adding that every transaction is immediately backed up online and made available to users.

Air Liquide's Connected Store offers ideal opportunities for organisations to band together to get access to everything they need without having to invest in their own stock, stores and inventory control systems. Together with Air Liquide, the combined needs can be established, the store can be stocked and quickly deployed to the jobsite.

"Our Connected Store makes it far easier for contractors to issue, control and track material use, in a modern, transparent, secure and cost effective way," Kawawa concluded.

airliquide.com

Assisting Africa in building-up national welding capabilities and progressing in the UN sustainable development goals

Chris Smallbone – IIW Fellow and ASR Honorary Member, IIW President 2005-2008, SAIW Fellow, SAIW Honorary Life Member, SAIW President from 1978 to 1979, WTIA Executive Director 1995-2014 and SAIW Executive Director from 1980-1994 – presents an abridged version of his Keynote presentation delivered at the 1st TWF Africa Annual Assembly and Conference held in Cairo from 14-17 March 2023.

As the world population continues to grow, the pressures on manufacturing, infrastructure and power generation, not to mention basic needs such as food, water, shelter, health and education, have become enormous common challenges.

The United Nations (UN) has 193 member countries and with the challenges of improving the quality of life in all countries, the UN has implemented 17 Sustainable Development Goals (SDGs) aimed particularly at low- and middle-income countries.

Africa has 54 of these countries and IIW has 51 Member countries constituting more than 80% of global GNP – the total value of goods and services produced by a country's citizens. Great opportunities for cooperation and collaboration exist.

The African Ministerial Conference on the Environment (AMCEN) recognises that natural capital underpins the continent's economy, affirms that using natural capital is a gateway to wealth creation and investments, allows for actions towards achievement of the United Nations 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs), and the AU Agenda 2063 through financial, economic, social, and environmental contributions.

Africa has major challenges on many fronts, particularly, however, with the economies of many of the countries being in prolonged low growth with high levels of poverty, inequality, and unemployment – especially amongst the youth.

The TWF Africa Annual Assembly in Cairo: from left: Hamed Abdel-Aleem, CMRDI; Ama Ikuru, NCDM; Grace Erhimona, PTI; and Iman El-Mahallawi, BUE.

The Welding Industry, IIW and African members

The welding industry is taken as those organisations and people:

- Involved with the total life cycle of welded products/structures including design, manufacture, fabrication, construction, conformity assessment, inspection and testing, operation, maintenance, repair and decommissioning including recycling, repurposing and other environmental conditions.
- Engaged in, or employing, any of the organisations or people involved above.
- Supplying welding equipment or consumables or materials to be welded.
- Involved with education, training, qualification, certification, research and development, work, health and safety (WHS), standards and industrial relations aspects of welding.

The Initial International Institute of Welding (IIW) model to assist African countries was proposed to the United Nations Industrial Development Organisation (UNIDO) in 1994, based on the South African Institute of Welding's world class achievements from 1979 to 1993. The IIW WeldCare Programme was also initiated in 1994 via IIW Working Group Regional Activities and Liaison with Developing Countries (WGRA).

Some excellent initiatives with UNIDO, International Atomic Energy Agency (IAEA), European Union (EU) and individual coun-

A group of TWF delegates from Nigeria and Uganda.

try support such as the UK and Germany, have taken place. IIW Members have also been active in creating IIW-Supported Educational Support Centres Networks and IIW Supported Technology Support Centres Networks, in Southern Africa, Southeast Asia, Southeast Europe, and Western Africa, for example.

Since 1948, the African countries that have been IIW Members include Algeria (64), Angola (154), Cameroon (134), Egypt (87), Ghana (110), Morocco (84), Nigeria (139), South Africa (108) and Tunisia (69), with the numbers in brackets showing the 2022 rankings given by the UN for each country to the total progress towards achieving the SDGs. The score can be interpreted as a percentage of SDG achievement. (Sustainable Development Report 2023 (sdgindex.org) .

The Southern African Institute of Welding (SAIW) and the Nigerian Institute of Welding (NIW) have played significant roles in promoting welding technology in Southern Africa and West Africa respectively.

SAIW (1997, 2006 and 2012), NIW (2009), the Central Metallurgical Research & Development Institute (CMRDI) in Egypt (2004) and the Centre Technique des Industries Mecaniques et Electriques (CETIME) in Tunisia (2010), have held very successful IIW International Congresses, and SAIW (2004 and 2018), NIW (2009), Egypt (2010) held technology innovation workshops as part of their technology transfer strategies in their national welding capability (NWC) plans and regional support.

NIW and SAIW have also been continental leaders in education, training, qualification and certification as IIW Authorised Nominated Bodies (ANBs) and IIW Authorised Nominated Bodies for Company Certification (ANBCCs)

South Africa (SAIW) and Tunisia (CETIME) became the two Regional Designated Centres (RDCs) for Non-Destructive Testing (International Atomic Energy Agency – AFRA) with the emphasis on training and certification of NDT personnel in over 20 countries throughout Africa.

Establishing a National Welding Capability (NWC)

Since 2013, the IIW NWC Project has aimed to assist a country's industry, government or IIW Member to achieve the following objectives:

- To identify the welding related needs in the country and provide solutions to ensure the country's future sustainability in relation to these needs.
- To implement its own NWC Project as a FLAGSHIP Programme.
- To identify the country's existing capability and consolidate the existing welding related 'building blocks' in the country to create the basis for an NWC.
- To analyse and identify the improvements required in the existing welding related 'building blocks' as well as what additional 'building blocks' are required in the country.
- To create the mechanisms and processes to establish and maintain the country's sustainable NWC, including the possible establishment or improvement of a national organisation or organisation's responsible for leading the promotion of welding and related disciplines.

Ayo Adeniyi, Chief Executive of the Nigerian Institute of Welding; Luca Costa, CEO of the International Institute of Welding, IIW; and John Tarboton, Executive Director of the Southern African Institute of Welding.

Such a lead organisation must: be correctly established; co-operate and collaborate with organisations and individuals; have adequate credible staff; be open to other NWC organisations; enable firms to access technologies; respond to demonstrated needs of industry; develop strong links with industry and agencies; provide ready access to NWC facilities and services; not unnecessarily duplicate facilities and services; seek to collaborate nationally and internationally to meet industry needs; and provide the forums/boards/committees for NWC organisations to participate in.

There is an identified lack of NWC planning globally. Much information has been compiled by the author to identify the key components required to develop such a plan and provide guidance on what it ought to consider. A particular focus on a potential response against each UN SDG can also be provided through this approach and could be adapted for a country-specific context.

On 4 March 2021, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) published a report titled *'Engineering for Sustainable Development: Delivering on the Sustainable Development Goals'*. (en.unesco.org/reports/engineering)

On a similar basis to the engineering industry, the welding industry is in a position to progress and improve the SDGs and the global quality of life for all. Examples of countries that have produced reports during 2022 on the progress of their NWC and SDGs include:

- Brazil, Brazilian Welding Association (ABS) and Uberlandia Federal University (UFU)
- Ghana, Ghanaian Institute of Welding (GIW)
- India, Indian Institute of Welding (IIW -India)
- New Zealand, Heavy Engineering Research Association (HERA)
- Nigeria, Nigerian Institute of Welding (NIW)
- Romania, Romanian Welding Society (ASR)
- South Africa, Southern African Institute of Welding (SAIW)

With an international perspective in mind, an IIW report titled "The Importance of a

The 1st TWF Africa Annual Assembly and Conference was held in Cairo from March 14 to 17, 2023.

Country's Welding Industry, Its National Welding Capability (NWC) and their Significance to the UN Sustainable Development Goals (SDGs)" is to be published during 2023 and distributed globally. An IIW Task Group has been established to achieve this.

NWC Flagship Programme

The International Institute of Welding (IIW) has linked its NWC Project and the SDGs so that strategies can be introduced by a country, including implementing a Flagship Programme with a single global focus: '*To Assist the Country to Establish, Sustain and Improve Its National Welding Capability and Progress its UN Sustainable Development Goals*'. Such a Programme may have many initiatives and projects associated with it, but all relate to this single global focus.

Five critical success factors for such a Flagship Programme involve its purpose; its specific niches to focus on, the resources available, its impact, and the key story, (corporate-citizenship.com>uploads>Flagship)

Possible Flagship Programme approaches could include the following.

- Each country's welding industry could work on its own in deciding what actions it will take if it so wishes. The welding industry could appoint its own Lead Organisation to implement a Flagship Programme in its country.
- A global cooperative and collaborative approach could be adopted between as many nations as possible, with an organisation such as IIW as the catalyst and lead to promote such a Flagship Programme, with each IIW Member also having its own country's Flagship Programme
- Welding industries in regional groups, such as the European Welding Federation (EWF), Asian Welding Federation (AWF), The Welding Federation (TWF)-Africa and South East European Network (SEENET), could lead and promote the Flagship Programme in their regions.
- Individual countries could simply assist another country by mutual agreement. There are many examples over the past three decades of how IIW member countries have previously cooperated and collaborated with developing countries.

Prioritised Industry Sectoral Projects (ISPs)

To succeed, it is essential that one must prioritise the strategies and projects to be implemented so that the resources and efforts are devoted to do the most good, with beneficial outcomes being realised in improving the NWC and progressing the SDGs. The initiative must be used to stimulate cooperation and collaboration both within and between countries at governmental, organisational and individual levels, to prioritise and target SDGs in conjunction with their national welding industries.

A targeted, prioritised industry sectoral project approach should be used, both for the NWC and for a number of SDGs, rather than a 'scattergun' approach. This should involve working nationally and internationally directly with leading firms, small and medium enterprises (SMEs), supply chains, education, training, qualification and certification organisations, research, and development (R&D) organisations, technology specialists in an NWC/SDG support centres (SCS) network, government departments, regulators and standards bodies, and aid and donor agencies.

An excellent example of a successful network bringing all such organisations together is the WTIA OzWeld Technology Support Centres Network. Linked to this were the industry sectors that would be involved in Industry Sectoral Projects (ISPs).

NWC business plan

An NWC business plan is essential, to continually clarify the thoughts and intentions of all NWC Project participants and as a roadmap in the efforts to create a successful NWC. It also assists a non-NWC person to understand why the NWC Project exists, what is expected from it, how it will achieve its expectations and the potential role for such a person in the NWC Project. Such people could include, amongst others: Government and aid agency representatives; a new NWC Project staff member; any person interested in any aspect of the NWC Project work; a new or potential participant in the NWC Project; or a new or potential member organisation.

The NWC business plan also improves the images of both the welding industry and the NWC by showing people that the NWC is a progressive, modern, pro-active, enthusiastic project worthy of support and involvement. It determines the required NWC Project resources, including staff, facilities, NWC Project membership, funding, and mentoring, amongst others, and it continually shows the value of, and return on, the efforts by all parties for the country.

Key areas identified in a country to assist in achieving the SDGs in conjunction with the welding industry improving its national welding capability include, amongst others, establishing or improving:

- The support infrastructure provided by the welding industry.
- Research and development.
- Technology transfer.
- National and international networks.
- Education, training, skills and careers.
- Qualification and certification of both individuals and companies.
- Appropriate cultures.
- Communications and marketing.
- Resourcing the strategies and actions required.

Since improving the NWC and SDGs may involve working with individual industry sectors, one approach is to use a Flagship Programme and an Industry Sectoral Project (ISP) strategy to cover both aspects

Industry Sectoral Project (ISP) needs analysis, solutions and information transfer

The first stage of an ISP needs analysis is

to analyse and define the key challenges, opportunities and requirements that will govern the competitiveness of the country's capability in each industry sector and identify specific areas where welding, joining and fabrication innovation and technology needs to be upgraded and transferred to improve companies' and the country's competitive advantage and market performance, including the effects on progressing the SDGs.

The second stage is to select ISP activities to meet the identified needs, demonstrate the innovation and technologies to be implemented and identify how the solutions can be implemented. How to document the activities, demonstrate the outcomes and disseminate the ISP activities to the wider industry follows. Activities for future actions needed can then be identified, including research, development, education, training, qualification, certification and standards development, which will also need to continually progress the SDGs.

The third stage will involve capturing all the appropriate information in transfer mechanisms such as key Expert Technology Tools (ETTs), Technical Guidance Notes (TGNs) and Standards for each technology/sector application/SDG and facilitate the ongoing transfer, uptake, tailored application and skills development by industry in each of the welding/joining/fabrication technologies/practices and SDGs identified through the ISP.

Some of the welding industry sectors identified in the SDGs include food, rail, road transport, water, pressure equipment, building & construction, energy, pipelines, marine platforms, pharmaceutical and medical devices. ISPs have been successfully implemented in countries such as the UK, Australia, Germany, Canada and USA, and outcomes could possibly be transferred into interested countries throughout the world.

