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SAIW

NOVEMBER 2022

Journal of the Southern African Institute of Welding



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

Tel: (011) 622 4770

Fax: (011) 615 6108

Editor: Peter Middleton

E-mail: peterm@crowns.co.za

Advertising: Peter Middleton

E-mail: peterm@crowns.co.za

Publisher: Karen Grant

Deputy publisher: Wilhelm du Plessis

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As an integral part of its commitment to building a stronger, more sustainable and productive South Africa, Afrox takes the long-term view to sustainable social responsibility, training, safety and industrial solutions.

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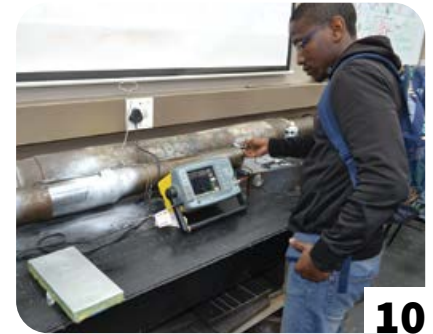
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WHAT YOU NEED TO BUILD A CAREER IN NON-DESTRUCTIVE TESTING

1

You need to be
**ANALYTICAL
INTELLIGENT
HIGH LEVEL
ATTENTION
TO DETAIL**

If you're one of the few people who're good at science & math, and have an enquiring mind, becoming an NDT professional will give you the chance of making a valuable future.

2

Consider yourself
**INQUISITIVE
PERSISTENT
INTUITIVE**

Being persistent and inquisitive, with a problem-solving attitude, studying SAIW's NDT courses will be your most flexible start to a better future.

3

You must be
**AMBITIOUS
MOTIVATED
KEEN**

If you're ambitious & motivated, contact the SAIW or visit www.saiw.co.za OR Call 011-298 2100 to enquire about our NDT courses.

THEN

You will be able to

4 EARN WHILE YOU LEARN

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SAIW provides training programmes, consultancy and industry support services to the metal industries in South Africa. The SAIW is active throughout Southern Africa, the Indian Ocean Islands and the Middle East. SAIW qualifications & certifications are regarded as the industry standard in South Africa and enjoy international recognition.

Non Destructive Testing (NDT) is the testing of material or manufactured components without destroying their usefulness. Applying scientific techniques such as electromagnetic induction, magnetism, capillary action, mechanical vibration or electromagnetic waves, and other testing techniques, to identify potential flaws or failures within supplied samples.

Call 011-2982100 or visit www.saiw.co.za



SAIW
Southern African Institute of Welding



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N Venter – Aveng Group

P Bruwer – SAQCC IPE

P Pistorius – University of Pretoria

SAIW and SAIW Certification representatives

Executive director

J Tarboton

Tel: (011) 298 2101

john.tarboton@saiw.co.za

SAIW Certification CEO

Herman Potgieter

Tel: (011) 298 2149

herman.potgieter@saiw.co.za

Training and technology manager

Mark Digby

Tel: (011) 298 2169

mark.digby@saiw.co.za

Executive secretary

Dimitra Kreouzi

Tel: (011) 298 2102 (Direct)

Fax: (011) 836 6014

dimitra.kreouzi@saiw.co.za

Finance and administration manager

Michelle Warmback

Tel: (011) 298 2125

michelle.warmback@saiw.co.za



I recently had the honour of attending a celebration in Addis Ababa at the Welding Training and Technology Centre (WTTC), which is now an IIW Approved Training Body (ATB) for Ethiopia. This is a great achievement for all those involved and we look forward to when the WTTC replaces the SAIW as the IIW's Authorised Nominated Body (ANB) for Ethiopia.

Developing National Welding Capabilities on our continent is vital to industrial development because welding is an enabling technology. It allows manufacturing, mining and construction to take place, which creates economic growth along with quality jobs that are in-demand and well-paid.

I think we can all agree that welding is a craft that combines skill, art and science. To master welding requires dedication, patience and determination. Most of the International Welders that I talk to are proud to be creating things through welding. Whether they are helping to build power stations, fabricating pressure vessels or manufacturing motor vehicles, this sense of pride, purpose and achievement comes through.

Here in South Africa, I am very pleased with our new approach to scheduling SAIW training courses. We have now streamlined the number of scheduled courses we offer so as to ensure that we never have to cancel a course again. If it is scheduled, it will run. And for courses in areas such as Cape Town, Durban or Secunda where we have not yet scheduled a particular course, we are inviting people to contact us and we will add their names onto a list for the next-available course in their region, which will be scheduled at a convenient time as soon as 5 to 10 candidates have signed up.

An exciting training success for us this year was the customised courses we developed for quality Inspection, welding and NDT personnel at the new-generation Ford Ranger plant in Silverton. We developed a custom NDT course that included ultrasonic testing for the spot welds along with visual testing for GMAW welds on the frames. We also trained inspectors on how to do macros from the frame plant and, for the stamping plant, we trained tool and die makers in weld inspection for repairs.

We are thrilled to be involved in South Africa's automotive industry and the success of this project bodes well for our ability to help other OEMs who wish to raise quality standards to meet international norms, with niche welding or inspection needs.

Turning attention to next year, we are looking forward to the inaugural TWF Congress in Egypt, which is taking place in March 2023. This will be the first time that all of Africa's welding network gets together for an annual congress and seminar. We at SAIW are thinking of presenting a technical paper, possibly on 3CR12 stainless steel, which we feel was born in Africa and is particularly suited for use in Africa, given its competitive price, excellent corrosion resistance, good weldability and its low surface friction and associated wear properties.

Here in South Africa, we are also planning to host a one-day welding seminar in September or October next year, which will be followed by our Annual Awards Dinner. I've spoken to some of our welding suppliers and they are quite keen to bring their technical specialists out from Europe to introduce and demonstrate their latest technologies. We also hope to give our local universities the opportunity to present their current research work.

Details to follow in the New Year. Until then, I hope you all have a happy and safe Christmas break.

John Tarboton



SAIW Course Prospectus 2023: streamlined, demand-driven and career-focused

With the launch of its 2023 Course Prospectus, the SAIW has streamlined its approach to choosing a welding career pathway and modernised the scheduling of the training programmes on offer to flexibly meet national and regional demand in the most cost effective way possible.

In recent decades welding has become a dominant process in the fabrication of industrial products and in the building of structures from steel. It is used in all phases of production and is needed not only nationally but also internationally in almost every industry ranging from micro-electronics to the construction of petrochemical and power generation, buildings, transport vehicles and infrastructure. Because of the diversity of welding-related projects, there is excellent flexibility for professionally trained people to switch industries without the need for a career change.

The fact that welding is in a strong growth trend accounts for the mounting interest in welding careers. Successfully completing a course in welding can virtually assure a candidate of gainful employment, which includes many progression opportu-

nities and a successful career. Welders can progress to become welding inspectors, welding coordinators, non-destructive testing (NDT) technicians, professional welding engineers or designers and can look forward to extremely rewarding career opportunities, for example.

SAIW has been offering training courses in welding, weld inspection and NDT technologies since the late 1970s. Young people can choose to be practical welders joining plates, tubes and girders together using different materials and various welding processes.

Welding careers can progress by further study in welding coordination to become a welding supervisor/foreman. But welding coordination courses are not only for welders. People hoping for a career in leading welding teams and managing the day-to-day operations of a fabrication shop

can enrol on these courses too, for example, and become welding engineers, welding technologists or welding specialists managing day-to-day welding projects and implementing the welding construction codes and ISO standards, such as ISO 3834.

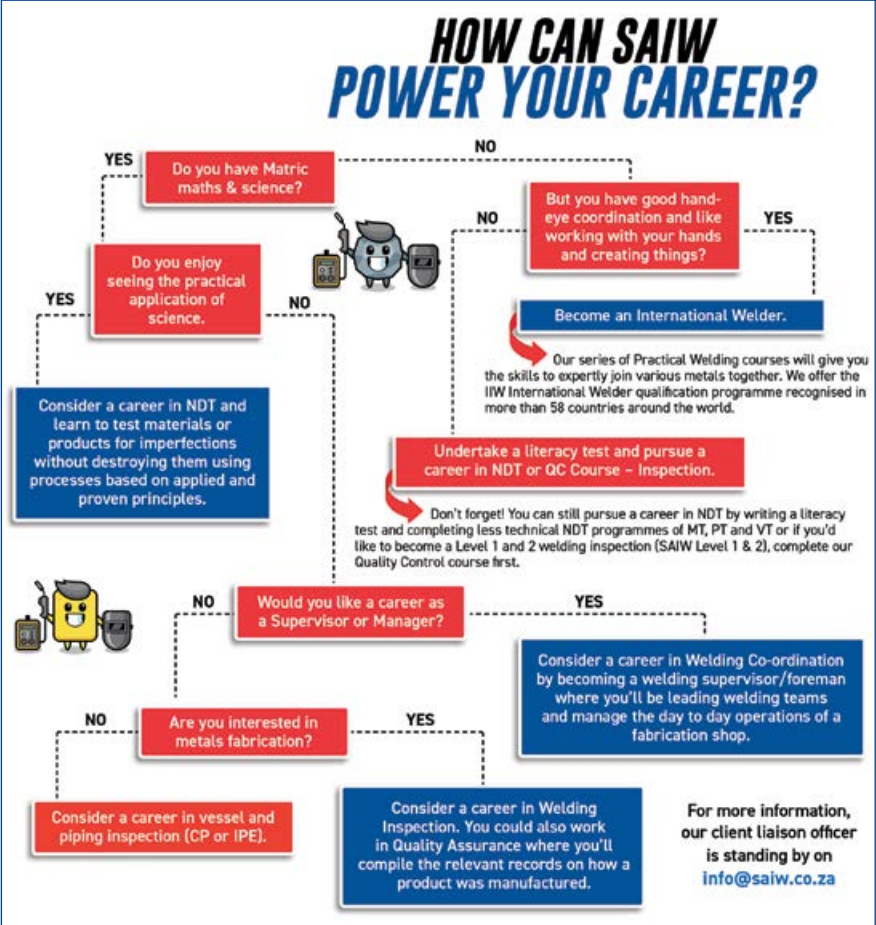
SAIW courses also present opportunities to enter careers as welding inspectors, who are responsible for verifying that welders are following work instructions and welding supervisors are doing their work according to approved welding procedures. Welding inspectors also work in quality assurance, compiling the relevant information for records on how a product was manufactured.

The SAIW offers Non-Destructive Testing (NDT) courses in six different testing methods. Personnel form part of the chain of various fields of expertise, which are used to ensure the world is using high quality products that pose little risk to the end user. NDT Personnel test materials or products for any imperfections without destroying the products or materials.

NDT is not only limited to testing of welds, however, but can be extended to various product sectors – such as castings, forgings, and tubes – and applied in most industrial sectors, such as pre-and in-service testing, power generation and petrochemical industries. This is achieved by using various applied scientific principles and, therefore, a career in NDT will never stagnate. There will always be the opportunity to diversify into other methods or alternatively, specialise in one or more methods to an advanced level of competency.