Recommendations

1. TWF Africa should integrate the SDGs into its own policy making and accountability to provide a leading role and a blueprint for African cooperation and collaboration, not just amongst its own members, but also in remaining African countries.
2. The Welding Industry in each African country should publicly support its government's work on the UN Sustainable Development Goals.
3. The Welding Industry in each African country should agree on a Lead Organisation to establish a Flagship Programme with a single global focus: 'To assist the country to establish, sustain and improve its National Welding Capability (NWC) and progress its UN Sustainable Development Goals (SDGs)'.
4. The Welding Industry in each country should promote organisations in industry, government, and academia to improve their welding capabilities and SDGs and to integrate them into their policy making and accountability.
5. Where appropriate, an Industry Sector Project (ISP) approach should be used for improving the NWC and SDGs in a country.
6. Create business plans and prioritise the strategies and projects to be implemented, particularly in relation to the resources available in the country, so that the resources and efforts are dedicated to doing the most good and beneficial outcomes will be realised in improving the NWC and progressing the SDGs.

With the four attributes of Enthusiasm, Persistence, Cooperation and Collaboration, we can all work together in an excellent team effort to improve the quality of life of people in Africa and globally.

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Advanced NDT: a global perspective

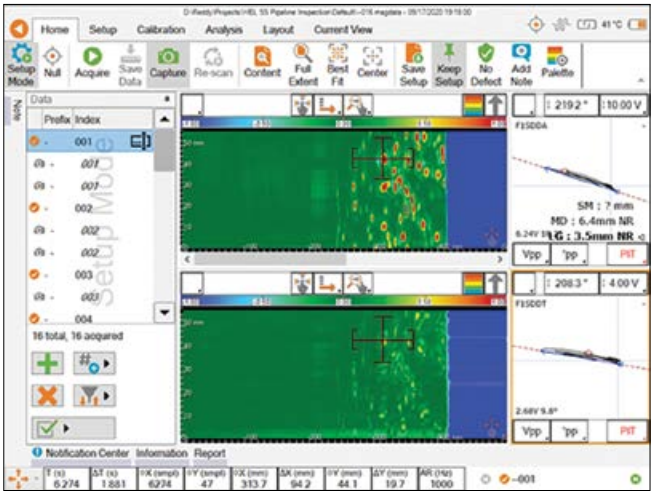
Grant Meredith, chief engineer at Eskom until the end of 2019, has now set up his own inspection business in the UK. He talks to *African Fusion* about the advancements in NDT he has experienced since leaving South Africa.

Having been a Certified Level 3 NDT Inspector for over 20 years – for industrial sectors from aerospace and power to oil and gas – Grant Meredith has been drawn to advanced NDT methods for his whole career.

"At Eskom I was responsible for NDT and looking into advanced NDT for the power utility's fleet. In 2019, though, I was approached by APPLUS+, which was looking for a suitably qualified technical manager – someone with ultrasonic and eddy current NDT Level III and advanced inspection experience. They also wanted a bit of radiography knowledge and competence in all surface inspection methods. I was offe red a contract and, within five months, found myself in Australia," Meredith recalls.

The position needed a cross-pollination of NDT technologies for clients upstream and downstream in the oil and gas industry, both onshore and offshore around Australia, and included taking care of contracts with Woodside Oil and Gas, Santos and Chevron. "My primary role as the company's NDT Level III consultant was to maintain the technical authority status of APPLUS+ NDT services, with an overview of all NDT operations. This included a feed-in role to assist hands-on, where required, and to stay on top of advancing technologies that could be applied in the field.

"My Australian team and I were also responsible for pitching new technological advancements to our oil and gas clients, most notably to Woodside. We were tasked with developing advanced inspection methodologies that could improve efficiency, reliability, and detectability, while ensuring safe plant performance and more efficient testing for NDT personnel," he tells *African Fusion*, before going on to describe some of the work he has been involved with.



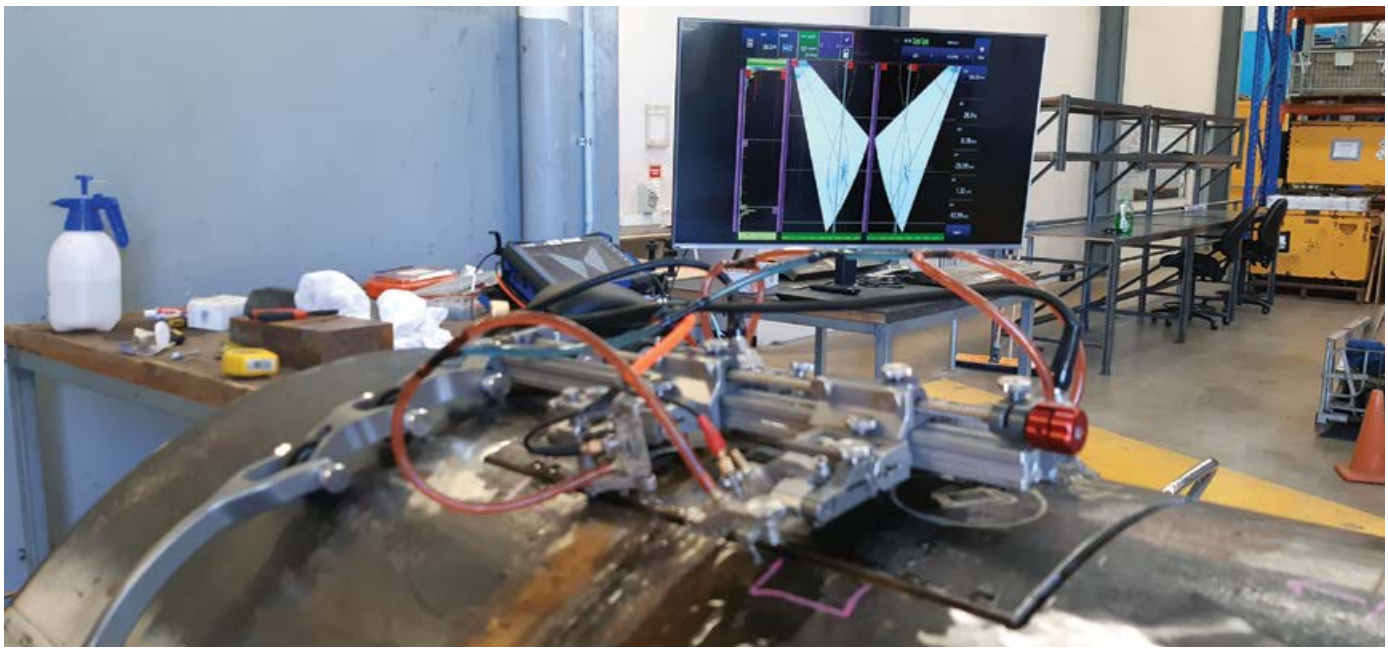
Eddy current array (ECA) testing can produce a single C-Scan overview of the surface condition, giving full length and breadth coverage of the test-piece surface.

Eddy-current array (ECA) testing

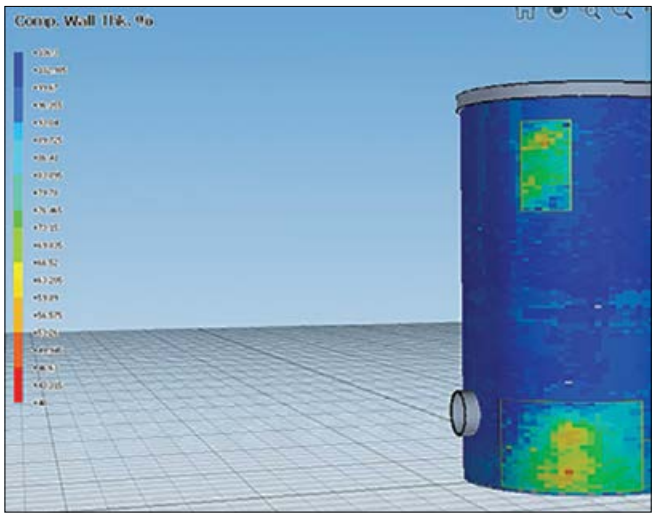
"Eddy current testing is a surface inspection methodology for surface breaking defects, primarily on conductive non ferromagnetic materials. An ac current in a coil is used to induce eddy currents close to the surface of the material. Any surface defect in the specimen disturbs the eddy currents and changes the impedance of the eddy current flow," Meredith explains.

Much like conventional eddy current testing, each test coil in the array generates a secondary electrical current in the test component and, once the system is calibrated for the size and depth of detection requirements, an impedance change can be sensed by any of the coils. The extent of the impedance change, from cracks, corrosion or even heat treatment is then displayed as a 2D map-type diagram called a C-Scan as well as a 3D C-Scan showing discontinuity amplitude.

"I was initially looking at providing an eddy current testing solution using array technology. Similar to ultrasonic phased ar-



A trial of a semi-automated phased array scan of a circular weld for a pipeline.



PEC is ideal for pipelines and vessels and is a "great technology for mapping the condition of an asset and giving an overall condition map".

ray technology where phased array UT has multiple transducers to cover larger areas in a single swept scan, an array of eddy current coils can be arranged into a single probe module and used to cover large inspection areas. Each coil communicates via various channels into one receiving unit and each indication can then be individually resolved to establish the overall condition– of an austenitic pipeline, for example.

"Using extrapolation, algorithms and analysis from all the data allows us to generate a single C-Scan overview of the surface condition, giving full length and breadth coverage of the test-piece surface," he tells *African Fusion*.

"The benefit is that, instead of testing one small area using conventional eddy current probes and multiple sweeps, you can cover a large area with an array of sensing coils. I was looking at pipelines for stress corrosion cracking (SCC) on 316 stainless steel in a marine environment, testing large surface areas for SCC on the client's pipelines," he notes.

"Typically, we will do a raster scan, along the length of the pipeline, to cover the entire circumferential area of the pipe, then the system can stitch different raster scans together to give full surface coverage. An NDT inspection team can typically cover 10s of m^2 area per shift and 100s of m^2 of area in an inspection campaign," he says. "We can detect pitting defects starting from 0.2 mm in depth and 1.0 mm diameter on 316 stainless steel, which is at the limit of detection capability for chloride stress corrosion cracking (CSCC)," he adds.

Grant Meredith and his APPLUS+ team did the initial trials and then introduced this technology to Woodside Oil and Gas: "They started mapping their pipelines to get a fingerprint or a baseline scan. From this starting position, they then looked to track degradation with time, so that they were constantly aware of the pipeline's surface condition in these extreme marine environments," he says.

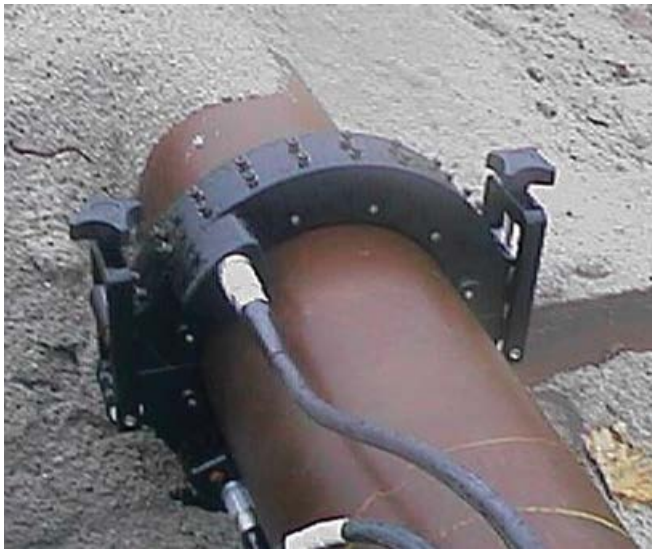
Pulsed eddy-current testing

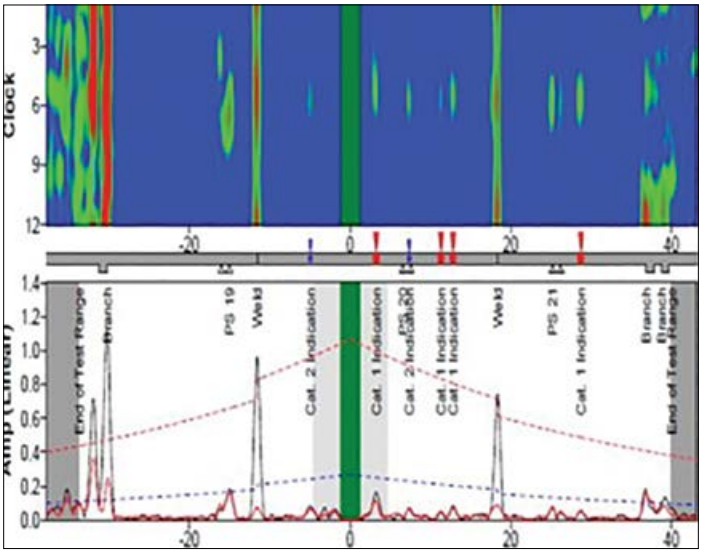
"If you consider pipes and vessels with lagging, though, you can create some strange and humid environments, particularly in offshore and marine conditions. This is where pulsed eddy current testing comes into play. To use conventional eddy current testing, including ECA or Phased Array corrosion mapping, the lagging on the pipe must first be removed," Meredith continues, adding that this led to a follow up project on the use of pulsed eddy-current testing that could offer a non-intrusive inspection alternative. "Pulsed eddy current systems can effectively penetrate through lagging to test the pipe surface underneath, which makes it a truly non-intrusive method for lagged pipes," he explains.