SAIW courses are intended to meet best practice international standards and many are accredited by the International Institute of Welding (IIW) or International Committee for Non-Destructive Testing (ICNDT) Mutual Recognition Agreement (MRA).

SAIW inspection courses also fulfil the requirements of local certification programmes for inspection personnel (SAQCC IPE and CP), which are approved by the Department of Employment and Labour, while SAIW practical welding courses are accred-





ited by IIW for the International Welder (IW) programme and welder apprenticeships by the South African Qualification Council for Trades and Occupations (QCTO).

Flexible demand-driven scheduling

The SAIW offers training courses at its Johannesburg headquarters, and in Durban and Cape Town, while many SAIW courses are also suitable for presentation at in-company training facilities.

In the past, all SAIW courses were scheduled in advance at the beginning of the year, with candidates invited to book for places according to pre-arranged dates. This approach could lead to course cancellations on one hand or, for popular courses, once a maximum number of candidates

had enrolled, additional bookings were rejected.

It was also particularly difficult to cost-effectively meet demand in regions such as Middleburg, Secunda, Durban or Cape Town. A scheduled course would often have to be cancelled at the last minute due to insufficient numbers, which was frustrating for students and companies.

With the new flexible scheduling approach, in Johannesburg, all SAIW courses are still being scheduled for at least once a year. For the Cape Town, Durban and Secunda regions, as soon a viable number of candidates has registered an interest, any course can be scheduled, and a trainer and a venue booked.

Also, if the break-even number of stu-

dents is exceeded, additional courses can be scheduled to meet the demand, and these can run consecutively, if need be, until all interested students have had the opportunity to attend. Through this new approach, the SAIW can efficiently, quickly, and flexibly adapt to demand, while maximising the interactive benefits students get from each other, making for a richer and more enjoyable learning experience while minimising disappointment and maximising cost effectiveness.

Most importantly, though, it enables the SAIW to fully service training needs in every region of South Africa, including those where the Institute has not previously had a presence.

www.saiw.co.za

Fast tracked IIW Welder qualification for experienced welders

The SAIW is proud to announce the launch of an exciting new streamlined international welder qualification via the new fast tracked IIW Standard Diploma for experienced welders.

At this year's 75th IIW Annual Assembly and International Conference in Tokyo, delegates approved the proposal to tailor the current IIW International Welder course to better suit experienced welders.

SAIW's Herman Potgieter says: "There is no doubt that there is a definite need for this type of international qualification, which creates a global benchmark of welding skill to advance standardisation and the enhancement of skills.

"It is also particularly relevant in South Africa where there are plenty of highly experienced and well established welders who don't yet have an IIW ISO 9606-certified global qualification, which precludes them from working on large projects. We want to grow the number of international welders in South Africa and across the African continent so that we no longer have to source foreign welders, but can rather utilise local welders who are internationally qualified."

The idea is to shorten the IIW International Welder course for a particular area of welding expertise. Most welders are highly experienced in one position and one area and do not want to or need to go through the entire IIW programme again. They, therefore, require a focused qualification that recognises their specific area of expertise.

For example, a structural steel welder would prefer to focus on plate welding theory while tube welders in the petrochemical or power generation sectors are far more familiar with specialised tube

welding, which forms the bulk of what they do.

The new streamlined option bypasses the need to go back to basics and complete the full course. It may not be as comprehensive and offer all processes, materials and welding positions, but it does provide the highly specialised knowledge and assessment to take experienced welders to the next level. Upon completion of the course, students get an IIW International Welder certificate proving they have been trained in a specific position, process and material.

The benefit of the new approach becomes clear when one considers that at present the IIW course for a beginner welder takes around 26 weeks for one welding process at an approximate cost of R166 260 (progress dependent). The introduction of the new format IIW Standard Diploma means that experienced welders can supercharge their training process over one to two weeks – including all training, assessment (examination), materials and welder qualification tests – at a cost of around R18 290, a cost saving of nearly 90%!

The IIW Standard Diploma covers the theory behind a single welding process either fillet, plate or tube in the form of lectures as well as written and practical tests. If these are passed the student receives an IIW Diploma and a Welding Certificate of record, which provides unequivocal proof that the welder complies with the IIW standards.

"To access the course, a student must



The SAIW is proud to announce the launch of the new fast tracked IIW Standard Diploma for experienced welders.

have been a full-time welder for at least two of the previous three years and possess a valid welder qualification certificate. They also have to have a CV with the endorsement from a current or previous employer," explains Potgieter.

Certification at an international level makes welders much more marketable both locally and overseas.

The IIW qualification is also the perfect springboard for more advanced careers in welding, such as inspection and coordination. These jobs add much needed depth of experience on welding projects at ground level and the higher level skills that are often lacking on key projects.



Encore Engineering: outstanding dependability

African Fusion profiles SAIW Member, Encore Engineering Services, a petrochemical-focused mechanical and specialist welding service provider that has successfully executed plant and piping projects in Secunda and Sasolburg for over 25 years.

Encore Engineering Services commenced business in early 1996 and, over the past 25 years, has been focused on its key client, Sasol, successfully executing many mechanical and piping projects in Secunda and Sasolburg. From the beginning, Encore began to evolve into a specialist piping and structural welding manufacturer with expertise in exotic materials.

“Our core business is the manufacture and maintenance of pressure piping, pressure systems and related equipment and structures, with manufacturing covering both fabrication and installation activities,” says technical director, Henk van Heerden. “We combine applicable welding technology with competent welding skills on carbon steel, stainless steel, aluminium, chrome and nickel alloys, using processes such as gas tungsten arc welding (GTAW), shielded metal arc welding (SMAW), flux-cored arc welding (FCAW) and gas metal arc welding (GMAW),” he adds

A notable project in its history, according to Van Heerden, was Sasol’s C3 polypropylene plant expansion project at Secunda, which began in April 2015 and was concluded in June/July 2016. “We had about 85 teams working continuously on that project – 60 welding teams and 15 mechanical teams – from April/May 2015

until we finally signed-off in June 2016,” he tells *African Fusion*.

The plant polymerises propylene fuel into polypropylene thermoplastic – and the C3 expansion took Sasol’s production from 103 000 tpa to just over 625 000 tpa. “This project won Sasol’s Project of the Year award for 2015,” Van Heerden says, adding that Encore reported to the lead EPC contractor, Technip, who in turn reported to Sasol.

“On the mechanical side, the fitters were responsible for installing and aligning equipment such as compressors and pumps, while our welding teams installed all the structural steel and piping,” he adds.

Describing the typical welding tasks undertaken, he says that the structural side was mostly carbon steel, but the piping involved a lot of stainless steel – 304 and 316 grades – along with some high temperature 1¼-chrome-moly materials.

“Pipe welding was done manually, with welders on the large bore piping having to produce sound GTAW root welds before filling and capping using SMAW electrodes, while all tubes smaller than 40 mm in diameter had to be welded using GTAW only,” continues Encore’s quality manager, Dewald du Plooy. “The majority of our welders are qualified on both processes, but we also have an elite group of GTAW welders to take

care of the small bore TIG welding, which can be very tricky,” Du Plooy adds.

“Almost all of the welders we use are local,” Van Heerden assures. “It is important to us to support locally skilled people around Secunda wherever possible. And when we cannot meet our needs, we look for people from other provinces. Only once in our history did we have to employ overseas welders (OCNs) but that was an absolute last resort because of a massive shutdown across the whole of Sasol,” he notes.

ISO 3834 and SAIW Membership

Talking about Encore’s ISO 3834-2 Certification from the SAIW, Du Plooy notes that in the welding field, this is increasingly becoming the required standard. “Using this standard can effectively ensure that welding quality meets the in-service standards required and more and more contracting companies are now insisting on it,” he says, adding that Encore Welding services has been an SAIW-certified ISO 3834-2 since 2017.

Van Heerden adds: “Another major contributing factor for us was that Sasol does not allow any contract to work on pressure equipment to be undertaken without ISO-3834-2 Certification. So certification has significantly increased our work scope.”

ISO 3834-2 requires welders to perform in strict accordance with the approved Welding Procedure Specifications, which must be properly displayed in welding areas. “We also have to control our consumables and do surveillances and verification audits on our stores and on our welding equipment on a regular basis,” says Du Plooy.

“Traceability through the quality management system is also vital,” continues Van Heerden. “We strive to achieve complete traceability and to close all loopholes to ensure nothing can come back to bite us after a project has ended.

“From a management point of view, we can definitely see that the quality of our welding is getting better and better, as we learn lessons and implement solutions. This is evident from the steady improvement in our weld repair rates.

“Our clients have a minimum requirement for all Welding Service Providers to



A notable project in Encore Engineering’s history was the Sasol’s C3 polypropylene plant expansion project at Secunda.



On Sasol's C3 polypropylene plant, Encore's mechanical fitters were responsible for installing and aligning equipment such as compressors and pumps, while the welding teams installed all the structural steel and piping.

achieve a repair rate of 5% or less, and we were achieving that before we first implemented ISO 3834-2 in 2017. Immediately after implementation, however, we achieved 4.56%, and ever since it has been declining steadily. We are currently sitting at 3.2% for this year, but that is immediately after a shut-down so we expect it to decline even further. This is a strong indication of the effectiveness of ISO 3834-2 in raising weld quality and, because weld repair is such a costly exercise, it points towards the cost-saving value of implementing this ISO standard," suggests Henk van Heerden.

In support of the company's technical welding requirements, Encore also has its own welding data capturing program, Encore Welding System (EWS), which was implemented in 2018 and is maintained by Du Plooy's Quality Control Department. "EWS captures all welding data per project and keeps track of WPSs, Welder Qualifications, Welding Consumables, Non-Destructive Testing, Post Weld Heat Treatment and Project Progress.

"Using this information provides data to cross-check all variables to ensure compliance to approved welding procedures, drawings and client requirements – and the system enables quick data recall for any quality or project related query, serving as an additional electronic archiving system," notes Dewald du Plooy.

On the added-value of SAIW membership, Van Heerden says that Encore first built a relationship with the Institute as the certification body for ISO 3834. "As an SAIW member, we have a direct line to access support: for procedures and procedure qualifications, for example, along with

technical assistance on any welding issues that may arise.

"Also, we have started sending our supervisors for specific training from the SAIW and as members, we get discounts. We believe that building better relationships is always going to be beneficial in the long run" he tells *African Fusion*, adding that another major benefit is that corporate members have free access to use the SAIW's comprehensive library of Welding Codes and Standards.

Encore Engineering Services' 6 000 m² under-roof workshop in Secunda consists of an engineering and fabrication area of 4 500 m²; a 720 m² cutting bay; and a material store of 720 m², which includes the company's ISO 3834-2 accredited Welding Store under 24/7 surveillance. In addition, the facility has a laydown area of 3 600 m², which is set up to accommodate large pipe sections, materials, and equipment.

The cutting bay is equipped with heavy duty benches and rollers to feed the bench grinders and/or the plasma cutter. It then feeds into the workshop, where work can be allocated to any one of the 32 workstations.