Pulsed Eddy Current (PEC) is an electromagnetic inspection technique used to detect wall loss on ferromagnetic lagged assets. It provides a volumetric measurement based on the footprint size of the probe used and the standoff. The resulting pulse is converted into an average wall thickness measurement in the probe's footprint area.

PEC generates a magnetic field by electromagnetic induction from the electrical current in the coils of the probe. The magnetic field penetrates through the stand-off: namely, lagging, concrete, insulation with a weather jacket or marine growth. When the signal is cut off after a pulse, it induces eddy currents in the inspection item. The rate of signal decay is then processed using an advanced signal processing algorithm, which is then displayed as an average thickness reading over the footprint of the probe.

PEC will tell you where the defects are, and you can then cut off the lagging in only that location if you need to size or repair them," he explains. "More to the point, if you test using a smaller footprint probe, you are able to detect a smaller discontinuity. If the probe footprint is bigger, it becomes more like looking for a needle in a haystack. If looking for pitting, you are not going to find it, but for corrosion patches, like 'lakes' – generally defined





Guided wave UT with the ultrasonic array built into a ring and clamped in a fixed position around the outside of the pipe, is able to test for corrosion very quickly over long distances.

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has having a three to one area to depth ratio – then pulsed-eddy current will find it," he adds.

In summary, he says the detectability is different, but PEC can give a good overview of where problems might be and it is a "great technology for mapping the condition of an asset and giving an overall condition map".

Also, though, Meredith says the method is not limited to pipelines. It is also ideal for vessels. "Pulsed eddy-current testing is starting to be used to support risk-based inspection (RBI) and is a great tool for the application of artificial intelligence (AI) and machine learning. It can be done while a vessel is online, lagged and at operating temperatures and pressures, and once the scan is done and the data collected, the vessel can be analysed with the results kept for track and trend purposes," he informs *African Fusion*, adding that this allows NDT operations to be better aligned with engineering operations.

Long range or guided-wave ultrasonics

Another application of ultrasonic testing is using guided-wave ultrasonic technology. A particular application is using a ring coupled with sensor-receiver transducers, typically using clamps around the pipeline circumference. These transducers pulse and receive bulk waves, forwards and backwards along the pipe. "With the ultrasonic array built into a ring and clamped in a fixed position around the outside of the pipe, we are able to test for corrosion very quickly over long distances.

"A torsional ultrasonic wave is sent in an axial direction through the thickness of the full circumference of the pipeline under interrogation. The guided wave is sent in both directions and, depending on the type of fault being looked for, the coating and the condition of the pipeline, whether buried or above ground, and the bends in the pipeline, we can test lengths of 60 m in the forward and backward directions from the ring location on the pipe," he says adding that the process is ideal for finding severe incidents of corrosion.

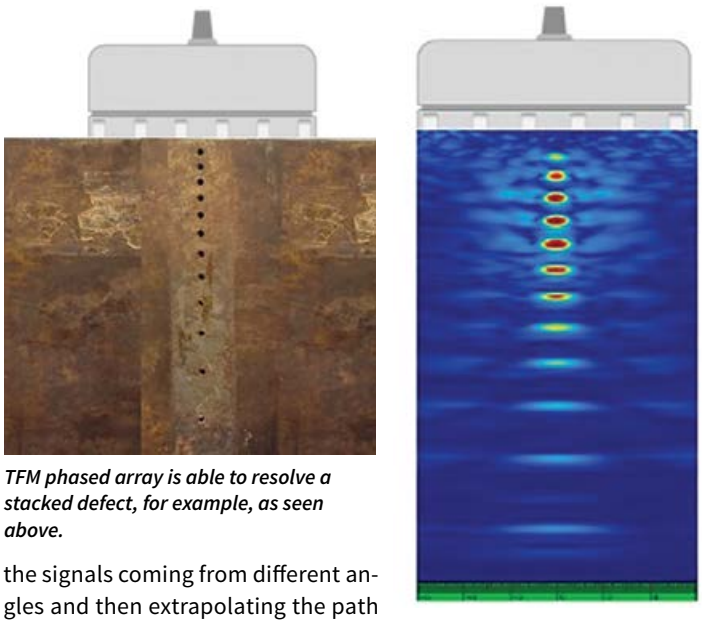
"The signal will be attenuated by pipe bends, buried pipelines and by various protective coatings, and in these cases, significantly shorter lengths of inspected pipeline in one scan are achieved. While it does not test welds, it does screen for general corrosion and corrosion under simple pipe supports over large distances. And any anomalous areas can be identified and quantified ," Meredith adds.

Total focusing method (TFM) phased array

"For automated pipeline inspection on a circumferential weld, for example, you would often run tandem inspections using two sets of phased array probes. This automation allows for long sections of welds to be scanned in a single pass with all the data acquired for a weld in one test run. An advancement of phased array technology called the Total Focusing Method has taken inspection results further," he tells *African Fusion*.

"This new phased array method involves a pitch-catch scenario. Essentially, all the ultrasonic sending elements on the array are fired at the same time, but while in traditional phased array UT the element that sends the signal is the one that that receives the return signal, with the total focusing method each transducer sends one pulse and return or echo data is collected by every other receiver in the array.

"If you have a 64 element probe, for example, every element fires one pulse and listens to 63 returning signals. The amount of data is therefore massively magnified. When you have a stacked defect, for example, you are able to resolve it with TFM, not by changing from the principle of pulse-echo, but rather by catching



TFM phased array is able to resolve a stacked defect, for example, as seen above.

the signals coming from different angles and then extrapolating the path length and the time of flight of each signal to place the returning echo indication at an exact position relative to its location.

"The fundamental principles of ultrasonic testing still remain, it's just about manipulating pulsed and received signals and using software to magnify and improve how the acquired data can deliver more detail," he explains. "this is particularly beneficial when inspection is carried out on thicker parts with U-prep welds and when testing exotic materials"

"I stand by the principle that as advanced as companies want to go, one must always be able to take the inspection outcome requirement back to basics. Sometimes simple visual inspection or penetrant testing may provide the desired results rather than applying an advanced and often expensive inspection methodology. The first port of call is to keep the testing as simple and understandable as possible.

"The fundamentals for all of the inspection methods remain essentially the same but the application of advancing technologies improves these systems for clearer outcomes. We now also have drones to improve accessibility; and array probes to improve efficiency and sensitivity; and advanced connectivity and software for collecting and processing the data we acquire," Meredith concludes.

Grant Meredith

Grant Meredith began his NDT career with Unit Inspection in South Africa back in 1989. He then spent 10 years working in the aerospace sector; for Denel Aviation, Hawker Pacific and Honeywell Aerospace, before joining Applus Velosi Steel Test for a further six years. In 2005, Meredith started Pulse Inspection Services to offer NDT Level III Consultancy services to all sectors of South African Industry.

In 2016, Meredith was appointed as chief engineer for Eskom Holdings SOC Ltd, a post which he held until December 2019. While there, where he pioneered the use of phased-array UT as a direct replacement for radiographic testing (RT) in Eskom's boilers.

He left South Africa to join Applus+, a worldwide leader in the testing, inspection and certification sector, first in Australia and then in the UK, where he continues to develop and implement new techniques, mostly for oil and gas installations. Grant is in the process of starting up his own inspection company to take his experience and knowledge base to apply it directly into a range of industrial sectors in the UK and Europe.

Usability a critical factor in long-term welder

This white paper, by Thomas Hold of voestalpine Bohler Welding, discusses the importance of welding machine usability – for efficiency, quality welds and, ultimately, welder satisfaction – and the various factors that contribute to it.

Welding machines are essential tools in a wide range of industrial applications, from construction and manufacturing to shipbuilding and repair. The usability of these machines can have a significant impact on the efficiency and quality of the welding process, and thus on the overall performance of the industry.

A good welding machine is characterised by several factors, including:

- POWER OUTPUT: Measured in amperes (A), the output is an important factor to consider when selecting a machine. It determines the size of filler metal and thickness of the material that can be welded and the type of weld that can be performed.
- DUTY CYCLE: The amount of time a welding machine can be used continuously before it needs to cool down. A higher duty cycle means a more efficient and reliable machine.
- PORTABILITY: An important consideration for those who need to move their welding machine from jobsite to jobsite.
- VERSATILITY: A versatile welding machine can perform a variety of welding processes, such as GMAW, GTAW (with high frequency arc ignition) and SMAW.
- QUALITY OF THE WELD: A good welding machine should produce consistent, high-quality welds, with minimal splatter and no porosity, undercut, pores or any other common defects.
- PRICE-PERFORMANCE-RATIO: The price of welding machines can vary widely, so it is important to consider the budget and what features are most important before making a purchase.
- BRAND REPUTATION: Consider purchasing a welding machine from a reputable brand with a history of producing high-quality products and providing good customer support.
- SAFETY FEATURES: Welding can be dangerous, so be sure to look for machines with built-in safety features, such as over-voltage protection and thermal overload protection.
- WARRANTY: Consider the warranty offered by the manufacturer, as this can give you peace of mind and protection against potential defects or problems with your welding machine.
- Ease of Use: A good welding machine should be easy to set up and use, with clear controls and intuitive settings.

The usability in welding machines

Usability, defined as the ease of use and learning of a product, system, or service, is an important factor in determining the success and widespread adoption of a technology. For welding machines, usability refers to the ease with which operators can use the machine to perform welding tasks and the speed with which they can learn to use it effectively. This applies to actions such as finding the right welding parameters or switching between different operating modes.

The TERRA NX welding system comes with seven proprietary Böhler Welding processes and up to 600 welding programs.

Several factors contribute to the usability of welding equipment, including ergonomics, user interfaces, customisability, connectivity, and the availability of documentation and training.

Ergonomics: Ergonomics is a critical aspect of welding machine usability, as it directly affects the comfort and productivity of the operator. Welding machines can be heavy and cumbersome, and they often require operators to work in awkward positions. A well-designed welding machine should have ergonomic features that reduce the physical strain on the operator, such as adjustable height, easily accessible controls, and well-placed handles.

User interfaces: The user interface is the primary means by which the operator interacts with the welding machine. A user-friendly interface should be intuitive and easy to understand, with clear, concise labelling and well-organised controls. The interface should also provide feedback to the operator, such as status updates and error messages, to help them understand the machine's current state and take appropriate action.

Customisability: The level of customisability of welding machines can be an important factor for a variety of users, depending on their specific needs and requirements. Here are a few reasons why customisation may be important:

Welding machines can be connected to various automation devices, such as robots or cobots, to enhance their capabilities.

satisfaction

- Improved efficiency: Customisation allows welding machines to be optimised for specific applications, resulting in improved efficiency and productivity. Böhler Welding enables you to choose from a wide range of power sources, wire feeders and software packages to meet your current needs. But even if your needs change over time, you can still upgrade the performance and versatility of your welding equipment.
- Increased safety: Customisation can add safety features to the machine, such as emergency stops or safety barriers, which can help to prevent accidents and injuries. Uranos and Terra welders work with standardised bus systems that allow you to connect the machine to a variety of welding automation devices, including safety systems.
- Better weld quality: Customisation can help to ensure that the welding machine is set up correctly for the specific application, which can result in improved weld quality and consistency. The fact that Böhler Welding offers a huge portfolio of filler metals and has specially designed Synergic programs associated to our filler metals available for our equipment, makes a perfect weld easily achievable. The symbiosis of machine, process and consumables makes it possible.
- Enhanced user experience: Customising a welding machine to the specific needs and preferences of the user can make the machine easier and more enjoyable to use, improving the overall user experience. When you customise your welding program or the design of the welding display that can store different jobs on the machine, you are ready to weld as quickly as you are ready to select your favourite channel on your television.