The workshop has four separate welding bays of approximately 1 000 m² each, and a 500 m² boiler making bay. Four large sliding doors on all sides of the workshop ensure proper material handling to and from the workshop.

"Our history of service and ISO 3834-2 certification gives Encore's clients and stakeholders the assurance that we continuously render services that not only comply to international standards, but also adhere to client specifications, needs and expectations. This has resulted in our trust-



Encore Engineering Services has an elite group of GTAW welders to take care of small bore TIG welding.



For the control of welding consumables according to ISO3834-2, Encore's accredited Welding Store is under 24/7 surveillance.

worthy reputation with current clients and acts as evidence to prospective clients that we can deliver high-quality and sustainable results," notes Du Plooy.

The company's managing director, Mano Laia says: "We at Encore apply experience gained with the assistance of our ISO 9001:2015 and ISO 3834-2 accredited system to deliver exceptional services to our clients: through a talented, dedicated team of highly skilled, qualified and well-trained employees. We strive to maintain the highest quality standards while diligently adhering to client requirements.

"The company's history in the petrochemical industry has resulted in safety and quality being placed at the centre of Encore's core values and daily activities, with dependability, integrity and employee expertise as additional values.

"We offer South African industry efficient, productive and sustainable services by providing high quality work that saves time and money for our valued clients," Laia concludes.

www.encore@secunda.co.za

Industry leader delivers lasting 360° social solutions

As an integral part of its commitment to building a stronger, more sustainable and productive South Africa, Afrox takes the long-term view to sustainable social responsibility, training, safety as well as industrial solutions. *African Fusion* finds out more...

Leading gases company Afrox incorporates a strong culture of social responsibility into its day-to-day business strategies through programmes supporting education, job creation and income generation. Its Corporate Social Responsibility (CSR) initiatives assist in practical ways while making a sustainable difference to society, positively impacting customers, stakeholders, surrounding communities and, importantly, the South African economy.

“We are committed to acting responsibly towards people and the environment, conserving natural resources and developing sustainable practices through socio-economic development and internal programmes,” says Afrox CSR manager Nemenita Mohabir.

“CSR is an inherent part of how we do business. Economically and socially strong communities enhance success and Afrox’s CSR initiatives are chosen to align with our long-term business objectives.”

Afrox’s CSR programmes comprise a host of projects ranging from fun days for under-privileged children to developing welding schools, donating gases and welding materials; talent and small business development schemes and internal programmes incorporating staff health and wellness, bursaries and tertiary assistance.

Mohabir cites a strategic CSR collaboration between Afrox and the Thuthukisa Institute, a community initiative approved by SARS as a Public Benefit Organisation. The Thuthukisa Institute runs a not-for-profit artisan and technical skills development centre where young black entrepreneurs can develop appropriate trade and production-centred vocational skills.

Says Thuthukisa Institute director Paulos Mahlangu: “In partnership with companies such as Afrox, we seek out young entrepreneurs from disadvantaged communities who are committed and display a keen interest in building viable businesses. Participants are mentored and encouraged to actively engage in entrepreneurial enterprises, while we transfer high quality and critically-needed skills, technologies, production and business know-how to the chosen candidates.”

The Afrox-Thuthukisa collaboration project involves 10 unemployed apprentices – five women and five men – in a business incubation programme with direct environmental impact. “Initially, the programme focused on the refrigeration side of Afrox’s business, with the candidates being trained in Thuthukisa’s workshops on the maintenance and repair of refrigeration equipment. But then we became

aware of the mountain of empty single-use refrigerant cylinders at Afrox’s Roodekop LPG and refrigerant warehouse,” Mahlangu tells *African Fusion*. “The idea was born to upcycle this waste by using the skill and creativity of our apprentices to create high-value corporate gifts as an entrepreneurial income generator.

“This has social impact in terms of income and employment, along with environmental and sustainability impact,” adds Afrox’s CSR manager. “And to date, our 10 apprentices have manufactured over 2 000 braai stands out of these cylinders.”

The end product, a portable outdoor cooker or braai stand, was distributed under the ‘We Care’ brand to all Afrox staff as an end-of-year company gift. This project exceeded the initiative’s original goals in terms of sustainability and environmental impact, while still meeting all of the small business and technical skills development goals.

As well as the wealth of experience gleaned from producing so many identical high-quality gifts, Mohabir points out that the sponsored trainees received welding and cutting training directly from Afrox, along with refrigeration, electrical/electrician and manufacturing skills training from the Thuthukisa Institute, all of which relate to Afrox’s business areas.

While on the programme, all students received a laptop with access to MS Office; and access to Thuthukisa tools, workshops and the business centre from where they were encouraged to run small businesses. Trade specific PPE, tools and consumables were also issued to each candidate and they all benefitted from a monthly stipend of R4 000.

“We have now depleted the stockpile of empty refrigerant cylinders at Roodekop and we are looking for other refrigerant suppliers who may have a similar waste stockpile problem. All our Afrox-sponsored apprentices are still with us completing various apprenticeship programmes,” says Mahlangu.

Another successful Afrox CSR initiative is the development of training centres focused on welding as an in-demand route to a sustainable career. Launched in 2016, the POPUP Welding School in Soshanguve provides welding skills to persons who need them most.

Following this success, Afrox sponsored the LIV Welding Academy in KZN, a custom-built container welding school developed in partnership with Afrox and the LIV Village. Through these training centres, Afrox contributes to the development of entrepreneurial skills for the upliftment of South Africa’s unemployed youth.



The ten Thuthukisa Institute Apprentices, from left: Nancy Mokoena, Paballo Motaung, Ntokolo Rakolodi, Xolani Ndlovu, Thabang Mohlala, Karabelo Lekgothoane, Kgotsotso Mahlangu, Precias Phetla, Phontso Aphane and Thabang Rampone.



*Of the 11 LIV welding apprentices that started training before the Covid Pandemic – **Bulelani Quishane; Mfundo Mthembu; Thobani Ngwane; Thulasizwe Mgobozi; Simphiwe Makhanya; Senzo Mthembu; Sakhile Nzuza; Nqobile Blose; Nombuso Vundla; Mdu Buthelezi; and Chris Phewa** – the eight in bold have now graduated as Red Seal artisans on the QCTO Welder Programme, while Chris Phewa is about to redo his Trade Test.*

“Welding is the backbone of industry. It’s a skill that builds economies, infrastructure and whole nations,” says Johann Pieterse, Business Manager for Manufacturing Industries at Afrox. “Our commitment to sponsoring welding schools and centres is as real as it gets because Afrox is dedicated to encouraging our youth to take up this profession, and we hope to see many more young people graduate as welders in the years to come.”

Most notably, Pieterse points out, eight of the welding apprentices from the Afrox sponsored LIV Academy are now among the first welders to graduate as QCTO artisan welders. “This is a tangible success story, for the welders who now have exciting careers ahead of them, for the new QCTO-Welder Programme and for the South African welding industry. We are very proud to have been associated with this success,” says Pieterse.

Pieterse emphasises the importance of Afrox’s responsibility to South Africa in terms of the safety of people working on industrial plant and the long-term sustainability of the industrial solutions Afrox delivers.

“We offer a comprehensive and customised safety auditing, training and implementation service, for example, for any company involved in using our gases or welding and cutting solutions. Not only do we strive to ensure people are safe at work, but we help companies to achieve site-based compliance with Health and Safety legislation,” confirms Pieterse. “In addition, we invest in developing 360° solutions such as our safety at height solution for general overhaul work on power-plant boilers. Our Afrox-developed Multi-User Pressure Panel (MUPP) enables welders to work at height while using gas from cylinders 100 m below them on the ground.”

This solution can also be coupled with Miller’s ArcReach technology. It enables the welding power source to be on the ground, while the welding process controls are set via a suitcase wire feeder or a small remote control that communicates directly via robust welding cables. “This solution is a win-win for safety, efficiency and productivity,” says Pieterse.

On the supply side of the business – and in collaboration with transformation and skills development specialist, LEAP – Afrox has designed a robust Enterprise and Supplier Development (ESD) strategy that encompasses comprehensive business development support for a group of relevant enterprises and suppliers. “The programme includes business management training, mentorship and support for purchasing assets, all with a view to reducing market concentration risks for Afrox ESD programme beneficiaries by exposing them to a wide range of other corporate and business opportunities,” says Afrox Procurement Director, Makhula Magaoga.

Other CSR programmes focus on socio-economic and skills development. These include the support and upliftment of secondary and tertiary schools across the country, who receive training for their learners, upgrading of equipment and facilities and up-skilling of their technical teachers directly from Afrox.

The gases and welding equipment company also runs Young Talent Development consisting of in-service training, apprenticeships, internships and learnerships, while its SED programme continues to provide donations of LPG to Early Childhood Development feeding schemes, and gases and welding materials to various training centres.

“Afrox’s skills development initiatives are largely focused on ensuring skills



The Thuthukisa Institute apprentices have manufactured over 2 000 braai stands out of empty single-use refrigerant cylinders from Afrox’s Roodekop LPG and refrigerant warehouse.



Thuthukisa trainees received welding and cutting training directly from Afrox, along with refrigeration, electrical/electrician and manufacturing skills training from Thuthukisa Institute.

growth in the chemical industries division. Last year we invested over R13-million in this sector and placed 480 learners in different training schemes,” says Mohabir. “A highlight of our annual calendar is Bumbani Day, a southern Africa-wide celebration that sees thousands of disadvantaged and under-privileged children entertained by our staff volunteers from all around the region. This is a staff-driven social event where we get the opportunity to become involved with the children, treating them to outings, fun games and gift bags.”

Afrox also runs an Employee Wellness Programme to enhance productivity and performance in the workplace and instil a culture of wellness and caring, while empowering staff to take responsibility for their own wellbeing.

Afrox’s CSR initiatives reflect the spirit of South Africa as a country and are grounded in consultation, empowerment and partnership, utilising innovative and effective means to build stronger, more self-sustaining communities. “Empowerment of Afrox people is a core value and at the heart of how we do business, with a culture based on the principles of safety, integrity, sustainability and respect,” concludes Nemenita Mohabir.

www.afrox.co.za



SAIW awards NDT and Weld inspection bursaries

During the second and third quarters of 2022, the SAIW conducted competitions and awarded bursaries to four deserving and talented young people. Three regional bursaries valued at R120 000 were won by Lerato Ruth Mokgawa; Marvin Mitchell; and Shaan Mokgwadi; while Izak Van Heerden from Cape Town won an SAIW Welding and Fabrication Inspector Level 1 course, worth R60 000.

On Friday 2 and then again on September 16, the SAIW held open days to give young unemployed bursary candidates the opportunity to explore Non-Destructive Testing (NDT) as a career and to experience a fully immersive tour of the SAIW's world-class facilities.

Attendees who were unemployed with Matric certificates in Grade 12 Maths and Science and who live in Gauteng were invited to bring their CVs along on the day in order to participate in a competitive selection process for a R120 000 NDT bursary – with the winners undergoing full time training in Johannesburg from October.