Connectivity: Welding machines can be connected to various automation devices to enhance their capabilities and improve the overall efficiency of the welding process. Some common welding automation devices and the methods used to connect them to welding machines are:

- Welding positioners: Welding positioners are devices that precisely rotate and/or position workpieces. They are typically connected to welding machines through a control panel that allows the welder to control among others, the speed and direction of the positioner.
- Welding robots: Welding robots are multi axis automated systems that perform welding tasks using pre-programmed instructions. They are connected to welding machines through a control system that can be operated through a computer interface.
- Welding columns and booms: Welding columns and booms are multi axis devices that provide a flexible, adjustable platform for positioning welding heads over workpieces. They are connected to welding machines through a control panel that allows the welder to control welding parameters in addition to the movement and positioning of the device over a workpiece.
- Welding carriages: A welding carriage is a device that is connected to a welding machine and is used typically for linear welding applications. Use of welding carriages makes it possible for the welder to comfortably carry out long weld seams with consistent positioning of the carriage-mounted weld head over the weld joint and to adjust the weld parameters as required during welding.

Documentation and training: Adequate documentation and training can also greatly affect the usability of welding equipment. Each machine should be accompanied by a comprehensive manual that provides step-by-step instructions for setting up and using the machine, as well as troubleshooting information. Training should be available for operators, either in person or online, to help them understand how to use the machine and get the most out of it.

Conclusion

Usability is an important factor in the design and acceptance of welding equipment. By considering ergonomics, user interfaces, customisability, connectivity, and the availability of documentation and training, manufacturers can create welding machines that are easy to use, learn and maintain.

This ultimately leads to increased efficiency, quality welds and better long-term welder satisfaction.

www.voestalpine.com/welding

The user interface is the primary means by which the operator interacts with the welding machine.

Ergonomics is a critical aspect of welding machine usability, as it directly affects the comfort and productivity of the operator.

Efficient Engineering: world-class quality, capability and experience

African Fusion **visits the fabrication facilities of Efficient Engineering in Tunney, Germiston and talks to Gerhard van Zyl, business unit manager for Pressure Vessels; Gary Colegate, the company's COO; and its Quality Manager and Welding Engineer, Dries Vandezande.**

Efficient Engineering was first established by Giuseppe Cimato back in 1968 as a small general engineering and fabrication shop manufacturing seat frames and operator cabins for forklifts, customised trucks, and mobile materials handling equipment. "Tony Cimato, our current chairman, joined his father in the business in the early 1980s, then slowly took over as the business expanded," says Gary Colegate, chief operating officer for Efficient Engineering. "In 2007, 2008 the business started to get really big, so they built the first of five new facilities based in Elandsfontein in 2009.

One of the company's key longstanding successes has been with a leading local OEM, initially on the refurbishment of large dump truck (DT) bodies for the opencast mining industry. "We have been working with this specific OEM for over 30 years, and the business is still strong and growing today, particularly since we started moving into the fabrication of new DT type bodies for Komatsu and other overseas OEMs," says Colegate.

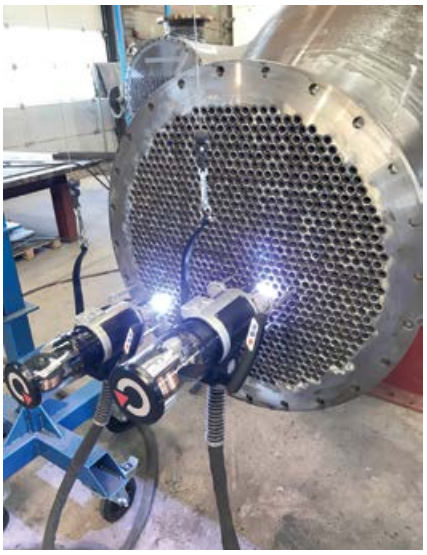
"Interest in our capability in the manufacture of yellow metal components for leading global OEMs continues to increase, partly driven by the DTiC's Equity Equivalent Investment Programme (EEIP), which was created for multinationals whose global policies prevent them from complying with the ownership element of B-BBEE," he explains.

As part of its expansion, Efficient Engineering also became a go-to fabricator for locally manufactured materials handling equipment such as ship loaders, stacker reclaimers and drum reclaimers for Southern Africa's mines, ports and power stations. "With the exit of certain OEMs from the South African materials handling business, and based on our experience of the past, which has been quite substantial, we are now seeing potential growth opportunities for this side of the business," Colegate adds.

Gerhard van Zyl, the pressure vessels business unit manager continues: "RMB Corvest bought into Efficient Engineering as the majority shareholder in 2010, and immediately saw the need to start diversifying from being solely dependent on the mining industry. The obvious choice was in pressurised equipment for the oil and gas industry; so, in 2012, I was invited to start this division," he says.

Today, Efficient is a leading local manufacturer of critical process equipment for the oil and gas industry, providing pressure vessels, process columns, shell and tube heat exchangers, air cooled heat exchangers and piping that is fully compliant with the industry's national and international codes, standards and specifications.

Operating out of three large heavy engineering fabrication facilities in the Tunney Industrial estate in Elandsfontein, Germiston, South Africa, the company now offers engineering, steel fabrication, machining and manufacturing to world-class standards, for South African clients and, increasingly, to mining clients across Africa. "Our African market is growing," says Colegate. "We are seeing export opportunities that we haven't participated in before. We are currently investigating the options to set up local facilities to service several African countries and we expect exports to start contributing substantially to our turnover in the near future," he tells *African Fusion*.



Efficient Engineering has purchased two state-of-the-art Polysoude orbital tube-to-tube sheet systems, which can each manage two independent welding heads.

The company has invested in a new fleet of water-cooled UNIARC SYNERGIC500 MIG/MAG welding machines that are locally assembled and supported in South Africa by Renttech.

Investment in welding productivity and quality

Efficient Engineering is currently involved in an extensive investment drive to better meet growing demand for high quality equipment to OEM-specified international standards. "We have embarked on a R55-million investment programme in new welding machines, large horizontal boring machines and other equipment to deliver the better productivity and quality our customers need," says Dries Vandezande, the company's Quality manager and one of the company's three in-house IIW-Certified welding engineers.

At the start of this investment is a new fleet of 33 water-cooled UNIARC SYNERGIC500 MIG/MAG welding machines that are locally assembled and supported in South Africa by Renttech. "In addition, to advance our tube-to-tube sheet welding capability, we have purchased two state-of-the-art Polysoude orbital tube-to-tube

Efficient Engineering is a leading local manufacturer of critical process equipment for the chemical and petrochemical industry, providing pressure vessels, heat exchangers and piping.

sheet systems. As well as delivering far better repeatability, we are looking for better mechanical properties on our boiler and heat-exchanger welds, because these are increasingly manufactured from critical steel types that require precise welding heat input. These orbital machines, which can each manage two independent welding heads at the same time, will put us on top of a niche market for fabricating high-end pressure equipment," he says.

Gerhard van Zyl continues: "With the current investment in the tube-to-tubesheet orbital welding machine, we now have the opportunity to further expand on the automation of pipe welding seams by simply adding welding heads to our current equipment. This will help us to produce better pipe welding seams. A wide range of pipe and nozzle sizes can be accommodated and, compared to having to do a manual TIG root and several stick filler passes to complete a pipe or flange weld manually, followed by extensive fettling, the Polysoude machine will be able to produce sound welds more quickly and more consistently, without the need for post-weld repairs," he tells *African Fusion*.

"We are also investigating the use of robots to improve productivity for the dumper truck bodies," continues Vandezande. "Initially to manufacture replacement ribs, which are high volume components with a relatively simple section. From there, we will investigate if a robot is suitable for any of the other manually welded components we need," he says.

"The underpinning idea for all of these investments is to use modern technology to raise quality levels and to put ourselves in front of other competitors in terms of productivity and capability," he suggests, adding that, like every fabricator in the highly competitive modern world, there is a need to offer more while reducing costs and improving quality.

As an ISO 3834 Part 2 certified welding fabricator for over 10 years, Efficient Engineering holds fast to the belief that weld quality needs to be systematically built into every part of a product through a properly implemented weld quality management system. "If you create a quality focused culture right from the beginning of a project and follow it through all the way to the end, you are sure to pass any certification audit. The ISO 3834 certificate it not just a badge, though, it tells our clients about the systematic way we go about controlling how every weld is done on the shop floor to ensure procedures have been followed and the quality requirements have been met. In addition, it assures that full proof and traceability of the process is recorded and available through the paperwork," he advises.

Van Zyl continues: "Working in the petrochemical industry really pushes us to make certain that all the paperwork for the welding quality system is in one place, so working in this way is a norm in our organisation. We take the same approach with the mining equipment, which doesn't always have the same high-level quality requirements.

"Also, 95% of major chemical companies require their fabricators to be ISO 3834 certified. If you are not certified, you won't get onto the approved suppliers list," he points out. "We often need to comply with ASME Appendix 10 as well, and while this is often overlooked, the South African Pressure Equipment regulations (SANS 347), which is part of the OHS Act, specifies that all equipment under pressure must be manufactured according to a weld quality system equivalent to ISO 3834," he adds.

For all welding activities, Efficient Engineering enforces its quality system. "We always have a procedure specification (WPS) that the welders must follow and we call for hold points when inspection must be done," says Dries Vandezande.

"So for all welding activities in Efficient Engineering, we enforce our quality system: we always have a procedure specification (WPS) that the welders must follow and we call for hold points when inspection must be done, etc, etc," adds Vandezande.

"We are very fortunate to have three fully qualified welding engineers working for us full-time, which many other fabricators have to contract in. Implementing our quality standard and delivering quality end products, differentiates Efficient Engineering from the other companies," continues Van Zyl. "We have in-house people who love welding and who are continuously ensuring that good decisions are being made based in the best interests of Efficient Engineering and its clients.

"That is why we are called Efficient," says Gary Colegate. "As well as being certified in all aspects of safety and quality, we have a flexible, dynamic, well qualified and very experienced management team that runs a very professional operation. We have managed to grow this business in very difficult times and I am pleased to say that we are now well positioned for a new era of growth.

"We are a highly respected fabricator and know we can stand proudly among the best in the world," Gary Colegate concludes.

www.efficient.co.za

ESAB innovations for reducing welding costs

African Fusion **tours the new premises of ESAB Southern Africa in the Tunney Ridge Business Park in Germiston and talks to Chris Eibl, Managing Director of ESAB South Africa, about the innovations being introduced to help local fabricators to reduce costs and improve productivity.**

ESAB South Africa's MD, Chris Eibl, begins by confirming that the move into new premises in the Tunney Ridge Business Park is now complete. "Everything in our modern and brand new 5 000 m^2 facility is in place. We moved into the new offices in October last year; our warehouse stock moved over to the new distribution centre on this site in January; we added the Training and Demonstration Centre in February; and in April, we opened our very first walk-in ESAB Retail Centre for direct sales," he tells *African Fusion*.

"We have also opened another retail outlet in Port Elizabeth, with Cape Town and Durban following shortly. And as word-of-mouth spreads, people are coming," Eibl adds.

ESAB, being the world's leading welding brand, has a full range of equipment and consumables to suit welding and fabrication tasks from simple to advanced. "People are pretty tired of getting stuck with low cost, poor-quality products. They are increasingly realising that it actually costs more money to buy at the lowest cost than it does to buy a quality brand that is specified for exactly what the job requires," he argues, adding that ESAB's current success is directly related to this quality and performance strategy.

"We sell product combinations that offer the best possible chance of a successful outcome, " he says. "In principle, this simply comes down to the basics: having the right quality products at the right price at the right time. Local presence in South Africa is also important. We have an extensive local support network, which includes technical support for welding processes as well as comprehensive aftersales support for the equipment we offer," says Eibl.

And while the welding market in South Africa has shrunk in recent times, Eibl says ESAB continues to do well. "Consumables remain the mainstay of our turnover, and we are exporting significant quantities into sub-Saharan Africa, particularly from our stick electrode range. In South Africa, we are still finding a strong stick market, but a lot of customers are also looking at semi and fully automated welding systems. I believe we have an amazing automation range," Eibl tells *African Fusion*.

At the heart of the current automation range is the ESAB 500 ix multi-process welding power source, which is a portable, heavy industrial pulse power source with a robust and reliable mechanical design. "Together with the all-new RobustFeed U82, this is a perfect solution for demanding pulse applications," he says.

The Aristo 500ix is built tough while providing clearance and making the unit fit for use in the toughest environments. Large side panels provide easy access for service and maintenance. The 500ix also comes with a sturdy cart, dedicated crane lifting points, a torch holder and large cable holders. "For those looking to take advantage of the high productivity, quality and competitiveness that automatic robot solutions can now offer, we typically couple our Aristo 500ix with industrial or collaborative robots from Yaskawa or ABB," he says.

"Also on its way – from Quarter 1 of 2024 – is the Warrior 500 Edge, which will become our new flagship." Redesigned with productivity in mind, the Warrior Edge has streamlined interface suitable for welders of all skills levels. No extensive training is needed and intuitive setup makes quality welds easier than ever.

It is also smart: It can memorise jobs for repeat use; and it incorporates a Smartcard login system to lock the machine onto specific welding procedure settings, for example. In addition, the new Warrior Edge range comes with ESAB's WeldCloud capability built in.

"Fabricators are increasingly under pressure to raise productivity levels and cut costs. We've recently done several demonstrations on the benefits of our InduSuite

ESAB South Africa opened its first walk-in ESAB Retail Centre for direct sales in April 2023.

At the heart of EASB's current automation range is the ESAB 500 ix multi-process welding power source, with the all-new RobustFeed U82.

An ESAB Eagle CS cutting system in the Training and Demonstration Centre of RESAB South Africa's new Tunney Ridge Head office and distribution centre.

ESAB offers extensive local support for South Africa, which includes technical support for welding processes as well as comprehensive aftersales support for the equipment on offer.

range of digital solutions, which can help organisations to better understand their true welding productivity levels. We have found that when people think they are achieving 25 to 30% arc-on time from their welding operations, analysis reveals that they are actually running at under 10%. That is scary. And doubling or tripling up on productivity, even from a low base, can have a profound effect on welding costs.

"Using this data-driven approach, one can start to understand where the bottlenecks are and the issues that need to be addressed to overcome them. But if you don't have the data, you can't make informed decisions. Looking forward, we need to keep migrating the South African market into the digital age of welding, which the rest of the world is adopting quite rapidly," Eibl points out.

From a cost perspective, he says that ESAB is offering a R3 000 per month rent-to-own option on InduSuite system hardware, which, he estimates, is less than most people spend on a monthly cellphone contract. And improved productivity and lower costs of a welding operation will very quickly cover the monthly costs of deploying this system," he assures, adding that after 36 months, the hardware becomes wholly owned by the user, who then only needs pay an annual subscription fee for the WeldCloud software packages – WeldCloud Productivity and WeldCloud Fleet#, for example.

Another key feature of modern ESAB welding equipment is Eco Power technology, which minimises energy losses during welding and while idling: "ESAB spends millions of euros in R&D to get its facilities and its welding equipment operating at optimal energy efficiency. All our new machines now include Eco Power technology, which improves the energy efficiency of welding by a minimum of 20% compared to traditional inverter technology. Further, if you compare this saving to older generation transformer-type machines, 50 to 70% energy savings can be achieved.

"If this technology were adopted by the whole of the South African welding market, imagine the electricity savings. We could literally drop one or two loadshedding stages, just because of reduced demand from welding machines," he says, adding that on one trial using a Warrior 750i, ESAB's Eco Power unit was 27% more energy efficient than a competitor on a like-for-like welding procedure. "If you calculated the savings based on reduced energy use alone, the payback period on a machine can be between six months and a year, while it will also contribute to reducing demand for electricity and carbon emissions," Eibl adds.

Another innovation embedded into ESAB's modern wire feeders is TrueFlow, which automatically optimises the gas flow through the welding torch. TrueFlow prevents unnecessarily high or dangerously low gas flow rates and optimises consumption during arc starts and during welding. "Savings of 20% on shielding gas bills are being achieved," Eibl suggests, with typical use cases amounting to US$600 to $1 200 per year.

"Innovation and change is happening, predominantly from Europe and America. We are fortunate to be able offer to our customers the benefits of these modern solutions. We believe that using the best, and most efficient welding equipment and consumables will deliver the best results and the highest productivity, which will ultimately deliver the lowest total unit costs for any welding operation," says Chris Eibl.

"It is not what a solution costs that matters most, it is what welding it can do, what productivity it can deliver, and how much it can reduce the costs of each weld seam," he concludes.

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Maintenance projects lead to Steinmüller innovations

Welding Operations Manager, Morne Kidson, and Divisional Manager, Leon Olivier talk about innovations such as explosive welding that have emerged at Steinmüller Africa as a result of its OEM and plant maintenance history.

In 2016 Steinmüller Africa completed a planned maintenance project for state-owned national oil company PetroSA's Mossel Bay-based Gas-To-Liquids refinery in the Western Cape. Steinmüller Africa Welding Operations Manager, Morne Kidson, explains that the scope of work involved replacing the internal coil U section of the Synthol Reactor, and structurally replacing and welding all the pipe components. The outside diameters of the pipes varied from 40 to 90 mm with the wall thickness varying between 3.0 and 25 mm.

Divisional Manager, Leon Olivier, explains that the Vaal workshop services Sasol Secunda during shutdowns. "We maintain Sasol's La Mont Boiler at its Nitric Acid plant, which entails boiler-making plate work and welding pressure and non-pressure parts, as well as the supply of fabricated stainless steel plates from our workshop in Sasolburg," he adds.

Additionally, Olivier notes that Steinmüller Africa is an original equipment manufacturer (OEM) for various state-owned power utility boilers and has ongoing boiler and high-pressure piping maintenance service contracts at 11 coal-fired power stations.

Kidson highlights the increasing demand for explosive welding technology during the maintenance of high-pressure heat exchangers at power stations. "Explosive welding is used to fuse tubes to tube plates or headers in high-pressure heat exchangers. It is performed when a tube is propelled against the tube plate material using the energy from an explosive discharge. In the process, expansion and fusion occur due to the high-energy impact rate," Kidson explains.

Ageing coal-fired power stations, such as Kriel and Arnot in Mpumalanga, had several heat exchangers that needed to be refurbished/replaced. They weigh several tons and have up to several thousand tubes that needed either to be plugged during maintenance or replaced during refurbishment. "Since traditional welding methods are time-consuming, explosive welding, with a weld metal travel speed of more than 8 000 m/s, reduces welding time, plant downtime and relative repair costs. It also achieves a weld that is expanded, fused and sound," Kidson says.

Explosive welding is also suitable for welding components of different metals, as well as for welding dissimilar metals, such as carbon steel to stainless steel and stainless steel to titanium. "Steinmüller can apply the process to manufacturing in workshops, or in-situ at the power stations," Kidson highlights. The explosive welding technology was mostly applied for in-situ heat exchanger tube plugging, and Steinmüller is the first company worldwide to manufacture a brand new heat exchanger from scratch using the technology. It is important to note that the process actually fuses the two materials into one homogenous material, ensuring that the fusion line is not detectable through a microscope or etching.

Although Steinmüller Africa originally introduced explosive welding to Eskom in 2010 under licence from TEI, it remains the only company in South Africa qualified and approved to perform explosive welding for the power generation sector.

Innovation is one of Steinmüller's values, and it constantly evaluates the market for opportunities. The company is 60 years old and must therefore evolve continually. It is vital to keep abreast of new innovations and technologies, as this allows the company to anticipate end-user needs.

As the welding sector continues to grow, South Africa's ventures into the adherence of reduction of carbon emissions in the production of energy means there are substantial opportunities in the renewable energy market.

www.steinmuller.bilfinger.com

Steinmüller's 30 000 m² fabrication facility in Pretoria houses its world-class welding, fabrication and pipe bending equipment – including a Pemamek boiler wall panel welding system (depicted here); an Oerlikon Automatic Welding machine; and the Cojafex Induction Bending machine, which is unique to the African continent.

Hypertherm Powermax SYNC®: legendary air plasma technology

Shaun Geyer, product manager for Hypertherm plasma cutters at Renttech SA, talks about Powermax SYNC® plasma technology and the SmartSYNC® torch: modern innovations making Hypertherm a world market leader.

The SmartSYNC® torch automatically adjusts the amperage and chooses the correct cutting or gouging mode.

Renttech SA, which is now an official Hypertherm Premier Partner, offers the full range of Hypertherm products with warranties, along with technical support from the company's Hypertherm product support team. This includes Hypertherm's latest innovations, the Powermax SYNC® range of plasma cutting systems along with its SmartSYNC® torch. Together, these are able to dramatically simplify cutting and gouging operations of materials of up to 20 mm, and non-precision severance cutting of up to 32 mm.

"While oxyfuel cutting systems can be used for ferrous metals and are typically reserved for use on thicknesses of 50 mm (2-inches) or more, the plasma cutting process accommodates both ferrous and non-ferrous conductive materials, including rusted, painted, or grated metal plate from very thin up to 50 mm, depending on the plasma cutting power," explains Renttech SA's Product Manager for Hypertherm, Shaun Geyer.

Above: Instead of five consumable parts, the SmartSYNC® torch that comes with Powermax SYNC® systems needs only one single colour coded cartridge-type consumable.

Below: The Powermax SYNC family is an entirely new air plasma platform.

"At a minimum," he says, "plasma is twice as fast as oxyfuel when cutting metals of up to 25 mm in thickness, and up to 12 times faster on thin materials. Cutting productivity is also affected by piercing delays, and while it can take 30 seconds to pierce a 16 mm steel plate with oxyfuel, a plasma cutter can do the same task in less than two seconds," he tells *African Fusion*.

For high definition plasma cutting, mechanised CNC Hypertherm systems, such as the gas-assisted HPR and XPR systems, are used to provide consistent, clean cuts at metal service centres and for large fabricators across the globe. For handheld plasma applications, though, compressed air is generally used for ease of use and practicality in workshops. This minimises training, improves results and increases profitability.

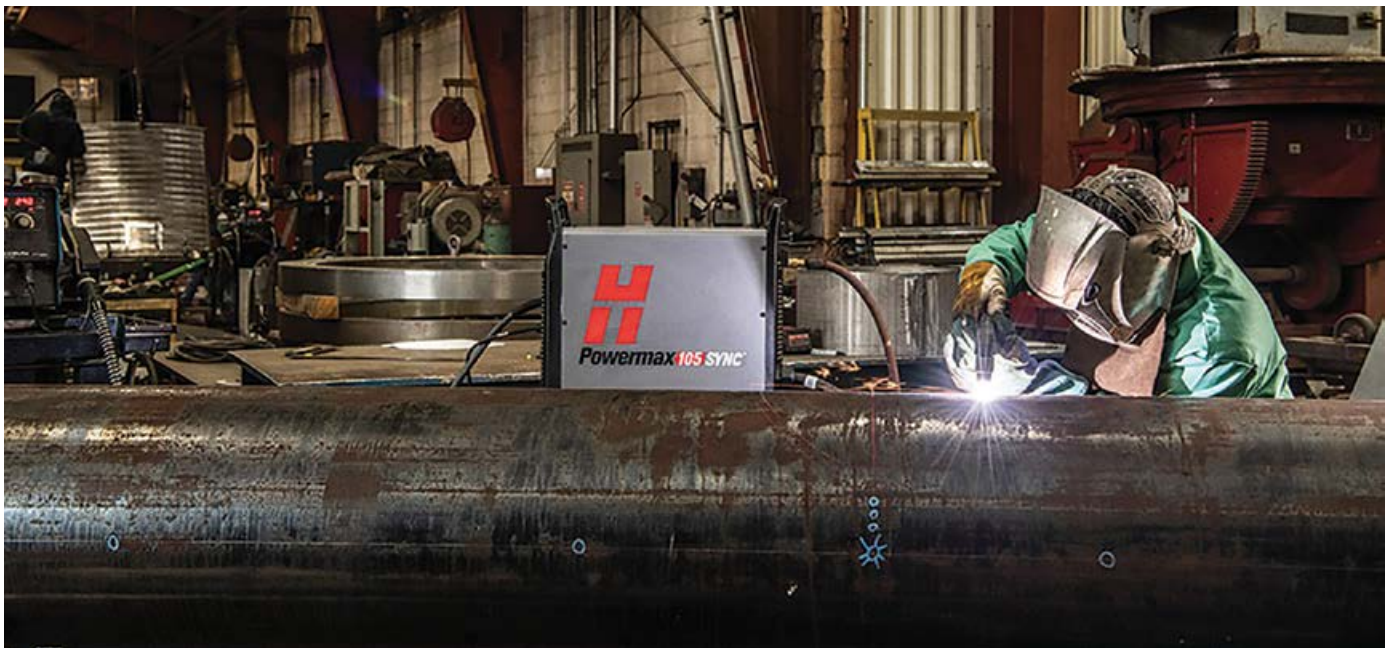
"When comparing oxyfuel to plasma, air plasma using compressed air is far less complicated. There are no gases to mix or regulate, and no operator settings to be adjusted to maintain the flame chemistry and heat. Furthermore, many handheld plasma torches allow the operator to drag the torch along the surface of the plate material, so no standoff is needed to hold a steady distance between the oxyfuel tip and the surface being cut," Geyer adds.

"Overall," he continues, "the plasma cutting process produces more precise and cleaner cuts than oxyfuel with better angularity, a thinner kerf, a smaller heat-affected zone, and zero to no dross. Poor cut quality on steel plates has a ripple effect on the production line, leading to unnecessary rework and delays in fabrication delivery. Many of these pitfalls can be avoided by switching from oxyfuel to the plasma cutting process," he advises.