The open days began with a presentation by Mark Digby, the NDT Training Manager at the SAIW. “NDT, what is it? What will we be doing?” asked Digby.

Non-destructive testing or NDT, he said, is a collection of technique or inspection methods that are used to determine the physical soundness or characteristics of a material, without doing any damage to that

material “Effectively, it is testing something without destroying the thing being tested,” Digby explained.

“NDT is a career for dedicated and hard-working people. You need to be in good physical shape, especially if you are going to inspect petrochemical or power plants and such. Before you can even get into the job you may be put on treadmill for your heart-rate to be measured to prove that you are fit and healthy enough to climb into a plant to do testing,” Digby points out.

“NDT techniques can be easy or more difficult. The easy ones are penetrant testing (PT), visual testing (VT) and magnetic particle testing (MT), while the more difficult ones are radiography (RT) and ultrasonics (UT), and the most difficult of all is eddy-current testing (ET). Most NDT methods are easy to perform, but can be difficult to interpret what is happening on or inside the material,” he noted.

“Integrity is a big thing in NDT. It is very easy to get bullied into making wrong de-

isions out there. An NDT inspector has to stand by his beliefs. We decide if there is a defect in a weld, tank or material and we need to be tough enough to stand up and say when anything is wrong.

“So the question is; does that sound like you?” he asked.

Following Mark Digby's talk potential candidates were split into four groups and taken to visit different areas of the SAIW: The virtual welding machine in Welding School; the submerged arc welding machine in the Welding Technology Centre; ultrasonic (UT) and visual testing (VT) demonstrations in the NDT classrooms; and magnetic testing (MT) in one of the NDT Laboratories.

SAIW has since announced three winners of the Gauteng NDT Bursary. SAIW Executive Director John Tarboton explains: “Initially, only one bursary was offered, but the standard of the entrants was so high it was impossible to choose a clear winner and we felt it was only fair to award three bursaries. So we set about securing funding for an additional two Regional NDT bursaries for Gauteng.”

Some comments from the bursary winners

Lerato Ruth Mokgawa:

“I went to a technical college where I studied mechanical engineering and obtained my N2-N5. I am currently awaiting my N6 certification in mechanical engineering. Upon completion of my studies, I was awarded an apprenticeship at Eskom Rotek Industries where I trained for four years and I am now a qualified Mechanical Fitter,” she said.



Marvin Mitchell:

“I am a boiler maker by trade and have been in the industry for about 10 years now, having worked with various people who had already done Level 1 and 2 Inspection courses. It has always been my dream to be a quality controller and do NDT inspections.”



At an open day at SAIW, NDT bursary candidates look for a weld flaw in a pipe weld using ultrasonic testing (UT).



environment and worked for Balindi Mining at Forzando South. I am now hoping to further my studies, not just through NDT, but I want to branch out to become a Welding practitioner and then a Welding Engineer,” Mitchell said.

Shaan Mokgwadi

is already a red seal welding artisan and was looking to further her education. “I matriculated in 2017 at Khutlo-Tharo Secondary School in Sebokeng. In early 2018, I got a mining learnership and in late December 2018, I left the mining sector for a welding apprenticeship.



“Being a female welder in a male dominated world, you have to prove yourself so much more and doing that is much harder,” she said, adding that her end goal is to start her own company and empower other women to do the same.

Cape Town Region bursary winner: Izak Van Heerden

The SAIW also announced a bursary opportunity for either a Cape Town or a Durban resident on an SAIW Welding and Fabrication Inspector Level 1 course, worth R60 000.

The winner of this SAIW bursary, Izak



A bursary candidate has a go at virtual welding in the SAIW's Practical Welding School.

Van Heerden, has forged a successful start to his career in welding. “I am a qualified welder having received my red seal certificate a few months ago. I grew up in my Dad’s workshop. He had a tool room and was one of the country’s finest air force tool makers. I’ve been working for 14 years in the workshop but was fortunate enough to work in industry until very recently, when I



decided to focus on my studies. I have been in the welding industry for eight years, but I have never had the money for the welding inspector course, so when I heard I had won the bursary, I accepted it with both hands,” he says.

“My main goal,” he says “is to become a Level 3 Welding Inspector and my prayer is that there will be another bursary for Level 2. I also have a passion for teaching and my dream is to teach young welders to believe in themselves and become somebody. I would also like to have my own company someday”.

www.saiw.co.za

ISO 3834 certification safe with SAIW

SAIW Certification received its first ISO 3834 accreditation in 2008 through the International Institute of Welding (IIW) and is home to more than a century of collective wisdom and experience. “We are extremely concerned about current irresponsible messaging to the market which can only be seen as designed to induce ‘panic buying;’ warns SAIW’s Herman Potgieter.

“Current and imminent audits to ISO 3834:2005 are still valid and SAIW’s ISO 3834 clients remain fully compliant with the current ISO 3834 standard for the full 12 months since their last audit,” he assures, adding that all scheduled audits conducted after April 2023 will be to the new ISO 3834: 2021 version, but current SAIW audits already include the changes as for ISO 3834: 2021 compliance.

There has been no fundamental change to the ISO 3834 standard, but rather minor adjustments to the phrasing of certain parts of the document. These newer paragraphs contain requirements that already form part of the SAIW Certification audit

checklists. Companies therefore do not have to undergo a new ISO 3834 audit if they fully comply with current ISO 3834 requirements, and there is also no need for clients to reprint their current certificates.

An unbiased, objective and highly experienced partner

“As the only ISO 3834 certification body recognised by the International Institute of Welding (IIW) as an Authorised Nominated Body for Company Certification (ANBCC) in South Africa, we take market misinformation very seriously. Given our role as the custodian of ISO 3834 certification in South Africa, we remain 100% committed to being an unbiased, objective and balanced partner of choice for our clients’ ISO 3834 requirements.

“Another of our key strengths is that as a not-for-profit entity we are founded on the principle of ‘by the industry and for the industry’. SAIW Certification’s main goal is to uplift South Africa’s welding capabili-

ties and champion the skill of welding by upholding and uplifting standards in the manufacturing and industrial sectors.

SAIW Certification is also able to draw from the collective training and technical expertise of the broader Southern African Institute of Welding in which we operate, and which has been in existence since 1948 as a founder member of the International Institute of Welding (IIW) and which specialises in a variety of welding and NDT related services.

Easing the financial burden of ISO3834 certification

To assist our clients to maintain their ISO 3834 Certification requirements, SAIW has instituted several market-related payment plans to ease the financial burden companies face when keeping up with the annual requirements of ISO 3834 certification.

“Overall, we are committed to upholding ISO 3834 standards in South Africa and we welcome feedback or any questions you might have,” Potgieter assures.

herman.potgieter@saiw.co.za

An investigation of δ -ferrite content in weld metal of modified 9Cr-1Mo electrodes using thermodynamic modelling and quenching experiments

This paper by Sibusiso Mahlalela and Pieter Pistorius from the University of Pretoria's SAIW Centre for Welding Engineering in the Department of Materials Science and Metallurgical Engineering in South Africa, outlines an SAIW-funded investigation into the welding of 9Cr-1Mo (P91) steels using different electrodes to determine how to prevent retained δ -ferrite content forming in the weld metal.

During fabrication of modified 9Cr-1Mo steels, δ -ferrite formed in the weld metal and heat-affected zone may not transform completely to austenite during subsequent cooling. The influence of changes in weld metal composition on δ -ferrite content was investigated using weld pads produced using basic coated P91 electrodes from four different manufacturers.

The weld pads were designated Electrodes 1, 2, 3, and 4 according to the different manufacturers. Electrodes 1 and 3 fully complied with the EN ISO 3580-A CrMo91 specification. Electrode 2 had very low nickel and high niobium contents, and Electrode 4 had carbon content above the maximum allowable limit.

Thermo-Calc results showed that the temperature range over which a mixture of δ -ferrite and austenite is stable (the A_{e_4} to A_{e_3} temperature range) was smaller by more than 100 °C for Electrode 2 when compared with those of the other three electrodes.

The limited A_{e_4} to A_{e_3} temperature range, the high ferrite factor and the chromium-nickel balance value of Electrode 2 were associated with an increase in the δ -ferrite content of the weld metal. Metallography results confirmed a significant amount of δ -ferrite in the as-welded microstructure of Electrode 2.

Thermo-Calc estimates for the amount of δ -ferrite at high temperatures were supplemented by experimental anneal heat treatment on the weld metal. High-temperature anneal heat treatments were carried out at 1 320 °C and 1 420 °C.

The amount of δ -ferrite in the high-temperature annealed and quenched samples was significantly less than predicted by Thermo-Calc property diagrams.

Introduction

P91 steel is a ferritic-martensitic steel in the 9% to 12%Cr family that is modified by nitrogen, niobium and vanadium additions. Modified 9Cr-1Mo (P91) steel has attractive properties, such as high creep rupture strength, good resistance to stress corrosion cracking, a low thermal expansion coefficient and high thermal conductivity, which makes it suited to long-term elevated-temperature application in power-generating plants [1].

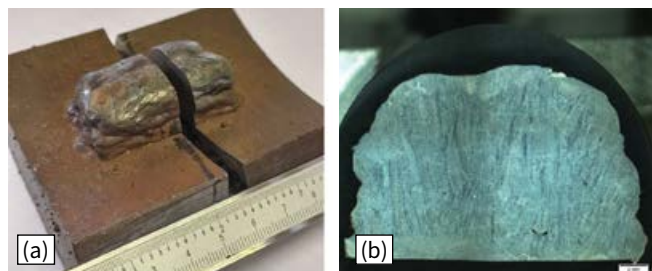


Figure 1: (a) A photograph of a sectioned weld pad on the P91 base metal; (b) Stereoscope images of the weld pad cross section at 10 \times magnification.

For adequate performance of modified 9Cr-1Mo steels, the alloy design and thermomechanical processes during manufacturing should be such that a fully martensitic microstructure is achieved that is free from delta (δ) ferrite. The presence of δ -ferrite, even in small quantities in the final microstructure, has a detrimental effect on mechanical properties [2], especially creep rupture strength in long-term high-temperature applications [3].

Production of P91 base metal always includes austenitisation at temperatures of 1 040-1 150 °C to dissolve any retained δ -ferrite, followed by air cooling and tempering [4]. During fabrication, austenitisation is not a feasible post-weld heat treatment, so δ -ferrite formed in the weld and heat-affected zone may not transform completely to austenite during subsequent cooling. It is under these circumstances that retained δ -ferrite is often observed in the final microstructure of the weld metal [5].

A strict balance between austenite- and ferrite-forming elements in P91 is necessary to ensure that no δ -ferrite is present in the weld metal. The retention of δ -ferrite in the weld metal is often predicted from the chemical composition using modifications of the Schaeffler, Schneider, Kaltenhauser, and Newhouse empirical formulas [6]. To obtain weld metals free from δ -ferrite, Onoro [7] stated that a Schneider chromium equivalent (Cr_{eq}) value lower than 13.5 and the difference between the chromium (Cr_{eq}) and nickel equivalents (Ni_{eq}) – referred to as the ferrite factor (FF) – lower than 8 are necessary. The Schneider formulas are as follows:

$$Cr_{eq} = Cr + 2Si + 1.5Mo + 5V + 1.75Nb + 0.75W \quad (1)$$

$$Ni_{eq} = Ni + 0.5Mn + 30C + 25N + 0.3Cu \quad (2)$$

Honda *et al* [8] reported that having Cr_{eq} and Ni_{eq} lower than the proposed limits does not always prevent the formation of δ -ferrite. Roberts *et al* [9] suggested using the chromium-nickel balance (CNB), given by Eq. 3:

$$CNB = Cr + 6Si + 4Mo + 1.5W + 5Nb + 9Ti + 11V + 12Al - 40C - 30N - 2Mn - 4Ni - 1Cu \quad (3)$$

Swindeman *et al* [4] reported that if the CNB is less than 10, δ -ferrite is not usually present; while for CNBs above 12, significant quantities of δ -ferrite are observed.

In the current investigation, shielded metal arc welding was performed using four coated P91 electrodes from different manufacturers. The main objective was to investigate the influence of compositional differences on δ -ferrite content in the weld metal and δ -ferrite/austenite (δ/γ) phase-transformation temperatures.

Thermo-Calc modelling results for the amount of δ -ferrite at high temperatures were supplemented by experimental anneal heat treatment on the weld metal. The annealing was performed at a temperature range in the equilibrium phase diagram where both δ -ferrite and austenite are stable. Additionally, the annealing experiments also enabled us to study the kinetics of delta-ferrite/austenite transformation during cooling.

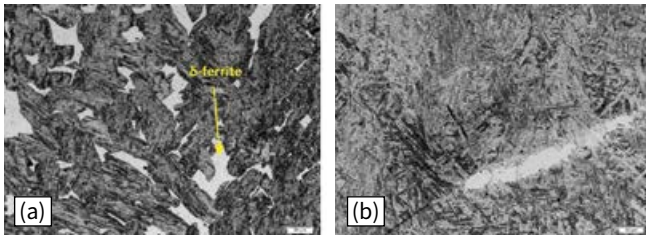


Figure 2: Optical images of as-welded microstructures of (a) Electrode 2, showing a martensitic matrix with δ -ferrite in the last-deposited beads, and (b) Electrode 3, showing martensitic matrix with δ -ferrite in the fusion line between the weld beads. 200 \times magnification.

Experimental procedure

A P91 sectioned pipe with a thickness of 40 mm was used as the base metal for the weld pads. Figure 1(a) shows a photograph of the sectioned weld pad. A stereoscope image of the weld pad cross section is shown in Figure 1(b). Two weld pads were prepared from each electrode, each with a size of 20 \times 25 \times 70 mm. One weld pad was deposited with the base metal preheated to 200 $^{\circ}$ C, and the inter-pass temperature maintained at a minimum value of 200 $^{\circ}$ C during welding. The other weld pad received no preheating.

Table 1 shows typical weld metal compositions of the electrodes (designated Electrodes 1, 2, 3, and 4) as supplied by the respective manufacturers.

P91 welds usually receive a temper treatment at a minimum temperature of 730 $^{\circ}$ C for 2:00 h to achieve optimum mechanical properties, but in the current investigation, the pads were analysed in the as-welded condition.

Table 2 presents the chemical compositions of the four weld pads, performed on the last bead deposited using the optical emission spectrograph (OES) technique. Electrodes 1 and 3 fully complied with the EN ISO 3580-A CrMo91 specification. Electrode 2 had very low nickel and high niobium contents, and Electrode 4 had carbon content above the maximum allowable limit.

Thermo-Calc version 2019b thermodynamic software was used with the TCFE7 database to perform one-axis equilibrium calculations based on the actual chemical compositions of the welds shown in Table 2. The equilibrium transformation sequence and temperatures were hence determined. An equilibrium phase diagram was constructed for the P91 composition with a range of mass percentage chromium. Individual phase diagrams with elemental range of carbon, nickel, and niobium were also constructed because they fall outside the composition specification limits for Electrodes 2 and 4.

Table 1: Typical analysis of weld metal (mass%), as supplied by electrode manufacturers.

| | C | Mn | Cr | Si | Mo | V | Nb | Ni |
|--------------------------------|-----------|---------|----------|---------|---------|-----------|-----------|---------|
| EN ISO 3580-A CrMo91 (Stdndrd) | 0.06-0.12 | 0.4-1.5 | 8.0-10.5 | 0.6 max | 0.8-1.2 | 0.15-0.30 | 0.03-0.10 | 0.4-1.0 |
| P91 Electrode 1 | 0.10 | 0.6 | 8.5 | 0.2 | 1.0 | 0.20 | 0.06 | 0.5 |
| P91 Electrode 2 | 0.09 | 1.0 | 9.0 | 0.2 | 1.0 | 0.22 | 0.07 | - |
| P91 Electrode 3 | 0.10 | 0.7 | 9.0 | 0.4 | 1.0 | 0.20 | 0.06 | 0.7 |
| P91 Electrode 4 | 0.09 | 0.6 | 9.0 | 0.2 | 1.1 | 0.20 | 0.05 | 0.8 |

Table 2: Average chemical composition (mass%) of weld metal pads (EN ISO 3580-A CrMo91).

| | C | Mn | Cr | Si | Mo | V | Nb | N | Ni | Al |
|--------------------------------|-----------|---------|----------|---------|---------|-----------|-----------|-----------|---------|--------------|
| EN ISO 3580-A CrMo91 (Stdndrd) | 0.06-0.12 | 0.4-1.5 | 8.0-10.5 | 0.6 max | 0.8-1.2 | 0.15-0.30 | 0.03-0.10 | 0.02-0.07 | 0.4-1.0 | - |
| P91 Electrode 1 | 0.12 | 0.58 | 9.31 | 0.21 | 1.05 | 0.22 | 0.076 | 0.043 | 0.44 | \leq 0.005 |
| P91 Electrode 2 | 0.10 | 0.98 | 9.92 | 0.43 | 1.13 | 0.24 | 0.144 | 0.038 | 0.05 | \leq 0.005 |
| P91 Electrode 3 | 0.12 | 0.74 | 9.34 | 0.36 | 1.01 | 0.27 | 0.065 | 0.031 | 0.68 | \leq 0.005 |
| P91 Electrode 4 | 0.15 | 0.52 | 10.30 | 0.22 | 1.06 | 0.22 | 0.071 | 0.027 | 0.74 | \leq 0.005 |

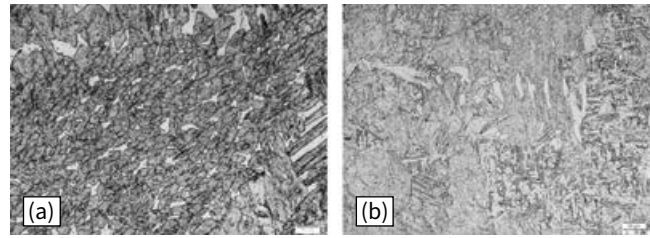


Figure 3: Optical microstructure images of welds annealed at 1320 $^{\circ}$ C for 1:00 h: (a) Electrode 2, comprising a martensitic matrix with 23% δ -ferrite; and (b) Electrode 3, comprising a martensitic matrix with about 2% δ -ferrite. 200 \times magnification.

High-temperature anneal heat treatments were carried out at 1320 and 1420 $^{\circ}$ C with soaking times of 60 min followed by a subsequent water quench. The heat-treated samples with dimensions of 10 \times 10 \times 5 mm were sectioned from the weld pads. The annealing was done on a vertical tube furnace under an argon gas atmosphere with an external thermocouple inserted to verify the temperatures during heat treatment.

Optical metallography and scanning electron microscopy with energy-dispersive X-ray spectroscopy (SEM-EDS) were carried out on the weld pads in both the as-welded and high-temperature annealed conditions. The phase fraction calculation of the microstructures was performed through ImageJ area fraction measurement. Electron backscatter diffraction (EBSD) analysis was performed on the as-welded samples only, using a Joel JSM instrument at an accelerating voltage of 20 kV and working distance of 10 mm.

Results and discussion

The as-welded optical microstructure of Electrode 2, shown in Figure 2(a), indicated about 13% volume fraction of δ -ferrite in the weld metal of the last-deposited beads. In contrast, that of Electrode 3, shown in Figure 2(b), showed martensitic matrix with small amounts (0.4%) of δ -ferrite retained in the fusion line between the weld beads. Weld metals of Electrodes 1 and 4 were fully martensitic. The use of preheating (200 $^{\circ}$ C) did not change the amount of δ -ferrite in the Electrode 2 weld metal.

An optical image of the Electrode 2 weld annealed at 1320 $^{\circ}$ C (Figure 3(a)) showed that the microstructure consisted of a martensitic matrix with 23% δ -ferrite. Electrode 3, shown in Figure 3(b), consisted of a martensitic matrix with about 2% δ -ferrite. No δ -ferrite was observed in Electrodes 1 and 4 weld metals that were heat-treated at 1320 $^{\circ}$ C.

The volume fraction of δ -ferrite observed in Electrode 2, shown

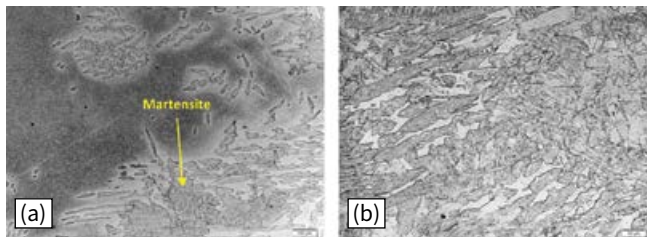


Figure 4: Optical microstructure images of welds annealed at 1 420 °C for 1:00 h: (a) Electrode 2, comprising a 72% δ -ferrite matrix with martensite at 100 \times magnification; and (b) Electrode 3, comprising a martensitic matrix with about 19% δ -ferrite at 200 \times magnification.

in Figure 4(a), exceeded 70% when heat-treated at 1 420 °C. Electrodes 1, 3, and 4 welds that were heat-treated at 1 420 °C showed a martensitic matrix with 16%–19% δ -ferrite shown in Figure 4(b).

EBSD was applied to determine if any austenite phase was present in the as-welded microstructures of the four electrodes. Figure 5(a) presents an EBSD phase map that shows the presence of only a body-centred cubic (bcc) crystal structure and no evidence of austenite was observed in the as-welded samples.

Differentiating between martensite and δ -ferrite was difficult because of the similarities in the crystallographic structures of the two phases. EDS was performed to determine whether any partitioning of elements between the phases or segregation along the phase boundaries could be detected. There was no evidence of any chemical segregation between the δ -ferrite and martensitic phases (Figure 5(b and c)). A difference in carbon concentration between the δ -ferrite and martensite phase may exist but the EDS detector was not sensitive enough to detect differences at the concentrations present in the welds. The green and brown images in Figure 5(b) represent elemental mapping scans for oxygen and manganese, respectively.