The world's first Powermax SYNC® design

Shaun Geyer says that the Hypertherm Powermax SYNC® design is a world first. Powermax SYNC is an entirely new air plasma platform from Hypertherm. There are three systems in all: the Powermax65 SYNC®, the Powermax85 SYNC®, and the Powermax105 SYNC®, all of which have built-in intelligence and a single-piece torch cartridge consumable.

"Instead of five consumable parts, the SmartSYNC® torch that comes with Powermax SYNC® systems needs only a single colour coded cartridge-type consumable. There is no longer need for concern about finding and fitting the correct combination of consumable parts. All that is required is a single colour-coded cartridge, which



Above: The plasma cutting process produces more precise and cleaner cuts than oxyfuel with better angularity, a thinner kerf, a smaller heat-affected zone, and zero to no dross.

Right: The Powermax65 SYNC® system and its associated torch, which has built-in intelligence and a single-piece cartridge consumable.

is screwed into the plasma cutting torch before starting to cut," he points out.

The SmartSYNC® torch automatically adjusts the amperage and chooses the correct cutting or gouging mode. Through its embedded RFID-enabled sensor, the torch will also inform users when the consumable cartridge is worn out and needs replacement. "You no longer need to check the wear life by unscrewing and removing the component stack to look at the electrode – or worse, wait until the torch fails to cut properly and causes damage to the workpiece," he suggests.

HPR-XD now with SmartSYNC torch cartridge

The new torch cartridge idea has also been introduced for mechanised Hypertherm cutting systems, where a cartridge has been designed for retrofitting in-service HPR-XD systems. "Apart from having to upgrade the torch on these systems, no changes are required to the plasma power unit or the CNC system settings. Operators can replace both the torch and the cartridge in seconds, without the need for tools," says Geyer.

"The new cartridge replaces the traditional 5-piece consumable stack with a perfectly aligned part that lasts longer while delivering extended high-definition cut quality. It makes consumable management and assembly much easier and eliminates errors caused by incorrect handling or installation. The HPR cartridge and torch are available for use in South Africa and they come in three amperages: 80 A, 130 A and 260 A.

"The PowermaxSYNC range of air plasma cutters is Hypertherm's smartest system ever. They can automatically set the amperage and operating mode and the cartridge-based SmartSYNC® torch alerts you when it is time to change out your cartridge consumable. This makes plasma cutting far easier and better," he says.

"The torches are also engineered for rugged, industrial environments with SpringStart™ technology to ensure consistent starting and a more reliable torch. They are legendary tools," Shaun Geyer concludes.

renttechsa.co.za/plasma

Flexible, cost-effective robotic automation for SMEs and lower volumes

Yaskawa Southern Africa sales engineer, John Mostert, introduces two new innovations now available in South Africa: The Weld4Me Collaborative Welding system; and a new partnership in South Africa to interface the Yaskawa tending robot with CoastOne press brakes for bending plate. These solutions are both targeted at supporting smaller jobbing shops and SMEs producing low numbers of repeat orders.

"There are two solutions we have introduced into South Africa recently that are designed for a new type of customer in the fabrication space," begins Yaskawa's John Mostert, a sales engineer who has been with the company since he first graduated 23 years ago from the PE Technikon – now part of the Nelson Mandela University (NMU).

The first is on the robotic welding side and is the Weld4Me Collaborative Robot Welding system. "In principle, modern collaborative robots are designed to work in close proximity to people, in a similar way to how a CNC lathe or milling machine is designed to work safely alongside an operator," Mostert explains.

"I think the biggest difference with our collaborative robot offering is that Yaskawa robots are industrial robots. Their role is to perform manufacturing tasks in an industrial environment, in the same way as traditional industrial robot arms, which have been used for volume production for many years. Yasakawa's 'industrial' collaborative robots, though, include features and functions that enable them to work flexibly and in close and safe proximity to the people who are also working on the shop floor," he explains.

The Weld4Me collaborative robot package from Yaskawa targets those fabricators who do not have large production quantities to justify investing in dedicated robotic welding cells.

He adds that their role is to produce the productivity, quality and precision that is required in the modern industrial environment to sustain long-term competitiveness and survival. But the Weld4Me package targets those fabricators who do not have large production quantities to justify investing in dedicated robotic welding cells. "The package is designed to help jobbing shops that have traditionally depended on manual welders who switch from one job to another several times a day," he tells *African Fusion*.

Weld4Me is not just a robot. "We talk about supplying a complete collaborative welding system that includes all the hardware, software, manipulation, clamping and welding equipment needed to safely begin to produce welded components. It is ideal for those that need to produce 10 or 20 identical components for a customer, small orders with low volumes that are not necessarily going to be repeated. The Weld4Me system offers a fully flexible solution to enable these types of jobs to be done without expensive jigging and tooling, replacing a skilled welder with an operator who deals only with product changeovers and programming," he adds.

As well as the robot, welding machine and welding torches, consumables and accessories, Yaskawa's Weld4Me Collaborative Welding system comes with its own high precision welding table and clamps, with different components to allow almost any part to be quickly and precisely held in place. Once clamped down, the welding path needs to be programmed, and this too has been designed to be far simpler.

"The key reason for this is that the robot has the facility to be guided by the operator to the key points along the welding path. The welding program is written by physically manipulating the robot around the part and entering key points along the way," Mostert explains. "This is not actually new, but it is far easier to do nowadays, and far more precise," he adds.

The Yaskawa MOTOMAN HC10DTP Classic robot used with the Weld4Me system can also be programmed using Yaskawa's standard teach pendant or the new intuitive Smart Pendant. And for particularly efficient programming via hand guiding, it has Direct Teach buttons on the wrist of the robot that can be used to accept taught positions immediately, without having to confirm them on the teach pendant.

From a training perspective, the system reduces operator programming training time considerably. "On a normal industrial robot, we would offer a week's training for a new installation. We can now train a Collaborative Robot Welder operator with enough knowledge to start welding in a few hours," he notes, adding that manual welding skills are not necessary, as the operator can learn these on the job. His role is to set up each job, which is the task that requires the most flexibility in a jobbing shop.

On the safety side, Mostert points out that the only additional safety requirement for Weld4Me to be used on a shop floor is a welding curtain in front of the robot to protect the operator and other shopfloor employees from the glare of the welding arc. "And if the operator has suitable eye protection, he can safely watch the robot from inside the curtain. If the robot detects the slightest resistance, it will stop moving and welding. Once released, it will then pick up from the exact place it stopped," he says.

Once a program is working properly, the robot can be left to complete its tasks automatically, with the operator simply loading a new part after each one has been completed. "And anyone who is familiar with machine tools such as lathes, milling machines or plasma cutters can easily be trained to operate a Weld4Me system," Mostert assures.

Robotic automation for Coast One press brakes

"The second innovation we are busy with is a collaboration between ourselves and

CoastOne, an OEM manufacturer of press brakes for bending sheet metal. CoastOne was founded in Finland and is now collaborating with Yaskawa Europe to automate the bending process using a tending robot," says Mostert.

As with Weld4Me, this coupling of a tending robot with a CoastOne servo-electric press brake is ideal for assisting machine operators to raise the quality and consistency of small runs of identical components. "The robot's role is simply to pick up the sheet metal and feed it into the press brake, and then to remove it and pass it down the line. The robot transforms bending operations into a completely automated process, while also ensuring better precision and faster more continuous production.

"In high volume bending applications there are specifically designed machines called panel benders that cost several millions of rands. With the local supplier of CoastOne equipment, Metal Chip, we are targeting customers currently depending on operators to manually load their bending machine, those who don't have the high volumes but might still have repetitive work and the need to raise their accuracy, consistency and productivity levels.

"On a normal industrial robot, we would offer a week's training for a new installation. We can now train a Collaborative Robot Welder operator with enough knowledge to start welding in a few hours," says Mostert.

"In terms of a cost comparison, we can add a Yaskawa robot to an existing CoastOne press brake for about a third of the cost of an automated panel bender, and a brand new Yaskawa-CoastOne system will still be half the price," Mostert estimates.

"With respect to training, service and support, we at Yaskawa will offer full support to local clients for the robot, while Metal Chip will be taking care of the CoastOne press brakes," Mostert assures.

"These two flexible systems fit very nicely in the many shops in the country that do both welding and bending. And they are both now accessible to SMEs and smaller fabrication and manufacturing shops in South Africa," he concludes.

www.yaskawa.za.com

WeldCube: The professional's solution for documenting, reporting and monitoring welding data

Fronius' WeldCube is suite of data management solutions that enable customers to prepare, train, record, analyse and evaluate welding data across multiple power sources. It is an all-inclusive package that incorporates hardware, software and services and is designed to link directly with Fronius TPS/i, TPS, TS and iWave welding systems.

Documenting, visualising, collecting and analysing welding data for quality management and traceability purposes are increasingly important in many production operations. Consisting of different hardware and software components as well as corresponding services, Fronius' WeldCube solutions can help fabricators to produce the high-quality welds that are essential for any critical plant equipment and most welded products, and to generate the documentation needed as evidence.

In addition, welding flaws lead to high rejection rates, which raise manufacturing costs. The earlier these flaws – and the circumstances that cause them to arise – can be identified in the manufacturing process, the quicker the response can be to eliminate them from the components being welded.

WeldCube Navigator

At the starting point of Fronius' suite of WeldCube options is WeldCube Navigator, a training and familiarisation tool for helping welders to develop and understand the welding requirements of a new welding task or procedure. WeldCube Navigator delivers step-by-step support for the manufacturing process. It provides visualisation of each task in the sequence and defines the pre-set welding parameters that need to be used, which can automatically be downloaded to the welding machines being used. This comprehensive upfront visual support is designed to help minimise the risks of errors and flaws being introduced during welding. Across all the welders in a production site, it also helps to standardise manufacturing processes, increasing consistency and the quality of production.

The Sequencer in WeldCube Navigator takes the welder or welding specialist through a pre-defined step-by-step guide of welding sequences and associated tasks for each given job. These steps – digitally created in the editor by a welding supervisor or engineer – can be displayed on any suitable screen, and the correct welding parameters associated with each weld in the sequence are sent to the power source by the welder via buttons on his Fronius welding torch.

WeldCube monitoring and data analysis

Once welding starts, WeldCube goes into data collection, monitoring and data analysis mode. For safety-critical or multirun welds, the system is constantly monitoring the welding parameters against the requirements of the welding procedure specifications. The system can immediately take corrective action should to these parameters fall outside the specifications. This avoids a part being rejected and minimises – or completely avoids – time-consuming repair work.

WeldCube is also able to halt further welding if there is an indication that a weld seam will be defective if, for example, the gas shielding has failed. This will then require a welding supervisor to inspect the workpiece before the system can be reset and welding resumed.

For seamless integration into manufacturing processes. additional digital solutions in the Fronius WeldCube portfolio add further functionality for the WeldCube and provide optimal support in unleashing welding potential.

Through Central User Management. individual authorisations can be assigned to each user via the authorisation system integrated into every Fronius welding machine. When someone logs in with a key card or fob, the system immediately knows what they are, and are not, allowed to do. A standalone solution in the WeldCube portfolio, Central User Management enables user rights to be defined with just a few clicks, and this can be done centrally so it applies to an individual machine or several systems. The relevant

WeldCube Navigator is a training and familiarisation tool for helping welders to develop and understand the welding requirements.

WeldCube Navigator delivers step-by-step support for the manufacturing process.

Through Central User Management, individual authorisations can be assigned to each user via the authorisation system integrated into every Fronius welding machine.

information is automatically sent to all connected systems.

In terms of data management, WeldCube Air is a cloud-based data and documentation solution for centrally recording welding data. Access to this data is available via any device with an internet connection.

At a level above, WeldCube Premium is a central server-based solution that collects the welding data from all connected welding systems in the manufacturing operation. It also offers intelligent management, analysis and statistical functions, as well as graphical visualisation of results and analyses. This means, for example, that an entire component in the process of being fabricated can be visualised live, with its progress being monitored in real time.

Through its Rework Station, WeldCube Premium can also indicate the need for rework action, with the option of setting the status of a seam/component to 'OK' following a successful repair.

As an innovation leader for arc welding and the global market leader for robot-assisted welding, Fronius creates advances inspired by its sustainability mindset. "We enjoy long-standing relationships with our customers. Fronius' strength lies in combining the knowledge of customers with our own expertise to unleash their full welding potential," says Edric van der Walt of Fronius South Africa.

www.fronius.com/en-za/south-africa

Cosmo Group launches 3-in-I hand-held laser

Cosmo Group is introducing cutting-edge new hand-held laser technology into South Africa that offers laser welding, cutting and cleaning capabilities from a modern and economical fibre-laser power source. *African Fusion* talks to Pieter Pistorius of the University of Pretoria about his interest in the system and to Petrus Pretorius of Cosmo Group about its core features and uses.

Cosmo Group is introducing cutting-edge hand-held laser technology into South Africa that offers laser welding, cutting and cleaning capabilities from a modern and economical fibre-laser power source.

"Our final year metallurgical engineering students at the University of Pretoria (UP) are required to do a classical practical at the end of their degrees, and every year we need to find novel welding-related research ideas. We typically use traditional processes to set up welding experiments, collect the data and then analyse the properties and metallurgy of the finished weld.

"This really began when we invested in a Lincoln Electric S350 Power Wave welding power supply for our SAIW Centre for Welding Engineering, which we purchased from Cosmo Industrial in Silverton a few years ago. We have since started attracting post-graduate students to do research in the welding field and produced several research papers," Pieter Pistorius, tells *African Fusion*.

Cosmo, he adds, because it is both easily accessible and offers excellent support on the welding process side, has now become the UP Welding Centre's go-to supplier of welding consumables and technical support. "We are not welders, so the Cosmo team has become very important to us. They know welding and we can have open discussions with them. When we show them a procedure, they will often ask why we want to do it like that? Then they simplify the welding to enable us to get far more practical and realistic results," Pistorius says.

"We are currently involved in research at all levels into the solidification structure of thin ferritic stainless steel materials, using gas-tungsten (GTAW), gas metal (GMAW) and metal-cored (MCAW) arc welding," he continues, adding that these steels are typically used for exhaust systems that get very hot. "We try to mimic the welding of exhaust-pipe tubing, for example, with a view to getting a finer grain structure into the weld metal that will be less susceptible to cracking," Pistorius explains.

When Pistorius heard that Cosmo had set up a demonstration unit of a new hand-held laser welding system, he scheduled a visit to incorporate the process into the university's research programme. "Petrus Pretorius did the welding for us in the demonstration centre at Cosmo. We see this process as an exciting addition to our research programme, as an alternative to GTA welding, for example. While the energy concentration of the beam is high, laser welding is known to offer reduced heat input compared with all traditional processes, which reduces distortion. For our research though, the lower heat input results in less grain growth and, potentially, finer grains with a less columnar and a more equiaxed structure in the weld metal.

The University of Pretoria's SAIW Centre for Welding Engineering is currently being used for research into the solidification structure of thin ferritic stainless-steel materials.

"For the initial undergraduate project on this machine, the hand-held laser was used without (autogenous) and with filler metal using the machine's built-in wire feeder, which seemed better. We haven't yet got any definitive results, though, but we are definitely excited to have a new welding process to explore," says the head of the SAIW Centre for Welding Engineering at the University of Pretoria.

Revolutionary hand-held solutions

Describing some of the revolutionary features of the hand-held laser welding systems, Petrus Pretorius starts with safety. "People need to be very careful when using any welding process, and hand-held lasers are no exception. Proper protective equipment is always necessary and the system does come with purpose designed laser goggles for eye protection," Pretorius notes.

To avoid any possibility of the laser beam being accidently aimed at a person nearby, Cosmo's hand-held lasers come

system for welding, cutting and cleaning

Laser controls include wire feed rate and wire weave width, laser power percentage, spot width and laser pulsing parameters.

with a safety-interlock, which automatedly turns off the laser power as soon as the gun breaks contact with the workpiece being welded. Pretorius explains: "Although it doesn't really need it, the system will not work unless an earth lead is connected to the plate. In addition, the system is designed so the torch must be electrically connected to the workpiece before the laser can be activated," Pretorius explains.

"The welding torch has a contact arm underneath it that the welder drags along the plate surface in front of the joint. The laser beam doing the welding will switch off the instant electrical contact between the arm on the torch and the workpiece is broken. This removes any risk of the beam being shone at anything apart from the metal plate being welded," he adds.

The contact arm also makes welding easier than traditional TIG, MIG or MMA welding processes, in that there is no need for the welder to control the standoff distance between the torch and the workpiece. "The welding beam is very narrow, and while this is ideal for line-welding some autogenous joints on thin plate, the fit-up has to be very good. To ensure that no part of the joint is missed, the spot size of the laser can be increased or the beam weave function can be used. It also helps when wire is being fed into the joint at the same time," says Cosmo Group's Petrus Pretorius.

In terms of machine settings, he says there is nothing complicated to worry about. "As with all welding, the input power – set as a percentage laser power – is the main parameter, along with the wire feed rate. And as well as the spot size and weave functions, there are numerous other 'fine' settings such as sloping start and stop features.

"We are just beginning to get comfortable with the new process, though, and it will take time to learn how to weld most effectively with this system," he adds.

The hand held laser torch brings laser welding with wire feed into ordinary jobbing shops.

The cost? "It is no more expensive than a high-end MIG/MAG or pulsed TIG system," Pretorius responds, adding that hand held laser welding could result in many cost saving advantage. These include:

- The welding speeds can be many times faster than other processes, due to the highly concentrated laser energy source. This can significantly raise production efficiency.
- The low overall heat input from the concentrated beam makes lasers ideal for joining thin, delicate parts with much less heat distortion. "Fit up must be right, though," Pretorius emphasises.
- Laser welds can be accurate with high quality and seldom need any post weld cleaning.
- The system is small and portable, so it can be moved from job to job inside a workshop.
- It is suitable for welding a wide range of different materials, including steels and stainless steels, aluminium, copper and many more.
- It can also be used to join dissimilar materials, providing a filler material compatible with both materials being welded can be found.

As well as the hand-held laser welding capability, the system can also do hand held laser cutting – for tube and plate – and hand held cleaning: "And these functions are activated simply by changing the torch nozzle and lens. "The laser cutting function can deliver good cut quality on any thin materials, while the cleaning function is ideal for cleaning rusted plate prior to welding, for example.

"This system is potentially revolutionary. It brings laser welding, which used to be reserved for highly specialised workshops and for welding very high-value components, into ordinary jobbing shops. For anyone looking to upgrade their welding operations or to expand what they can offer to South African customers, this 3-in-1 laser welding, cutting and cleaning machine might be an ideal solution," Petrus Pretorius concludes.

The remote control for the laser settings.

Hand held laser welding is ideally suited to welding thinner sections in a wide range of different materials, including steels and stainless steels, aluminium, copper and many more.

cosmogroupsa.co.za

Dekra Industrial SA awarded DNV GL International Marine certification

Global leader in non-destructive testing (NDT), inspection, certification and consulting services, Dekra Industrial SA, has achieved DNV GL certification, an international certification that ensures the reliability of components and systems against marine hazards.

As a global company with a 98-year track record through its global parent company, Dekra Industrial SA is renowned industry-wide as an expert provider of NDT, Advanced NDT, material testing, laboratory services and asset integrity services in 50 countries across five continents.

The company has been responsible for work on major projects across a multitude of industries – power generation, oil and gas, construction, petrochemical, manufacturing, fabrication, pulp and paper, rail, mining, steel industry and foundries – in South Africa and pan-Africa, providing a range of these services including specialised testing in the maritime sector in partnership with international contractors, fabricators, and original equipment manufacturers (OEMs).

Highlighting the significance of holding the international accredited registrar and classification society DNV GL certification, Dekra Industrial SA Industrial Level 3 Technician, MC Liebenberg, explains that the certification unlocks a new era of opportunities for the company to independently offer its myriad technical testing services to the maritime sector.

MC Liebenberg.

He says DNV GL, which was formed through the merger of Det Norske Veritas (DNV) and Germanischer Lloyd (GL) and has its international headquarters in Norway, issued Dekra Industrial SA with the highly regarded 'Non-destructive testing on classification projects, in accordance with Class Programme DNV-CP-0640' certification. The certification is valid from May 2023 until May 2026.

Dekra Industrial RSA is a leader in inspection services, non-destructive testing (NDT), material testing, laboratory services, advanced NDT and asset integrity services.

Johann Dorfling.

"This global certification provides our industrial clients in the maritime sector with assurance of the highest quality of international standards for all our marine testing work conducted to establish the integrity of a range of maritime vessels, installations, and oil rigs. The certification specifies our assignment of qualified operators and supervisors for six different testing methods including penetrant, magnetic particle, ultrasonic, eddy current and radiographic testing as well as visual inspection," Liebenberg explains.

He adds that these advanced testing and inspection methods complement one another to ensure testing can be conducted to achieve the utmost safety of vessels and installations to protect human life and the environment.

"As technical professionals we know that it is our responsibility to ensure occupational health and safety and that this depends on the technical reliability of our testing services. We understand that the reputation of our industrial maritime clients, in the eyes of their customers and the communities in which they operate, largely depends on consistently achieving only the highest quality standards, and for this only the best independent testing experts can be contracted to work on their marine vessels and installations in the field. Reliability and efficiency are key, and this certification now attests to our international credentials in the maritime sector," he says.

Dekra Industrial NDT division manager in the Western Cape Johann Dorfling agrees that the international certification enhanc-

es the company's already strong reputation as a trusted independent marine inspection authority.

"In the shipbuilding industry the DNV GL certification ensures reliability of components and systems in the face of marine hazards. As a highly regarded international certification it is accepted globally by stakeholders in the maritime sector as it is known to be held only by highly reputed marine inspection service professionals," Dorfling says.

He says that, whereas the company previously provided its independent testing services under the auspices of, for example, OEM ship builders and fabricators, the DNV GL certification now allows the company to be recognised as a testing service provider in its own right.

He adds that as a result Dekra Industrial SA is now pursuing many opportunities across South Africa, including in Durban and Cape Town, as well as in Mozambique and across the rest of Africa, to provide its highly regarded testing services to the shipbuilding and wider maritime sector.

"Achieving the DNV GL certification is expected to be a complete gamechanger for our business as we will now provide our entirely independent testing services as an internationally recognised authority in the maritime sector. We look forward to continuing working with OEMs, fabricators and many other new clients in the maritime industry across the country and the rest of the continent," Johann Dorfling concludes.

www.dekrarsa.com

Dekra Industrial

Dekra Industrial RSA has established a formidable reputation as a leader in inspection services, non-destructive testing (NDT), material testing, laboratory services, advanced NDT, and asset integrity services, and offers industry training through the Dekra Institute of Learning (IOL). With a Group presence in more than 50 countries on five continents, Dekra Industrial RSA provides safety solutions across a multitude of industries, including power generation, oil and gas, construction, petrochemical, manufacturing, fabrication, pulp and paper, rail, mining, steel industry and foundries, within South Africa and pan-Africa.

Dekra Industrial RSA , a Level 1 BBBEE-compliant with 51% black woman ownership, is a holistic services provider of NDT inspection, corrosion control with rope access and lifting.

B.E.D. Group and NAMPO

The Bolt and Engineering (B.E.D.) Group was proud to exhibit once again at Grain SA's annual NAMPO Harvest Day from 16 to 19 May, marking its 31st year as a NAMPO exhibitor. This year's stand was the biggest ever, and in addition, B.E.D. was able to offer real support to its chosen corporate social investment (CSI) partner, Cancer.vive.

B.E.D. CEO Mike Giltrow Explains: "At NAMPO, our focus is always on agriculture and the farming community, and we set out to improve our offering each year. We have something for everyone: from the workshop tools, lifting equipment, and welding and cutting tools, to gadgets for the youngsters and craft tools for the ladies.

"We were pleased to showcase some of our preferred brands this year, including Kennedy hand tools, Metabo, Giant lifting, Bosch Professional, Tork Craft, Fronius, Gys Welding and Hypertherm, as well as locally manufactured genuine buffalo-hide leather boots and accessories."

A heart-warming drawcard at this year's B.E.D. stand came from its longstanding partnership with the Cancer.vive group. Giltrow notes: "This dynamic cancer awareness and education project has been part of our focused CSI planned campaigns since 2019. At this year's NAMPO, we donated a cheque to the value of R10 000, as well as a KENGIRL 77-piece pink toolbox. This was then auctioned to raise more funds."

The KENGIRL pink toolbox is distributed by B.E.D. and is targeted at women; and similarly a KENGUY toolbox in a primary blue colour aimed at men. These are produced by Cromwell and are suited for the DIY enthusiast.

Giltrow adds: "Because Cancer.vive focuses on what it calls the 'shy cancers,' including breast and testicular cancer, we thought it would be useful to make these specialised pink and blue toolboxes available to both the industrial and retail sectors. The pink toolbox also ties in with B.E.D.'s growing focus on personal and protective equipment (PPE) for women."

The KENGIRL toolbox donated by B.E.D. was raffled by Cancer.vive at an evening fundraising event, and raised an impressive R65 000.

Giltrow tells the story: "Bsure Brokers bid R27 000 to Cancer.vive at the KENGIRL Toolbox auction, and then gave it back! This ensured another bid of R33 000 by Motus Parts, who also gave it back. In the end, the total raised was R65 000 – an extraordinary act of generosity from all parties."