The dark region in the oxygen map is a shadowing effect from the surface topology which is an artefact of the acquisition process.

Table 3: Ferrite factor ($Cr_{eq}-Ni_{eq}$) and chromium–nickel balance (CNB) to predict δ -ferrite retention.

| | $Cr_{eq} (< 13.5)$ | $Ni_{eq} FF (< 8)$ | FF (< 8) | CNB (< 12) |
|-----------------|--------------------|--------------------|----------|------------|
| P91 Electrode 1 | 12.5 | 5.4 | 7.1 | 8.6 |
| P91 Electrode 2 | 13.9 | 4.5 | 9.4 | 13.1 |
| P91 Electrode 3 | 13.0 | 5.4 | 7.6 | 9.0 |
| P91 Electrode 4 | 13.6 | 6.2 | 7.4 | 7.9 |

Figure 5(c) shows chromium and nickel EDS line scans represented by the pink and blue scans, respectively.

Based on the chemical compositions in Table 2, Schneider empirical formulae and the CNB were used to predict the presence of δ -ferrite in the final weld metal [4]. The results are presented in Table 3.

Electrode 2 had the most indicators of δ -ferrite retention in the weld metal due to its high FF and CNB values. The weld metal from Electrode 4 had a marginally high chromium equivalent, but no δ -ferrite was observed in the weld metals because of the balancing effect of the nickel equivalent.

Figure 6 shows P91 equilibrium phase diagrams constructed using Thermo-Calc software, where Figure 6(a) shows the variation in chromium content between 5 and 15 mass%, Figure 6(b) shows the range of carbon content between 0 and 0.25 mass%, Figure 6(c) shows a content range of nickel between 0 to 2 mass%, and Figure 6(d) is a 0 to 0.2 mass% of niobium content range.

Chromium is the main alloying element in P91 steel because of its influence in both oxidation resistance and creep strength and it is a strong ferrite former. The equilibrium phase diagrams with chromium variation demonstrates clearly the influence of chromium on transformation temperatures and on restricting the austenite phase field.

Higher chromium content leads to the increased chance of delta ferrite presence in the final weld metal. Carbon, nickel and niobium were outside the composition specification limits as shown in Table 2, and thus it was important to highlight the extent of their influence on the Ae_4 and Ae_3 transformation temperatures. Austenite and δ -ferrite are both stable at the annealing temperature.

The equilibrium transformation temperatures are defined as follows (on heating):

Ae_1 : Onset of austenite formation.

Ae_3 : Fully austenitic phase is achieved.

Ae_4 : Onset of δ -ferrite formation from austenite.

Ae_5 : Completion of austenite to δ -ferrite transformation.

In comparing the phase diagrams of Figure 6, the effect on transformation temperature of the elements is evident. Carbon and nickel are austenite formers and enlarged the (Ae_4 - Ae_3) temperature range which reduces the tendency for δ -ferrite retention. The strong effect of nickel on the Ae_1 temperature is evident in Figure 6(c). Niobium is a ferrite former but shows minimal effect on the transformation temperatures as seen in Figure 6(d); it is mainly

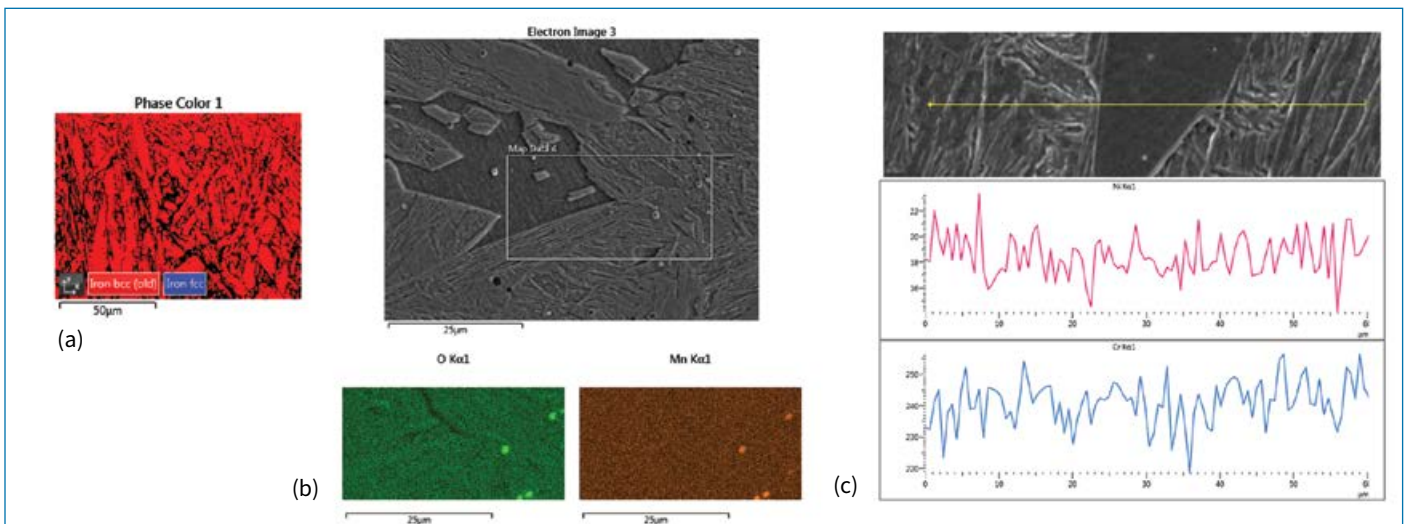


Figure 5: (a) An EBSD phase map (red: martensite and δ -ferrite) of Electrode 2 weld metal showing the presence of only iron bcc phases; (b) Elemental mapping scan between δ -ferrite and martensite phases showing no segregation, although some inclusions are observed; (c) EDS line scan analysis, showing no evidence of segregation.

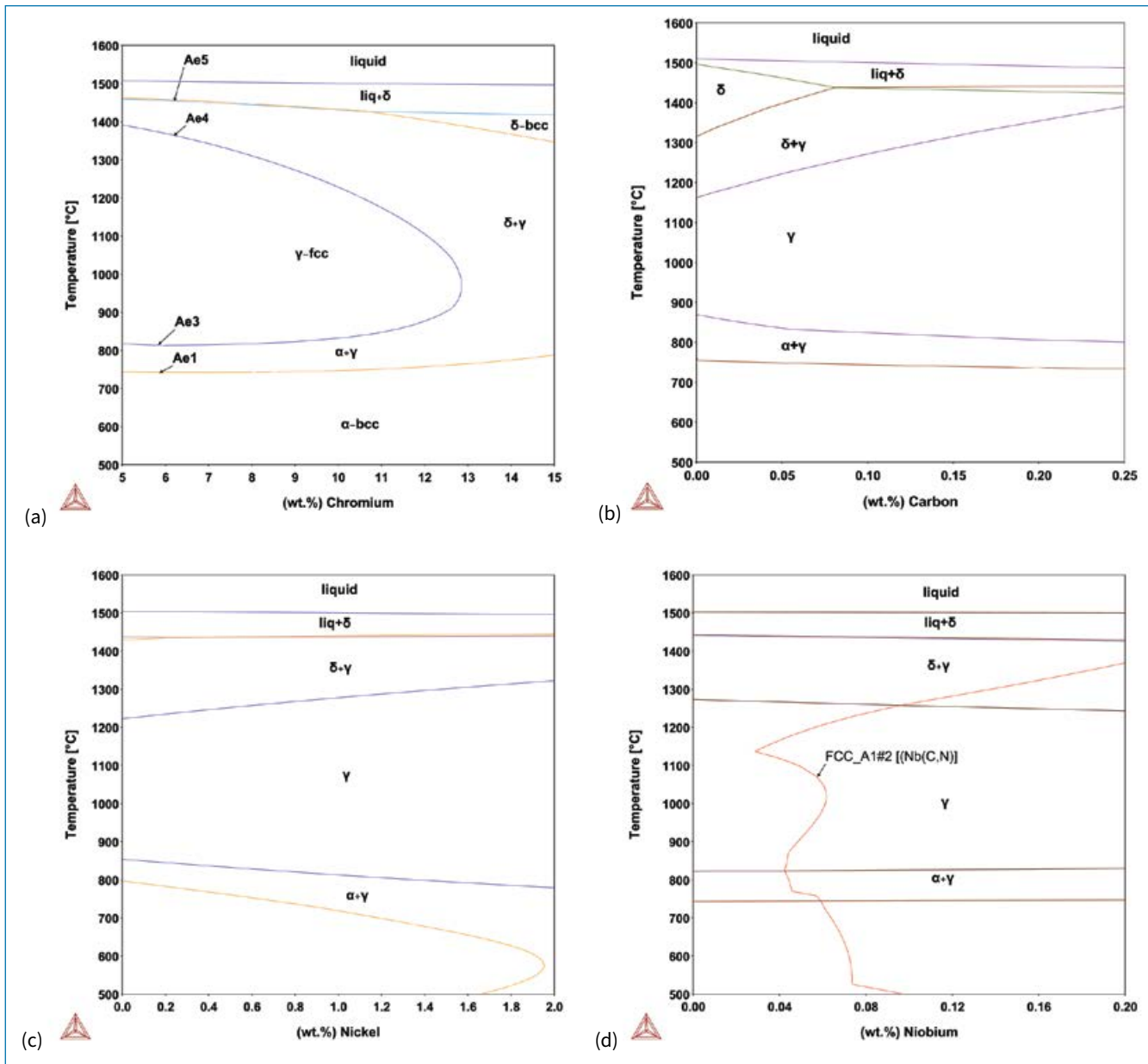


Figure 6: P91 compositional phase diagrams showing (a) 5 to 15 mass % chromium, (b) 0 to 0.25 mass% carbon, (c) 0 to 2 mass% nickel, and (d) 0 to 0.2 mass% niobium.

added as a carbo-nitride former. This highlights the importance of achieving a good balance between ferrite- and austenite-forming elements in P91 alloys because of their influence in the (Ae_4 - Ae_3) temperature range.

The Thermo-Calc equilibrium property diagrams shown in Figure 7 reveal different phase-transformation sequences that takes place during cooling, depending on the composition of the weld deposit:

Liquid \rightarrow liquid+ δ \rightarrow liquid+ δ + γ \rightarrow δ + γ \rightarrow γ (Electrodes 1, 3 and 4)
 Liquid \rightarrow liquid+ δ \rightarrow δ \rightarrow δ + γ \rightarrow γ (Electrode 2)

The thermodynamic property diagram for Electrode 4, shown in Figure 7(a), was very similar to those of Electrodes 1 and 3. The transformation temperatures and behaviour of Electrode 2,

shown in Figure 7(b), were slightly different, in that solidification was almost complete before the onset of austenite formation; Electrodes 1, 3, and 4 still had a significant amount of liquid when austenite started forming.