B.E.D. further supports the Cancer.vive toolbox initiative by having available stock of these unique toolboxes year-round, at each of its nine branches country-wide.

Giltrow concludes: "The atmosphere at this year's NAMPO was electric – really buzzing – and the show featured all the great traditions that make us so 'proudly South African' as a nation. I would like to thank everyone who came to visit our stand, including our partners, suppliers and valuable customers, as well as B.E.D. employees. We value their support and are looking forward to another record-breaking NAMPO 2024!"

www.bolteng.co.za

The B.E.D. team at NAMPO, from left: Mariska South (Volunteer), Mike Giltrow (CEO B.E.D.), Charmain Rider, Marlene Nortjè (CEO Cancer.vive Ride), Wilma Maritz (Volunteer), Carlien Bruce-Smith and Garth Benney (National Sales Manager – Cromwell South Africa/SADC/North Africa).

SAISC 'brand for hire' concept

An innovative Southern African Institute of Steel Construction (SAISC) initiative will give member companies and other industry professionals the opportunity to directly benefit from its substantial brand credibility, boosting their profiles across South Africa and the rest of Africa.

SAISC is facilitating a dynamic and ongoing programme of events, networking platforms, digital training sessions and more as part of its new 'brand for hire' marketing and revenue-generation model. In terms of this new model, the Institute's members – from across the entire steel value chain –are invited to co-sponsor initiatives, conference visits, and events. Sharing the brand space will allow these members to leverage the SAISC's brand equity and credibility accordingly.

The initiative will also unlock new sources of revenue for the Institute, which until now has relied largely on membership fees for its income.

A custodian marketing the steel value chain

Commenting on the new initiative, the SAISC's Chief Executive Officer Amanuel Gebremeskel says that the revenue derived from this new marketing model will ensure sustainability, while helping the Institute to expand on its traditional role as a custodian of quality and the industry's marketing arm.

"This is vital to the continued well-being of the entire steel value chain," Gebremeskel says.

"We would like to give a lot more opportunity to member companies to be associated with us in the eyes of the market. The advantage we have as the Institute is that we have an excellent brand. People look at us and they see technical excellence, knowledge, methodology regarding how to design and build in steel in the best manner. They also know that the SAISC brand is one inherently associated with quality and safety – which we promote strongly," he explains.

Although the Steel Awards will remain the flagship in the SAISC's marketing calendar – the premier showpiece celebrating the industry – the Institute is also keenly and proactive exploring other avenues through which to assist members to access new markets.

Developing quality standards for Africa

Members hoping to export to the rest of Africa as regional trade treaties – such as the African Continental Free Trade Area (AfCFTA) agreement – come into force, spurring infrastructure development, will improve their prospects greatly if they help to shape industry standards, which will be applied across the continent.

Gebremeskel says that the SAISC – as the only Institute of its kind in Africa and indeed one of only 6 worldwide – is the only body in the region that can facilitate this standardisation process. As such, he would like to see member companies, or groups of companies, associating with and sponsoring the Institute's efforts.

SAISC's Chief Executive Officer Amanuel Gebremeskel.

"Our work will target specific markets and products and include foreign visits to help draft common specifications and codes – aimed at achieving steel construction standards harmonisation and to assist with education and training at African universities," he says.

He points out that this is likely to be a boon for SAISC members' businesses in the future, but the groundwork is not something individual members can achieve alone. Gebremeskel believes the South African steel industry has a lot to offer the continent, particularly when it comes to developing product and quality standards for the steel sector.

"We have been working on and with product and quality standards for decades,

With Amanuel Gebremeskel at the Steel Awards 2022 is the overall winner, the development team of the general treatment plant for the Benguela Gem, the mast advanced diamond mining vessel in the world.

so it would be a pity for us not to engage in the latest pan-African standards developments; as well as the market developments that are unfolding on the continent," he says.

Synergistic education, digitisation and promotion

Touching on the SAIC's commitment to education and digitisation, Gebremeskel envisions the Institute as supporting more self-directed learning, enabling geographic reach to profile what he terms the "essential excellence" of the local steel industry.

Here, he sees opportunities for member companies to provide sponsorship and to associate themselves with training and standards development, while synergistically benefitting from the Institute's 'brand for hire' concept.

Gebremeskel hopes to see more steel companies benefiting from the SAISC brand. He says this can include "something as simple as travelling with us to other countries."

"We are known in the United States, but a South African fabricator or supplier might not be known," says Gebremeskel, referencing the American Institute of Steel Construction's conference which he attended with a delegation of local fabricators in April 2023. The conference, in North Carolina, is one of the largest events of its kind in the world, bringing together thousands of delegates to share research, unveil new products and equipment, network, and ultimately, seek that next big deal.

Gebremeskel says the conference was the first major event SAISC has attended recently, marking a real return to international steel conferencing, networking and marketing efforts since the Covid-19 pandemic.

Industry's business development 'calling card'

He stresses that it is vital for members to provide sponsorship so the Institute can attend these events and for members – representatives of companies, or groups – to accompany the SAISC. To this end, while sending delegates abroad is expensive, the business development potential for the industry is vast, he explains.

"For example, if a South African fabricator manages to win a 3 000 ton job, even if they spent R1-million to do this, it makes sense. It is still very affordable when compared with the potential return-on-investment in the form of new business," he says.

While it is true that conference visits do not always bring immediate benefits, Gebremeskel likens their value to the metaphorical stone cast into water: it causes ripples, the results of which can be far-reaching.

He says the by facilitating attendance at global steel events, the Institute is providing members with a 'calling card' that allows them to cast those stones into the proverbial 'pool' of business development opportunities. In this way, members attending can benefit from reputational endorsement and direct access to players working on large multi-national steel projects.

Selective sponsorship

Gebremeskel says the SAISC will be selective about sponsors for the various 'brand for hire' revenue generating initiatives it has planned, aiming to team up with member companies which do quality work, strive for technical excellence and which are legally compliant. More than this, he says SAISC seeks partners which share its vision.

"We would like our brand to be hired by companies aligned with our ethos and goals, those that support quality and professionalism in the steel value supply chain. And we would like companies and groups that share our vision to invest their resources and their support because they wish to be part of ensuring there is a vibrant, sustainable and strong SAISC – empowered to serve the interests of the entire steel value chain," he says.

www.saisc.co.za

Portable Master M machines from Kemppi

Kemppi has introduced new portable and versatile welding equipment for MIG/MAG welding: the Master M 205 and Master M 323. The new welding equipment is ideally suited for industrial welding in shipyards and repair shops, and furthermore for dedicated hobby welders. Thanks to their small size and transportability, the Master M series is also an ideal choice for repair welding.

The Master M series delivers excellent usability, best-in-class welding performance, and a smooth parameter setup. Both Master M 205 and Master M 323 are developed in collaboration with professional welders and are manufactured in Finland.

Master M 205 is developed specifically for welding tasks that require lightweight, easy-to-move welding equipment, but also high-quality welds. Master M 205 is a portable but powerful MIG/MAG welding machine for manual, synergic and pulse MIG/MAG welding of stainless, light steel, and aluminium. The 200 A, single-phase power source operates with a 40% duty cycle at full power. In addition, the Master M 205 comes with 17 welding programs for pulse MIG and 20 welding programs for 1-MIG.

Master M 323 is the ideal choice for sheet metal welding, and thanks to its portable size and versatile accessories, it is also well suited for welding environments with challenging spaces. This machine is a portable powerhouse for manual and synergic MIG/MAG welding. The power source operates with a 40% duty cycle at 320 A. Moreover, Master M 323 has 28 welding programs for Fe, Ss, AlMg5, AlSi5, CuSi3, CuAl8, and FC-CrNiMo filler materials and four welding programs for the MAX Cool arc welding process.

Master M 205 and Master M 323 are equipped with a Weld Assist function that automatically sets the welding parameters to make daily welding faster and easier.

"High-quality welds, ease of use and efficiency are combined with best-in-class ergonomics and transportability in the Master M series. Master M 205 and 323 come with the latest technology to offer reliable and compact quality for shipyards and repair shops without compromising cost-efficiency," says John Frost, Product Manager.

www.kemppi.com

Master M 205 and 323 models complete the Kemppi Master M series. The machines portable and light MIG/MAG welders that are easy to carry to wherever they are needed.

Linc-Cobot: a game changing welding automation solution

Lincoln Electric's Linc-Cobot welding system has been designed to complement the skills of human welders, while improving weld productivity, quality and repeatability in fabrication shops. Thulani Mngomezulu, Lincoln Electric Technical Applications Manager for the Middle East & Africa, explains.

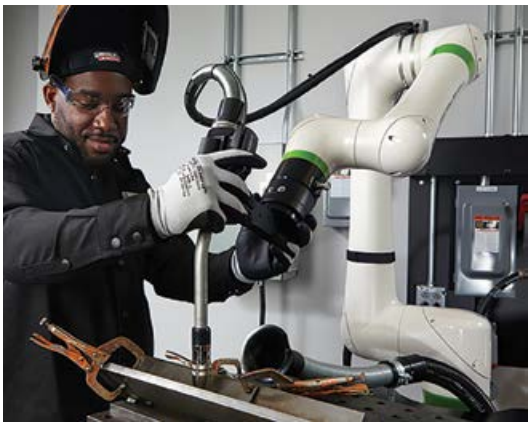
The Linc-Cobot combines Lincoln Electric's welding expertise and its automation experience to meet real-world needs.

With an integrated Power Wave R450 robotic welding platform and a precision worktable incorporated onto a single compact and portable platform, Linc-Cobot is ideal for those looking to add flexibility, workplace safety, consistency and cost-efficiency to its operations.

"Our Linc-Cobot welding series combines Lincoln Electric's welding expertise and its automation experience to meet real-world needs of fabrication shops all over the world," says Thulani Mngomezulu of Lincoln Electric. "We understand that humans are versatile and can easily adapt to new situations and set ups, but people are not all that consistent. Even highly skilled welders can have an off day.

"When using a Linc-Cobot, the human operator works out how best to weld a job and teaches the robot through direct interaction. Then the robot executes the welding program. A variety of welds can also be sequenced and repeated in the same order and with the same consistency," says Mngomezulu.

"Compared to traditional robot welding, however, using the system is easier than ever," he continues. "The whole integrated and compact system is mounted on wheels so it can be deployed in any area of the shop as easily as a stand-alone welding power source. And it can be programmed to weld in minutes," he says.



When using a Linc-Cobot, the human operator teaches the robot through direct interaction.

The system uses a Fanuc® CRX robot driven by the Lincoln Electric Power Wave® R450 power source for robot welding. The Power Wave software controls and monitors welding processes to deliver the highest levels of weld quality and productivity, which are both essential in the competitive fabrication environment.

The Linc-Cobot system is ideal for high-mix component welding; repair and remanufacturing work; part resurfacing and reconditioning; roof and bridge truss manufacturing; mechanical contracting and pipe welding; agricultural equipment manufacture; plant equipment fabricators; metal service centres; and welding training and educational programmes.

Key features include:

- Compact, easy to deploy and quick to program for repetitive welding tasks.
- Drag-and-drop and smart programming, allowing for straightforward robotic programming without complex training.
- Intelligent contact-sensing technology allowing Linc-Cobot to work safely, side-by-side with welding operators.

From a reliability perspective, the CRX FANUC Cobot features components and technology proven in the most rigorous industries for over 30 years. FANUC backs its reliability by providing a guarantee of eight years of zero maintenance on motors, reducers, sensors, cables, and grease.

Thulani Mngomezulu cites three key reasons why fabricators should consider adopting this technology:

First, he says: "The Linc-Cobot isn't a fully automated welding system, so fabrication shops that do not have much experience with automated systems can use the Linc-Cobot as a smart bridging tool between manual welding and full automation. It is an advanced, mobile, plug-and-play system to help fabricators start automating some of their simpler repetitive jobs."

Second, the system is ideal for partially automating tasks where dedicated cells do not quite work. "People often need a system that can be moved from one welding station to another, for example, and the Linc-Cobot is designed for that situation," he says, adding that the entire Linc-Cobot system can be moved into a welding bay to do specific difficult/critical welds, with manual welders completing other welds either before or after.

Most notably, however, he points out that the Linc-Cobot is ideal for high-mix, low volume work, which can become problematic when customers move to fully automated fabrication processes: "A big drawback of full robotic automation is in shops that face a lot of job variation. Production must stop for each changeover and for rewriting each new program for the different tasks, which is not that easy on an industrial robot. The Cobot allows a new program to be written quite quickly, making it far easier to changeover from one job to another.

"From a people perspective, rather than replace the welder in the welding booth, the Linc-Cobot system uses human skills to best effect: working out how best to weld a component using the Cobot, instead of having to rely on manual hand skills to manipulate a welding torch," Thulani Mngomezulu concludes.

www.lincolnelectric.com/en

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