Arivazhagan and Kamaraj [6] stated that the chance of δ -ferrite retention in the weld increases with a lower value of (Ae_4 - Ae_3). A larger (Ae_4 - Ae_3) value means that austenite is stable over a wider range of temperature and that δ -ferrite has more time to transform to austenite during cooling. The equilibrium transformation temperatures determined from the property diagrams are listed in Table 4. Electrodes 1, 3, and 4 weld metals had (Ae_4 - Ae_3) temperature ranges between 417 and 434 °C, which are more than 100°C larger than the corresponding temperature range for Electrode 2 weld metal.

Table 4: Thermo-Calc equilibrium transformation temperature (°C).

| | Ae_1 | Ae_3 | Ae_4 | Ae_5 | Solidus | ($Ae_4 - Ae_3$) |
|-----------------|--------|--------|--------|--------|---------|-------------------|
| P91 Electrode 1 | 796 | 840 | 1 271 | 1 439 | 1 434 | 431 |
| P91 Electrode 2 | 802 | 876 | 1 170 | 1 420 | 1 430 | 294 |
| P91 Electrode 3 | 764 | 836 | 1 270 | 1 435 | 1 431 | 434 |
| P91 Electrode 4 | 773 | 839 | 1 256 | 1 431 | 1 424 | 417 |

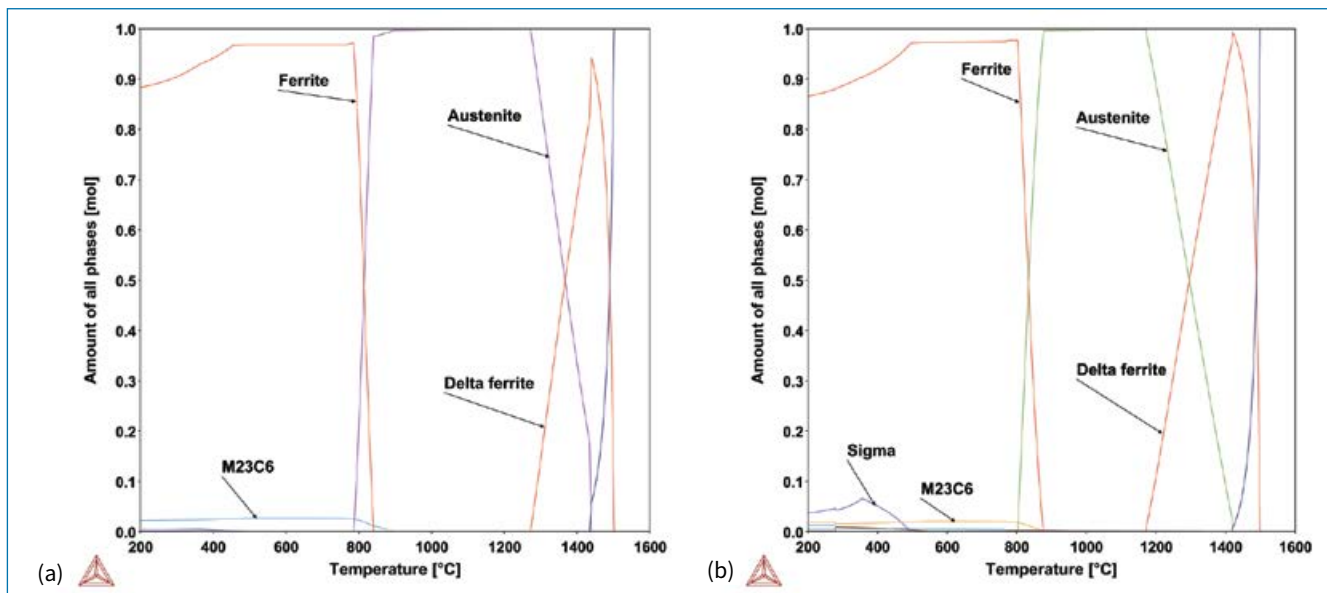


Figure 7: Property diagrams for (a) Electrode 4 and (b) Electrode 2 weld metals showing the mole fraction of phases as a function of temperature

Table 5: Measured amounts of δ -ferrite in the as-welded and annealed (HT) weld metal compared to Thermo-Calc predicted results. Note - indicates that the microstructure was fully martensitic.

| | Ae ₄ -Ae ₃ | FF | CNB | Measured δ -ferrite % | | | Thermo-Calc predicted δ -ferrite % | |
|------------------------|----------------------------------|-----|------|------------------------------|--------------|--------------|---|----------|
| | | | | As- welded | HT@ 1 320 °C | HT@ 1 420 °C | 1 320 °C | 1 420 °C |
| P91 Electrode 1 | 431 | 7.1 | 8.6 | - | - | 18 | 25 | 76 |
| P91 Electrode 2 | 294 | 9.4 | 13.1 | 13 | 23 | 72 | 60 | 98 |
| P91 Electrode 3 | 434 | 7.6 | 9.0 | 0.4 | 2 | 19 | 27 | 78 |
| P91 Electrode 4 | 417 | 7.4 | 7.9 | - | - | 16 | 29 | 74 |

Table 5 summarises the results from the Thermo-Calc calculations and ferrite-prediction empirical formulas compared with the measured phase fraction of δ -ferrite in both the as-welded and high-temperature annealed samples. Electrode 2 had the smallest (Ae₄-Ae₃) temperature range and high FF and CNB values. These characteristics resulted in a significant amount of δ -ferrite in the weld metal when compared with other electrodes.

A small amount of δ -ferrite was observed on the as-welded microstructure of Electrode 3 even though the ferrite-predicting empirical formulae values were within the recommended limits. The chromium equivalent (Cr_{eq}) was slightly above the recommended limit and the carbon content was above the specification limit for Electrode 4, but the microstructure was fully martensitic. The empirical formulas (FF and CNB) are not always accurate in predicting the presence of delta ferrite in the final weld metal.

The amount of δ -ferrite observed in the annealed welds was significantly lower than predicted by the Thermo-Calc property diagrams under equilibrium conditions. This may indicate that even with a very fast cooling rate, it is difficult to completely suppress the δ -ferrite to austenite transformation.

Conclusions

Four commercial P91 electrodes were compared with respect to δ -ferrite content in the as-welded and high-temperature annealed conditions. Electrodes 1, 3, and 4 weld metals had (Ae₄-Ae₃) temperature ranges exceeding 400 °C, which was more than 100 °C larger than that of Electrode 2 weld metal, which contained a significant amount of δ -ferrite in the final microstructure. The lack of nickel, an austenite stabiliser, in the Electrode 2 composition highlights the importance of a strict balance between austenite- and ferrite-forming elements in preventing the presence of δ -ferrite.

Manufacturers' weld metal compositions should target the EN ISO 3580-A CrMo91 or similar standard to reduce the risk of δ -ferrite retention. As observed in the annealed weld-metal microstructures, the amount of δ -ferrite was significantly lower than predicted by Thermo-Calc property diagrams. Determining the high-temperature structure probably requires much higher cooling rates than can be achieved by water quenching.

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ERP is only for large

enterprises.

MYTH

This is one of the 16 commonly held and yet mistaken beliefs surrounding ERP. To truly maximise the benefits of an ERP system, it is crucial to have the right expectations. This is why Frost & Sullivan in collaboration with SYSPRO have released *ERP Myths & Truths: Dispelling Misconceptions About Enterprise Resource Planning Systems*.

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ONE STEP AHEAD.

Dispelling misconceptions about ERP systems

Frost & Sullivan Africa, in partnership with Syspro, has completed an investigation into the myths and truths about Enterprise Resource Planning (ERP). *African Fusion* presents a short introduction.

Increasing geopolitical tensions and supply chain shocks have pushed executives to adopt and implement digital solutions such as Enterprise Resource Planning (ERP) technology to minimise disruptions and maintain business continuity. However, adoption and implementation can have a wide range of outcomes, which has led to many misconceptions, truths and myths around this software.

Advancements in ERP systems have increased the adoption of the software in organisations across a range of industries. Collaboration, efficiency, and flexibility are attributes that have shifted from ‘desired’ to ‘crucial’ in our post-pandemic world. Adopting business processes and digital tools to limit disruption has dominated executive agendas, with recent events revealing just how fragile our systems are to supply chain shocks.

Defined as an end-to-end business tool organisations use to centralise and manage business processes, Enterprise Resource Planning (ERP) software has seen widespread adoption across a range of non-traditional industries and market segments over the past decade. Originally designed to manage quality and inventory in large manufacturing enterprises, ERP systems have transformed to support a much wider range of organisations. Today, anything from financial services to distribution businesses, and from small start-ups to large multi-national corporations can afford and derive significant value from ERP systems.

The advanced offerings are now linked into a range of advanced technologies. Insight from an interview with an ERP specialist reveals that, since 2016, ERP systems have seen widespread adoption of cloud services, mobile services, network access and interconnectivity between devices.

This has not only reduced entry barriers and incremental costs, but it has enabled ERP systems to integrate a whole new range of IoT (Internet of Things) and IIoT (Industrial Internet of Things) devices. The transition will lay the foundation for more ‘advanced technologies’ to be used efficiently and effectively in the years to come,

by harvesting data for these advanced applications across various parts of the organisation, from HR to manufacturing.

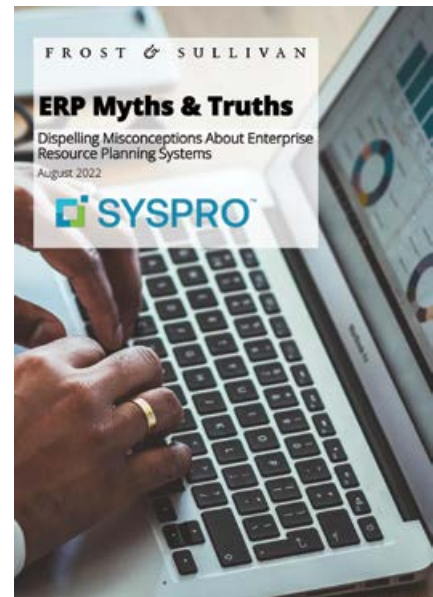
To truly maximise the benefits of any ERP system, however, it is crucial to have the right expectations, which is why SYS-PRO and Frost & Sullivan have released ERP Myths & Truths: Dispelling Misconceptions About Enterprise Resource Planning Systems, which is a white paper that addresses the myths surrounding ERP systems and uncovers the truth about this software.

ERP systems generate vast amounts of data which, if integrated and utilised effectively, can become one of an organisation’s biggest assets. This could include optimisation of supply chains, customer profiling and other business process insights.

The research paper addresses 16 common myths that occur along the four lifecycle phases of ERP systems, including: Decision making; Selection; Implementation; and Managing.

Whether considering buying a first ERP system, switching providers, or looking to maximise an existing investment, this paper uncovers the real truths around these innovative and essential systems.

“If you look at the common ERP misconceptions, it is clear how most companies might be missing out on a true opportunity for growth. From finance to inventory, manufacturing, reporting and more, ERP gives a single source of truth that

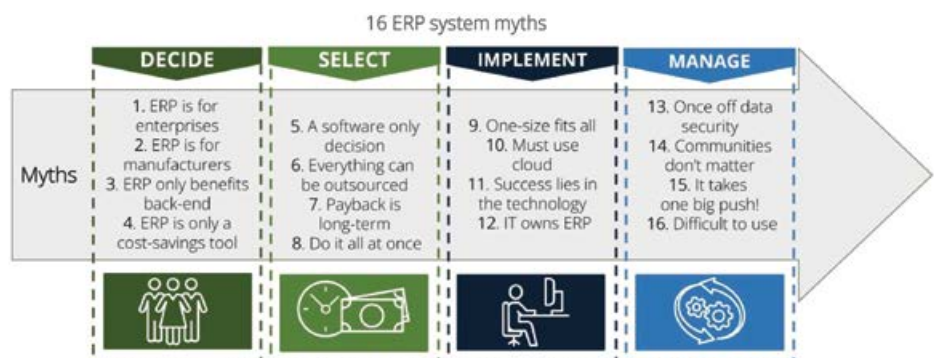


is used across all the areas of business to consolidate disparate systems and eliminate manual processes. With the many disruptive factors affecting businesses today, there has never been a better time to deploy an ERP solution than right now,” says Doug Hunter, manager for Customer and Ecosystem Enablement at SYS-PRO.

To access and download the full white paper scan this QR code:



The taxonomy of ERP systems, which are increasingly being used for a range of ‘advanced offerings’ such as analytics, which are often externally focused.



The 16 common myths that occur along the four lifecycle phases of ERP systems.

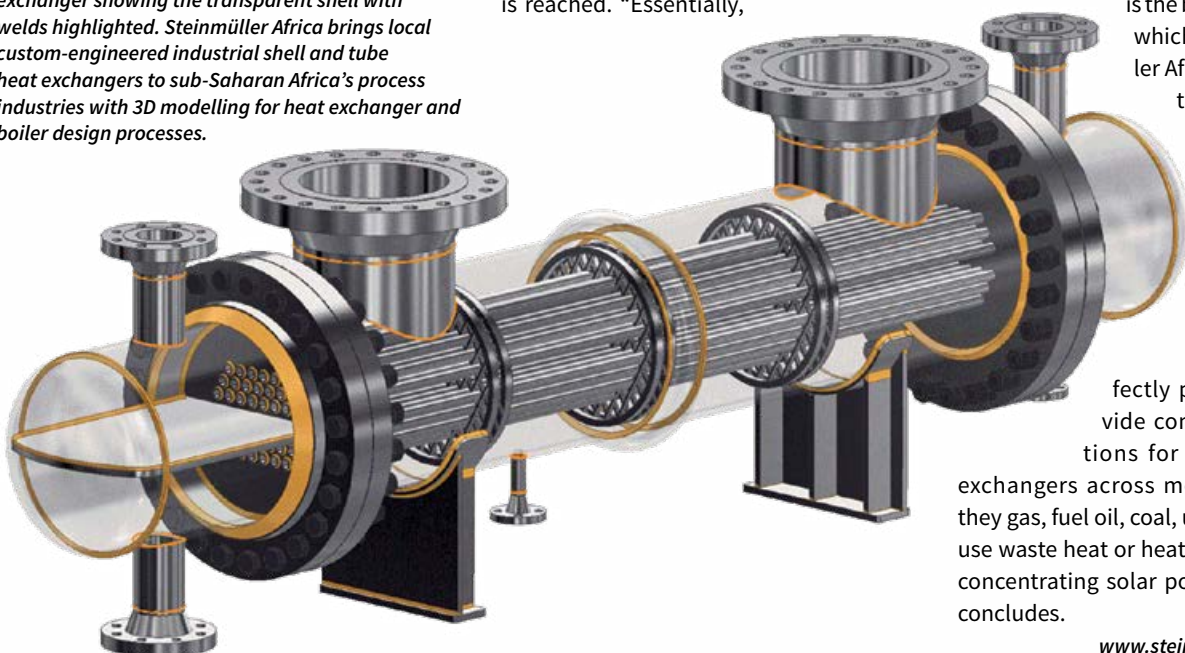
Local heat exchangers offer reduced costs and faster turnaround

Steinmüller Africa, South Africa's steam generation and heat exchange expert, brings local custom-engineered industrial shell and tube heat exchangers to sub-Saharan Africa's process industries. The company has now introduced three-dimensional (3D) modelling to the heat exchanger and boiler design process, which increases design accuracy while simultaneously reducing turnaround times and costs for its clients.

New state-of-the-art design software at Steinmüller Africa has replaced the traditional process of designing heat exchangers in logical steps, which sometimes results in part fit-up problems, impacting the design process and project execution. All heat exchangers from Steinmüller Africa are now designed purely as 3D models to begin with, which allows the various engineers to design and fit all required parts with minimal effort and to generate drawings along with the bill of materials; facilitating accurate pricing, even at the design stage.

"Our 3D modelling makes it relatively easy for our proposals department to obtain effective pricing, and our manufacturing department to accurately manufacture the heat exchanger with the least quantity of materials possible," explains Mohammed Khan, director at Steinmüller Africa. "This substantially simplifies the design process, allowing us to generate several different designs, time dependant, and identify the most cost-effective version while still at tendering phase."

A 3D model of an industrial shell and tube heat exchanger showing the transparent shell with welds highlighted. Steinmüller Africa brings local custom-engineered industrial shell and tube heat exchangers to sub-Saharan Africa's process industries with 3D modelling for heat exchanger and boiler design processes.



Combining parametric modelling and intellectual property

The 3D modelling is executed using parametric modelling in AutoCAD Inventor software and is uniquely linked to Steinmüller Africa's intellectual property. This allows Steinmüller Africa to determine the best solution based on a client's specific requirements. "For example," Khan explains, "we can optimise materials and costs, be it for a new or an existing heat exchanger, taking aspects such as weight, size and cost into consideration at an early phase of development. This highly accurate modelling also puts us in a position to manufacture the solution, with cost-optimised materials of production, in a much faster turnaround time than previously possible. It also gives us the opportunity to examine the client's existing heat exchangers, discover their flaws, and ensure that those flaws are eliminated in any of our new designs."

The reduced manufacturing turnaround time is made possible because all teams – design, mechanical, procurement and manufacturing – have their input on the various design iterations before that phase is reached. "Essentially,

we offer a single customised, technically and commercially optimised solution to any client's heat exchange challenges – and in a fast turnaround time," says Khan.

Digital twinning and process plants

With this technology, Steinmüller Africa is now able to design and manufacture complex heat exchangers for process plants that require a mixed phase flow. "While the 3D technology used is not new in the industry, it has been predominantly used by overseas companies," Khan notes. "We have trained ourselves to do the design and manufacturing locally, positioning us ahead of competitors that commission offshore companies for heat exchanger design or manufacture – or both."

The 3D model is, in essence, a digital twin of the real heat exchanger, which is used to calculate precisely what will occur under various operating conditions. "Where a shortcoming is identified, we change the digital model, which allows us to accurately determine what will occur when those changes are implemented on an existing or new plant," Khan explains. He adds that another benefit of this method

is the baseline modelling, which allows Steinmüller Africa to easily ascertain the reason for a fault at any time in the future by modelling that fault, accurately identifying it and correcting it on the digital twin.

"We are now perfectly positioned to provide comprehensive solutions for boilers and heat exchangers across most industries, be they gas, fuel oil, coal, unfired boilers that use waste heat or heat exchangers within concentrating solar power plants," Khan concludes.

www.steinmuller.bilfinger.com

Technical Training Academy shapes the future

Since its establishment in 2011, Steinmüller Africa's Technical Training Academy has successfully qualified 253 artisans and upskilled over a thousand employees. The Academy offers apprenticeships, skills courses, learnerships, short courses and qualifications in technical occupations and trades. The programmes are grounded on four specialisations in the industry, namely welding, boilermaking, rigging and mechanical fitting. Currently, 52 learners are enrolled for one of these technical training programmes.

Learners can fund their own tuition, apply for financial support through Steinmüller Africa's bursaries, or apply for grants from merSETA. Bursaries from Steinmüller Africa are also available through apprenticeships for candidates who have completed Grade 12 mathematics and physical science and are previously disadvantaged, unemployed youth or are residents within proximity to the site. In addition to these learnership opportunities, Steinmüller Africa offers training and upskilling to its own employees.

"We maintain a pipeline of the skills we require to achieve long-term sustainability, an imperative factor for the success of our company. We are proud to have an initiative that improves the lives of those who participate in these programmes. The initiative enables unskilled and unemployed students to acquire valuable knowledge, skills and experience, while enabling permanent employees to become upskilled to continue performing at a high level of service on projects," says Karin Kaempffer, Executive General Manager for Human Capital Management at Steinmüller Africa.

Steinmüller Africa's internal programmes, including practical training, are facilitated by the company's appointed educators. The external programmes are run by external educators who conduct National Accredited Technical Education Diploma (NATED) studies at Technical Vocational Education and Training (TVET) colleges.

Programme candidates are required to pass all practical and theory modules, NATED studies, and a final exam in a minimum



Bridging the skill's gap for increased employability supports Steinmüller Africa's aim to prepare developing professionals for the future of the industry.

period of two years and a maximum period of four. On completion, graduates are awarded a Red Seal QCTO Certificate.

"Through institutional training, learners become equipped with first hand skills and knowledge on how the relevant specialisations in the industry work and what it demands to thrive. The employable skills that are gained in these programmes are especially beneficial for those who do not yet have experience or are currently unemployed. Bridging the skill's gap through knowledge and practical training for increased employability supports our aim to prepare developing professionals for the future of our industry," concludes Kaempffer.



Steinmüller Africa's institutional training programmes improve the knowledge, skills, employability and lives of its candidates.



Through institutional training, learners become equipped with first hand skills and knowledge in relevant specialisations in the industry.

ESAB expands South African presence

ESAB South Africa has moved into an upgraded facility, in Tunney Ridge near OR Tambo Airport, which will include the South African head office and distribution centre (DC); a showroom and demonstration area; training and conference facilities; a repair centre and a walk-in welding shop. *African Fusion* talks to Keith Saunders about the move and some of ESAB's hopes and successes.

Since 2016, when ESAB re-established its formal presence in South Africa, the company's head office and central warehouse have been hosted out of Howden Africa's Booyens premises just south of the Johannesburg CBD. "We remain a sister company to Howden and our ESAB business won't be changing in terms of ownership or operations, but we are moving out of the Booyens site, because Howden needs to meet growing production and repair needs, while our ESAB operations there have become constrained by the shared space," Keith Saunders tells *African Fusion*.

"So we are moving into newly refurbished facilities in the Tunney Ridge area, not far from OR Tambo Airport, east of Johannesburg," he says.

ESAB's new South African head office and central distribution warehouse comprises 5 000 m² of modern office, ware-

housing and demonstration space that has been carefully designed to meet the future needs of the global

Tier 1 welding and cutting equipment and service provider. "Everything is now getting upgraded with new racking, shelving and signage currently being finalised. The facility will have a large demonstration room with all of ESAB's newest and latest welding machines to enable customers to come for a proper welding experience before deciding to invest. Our gas and plasma cutting equipment will be on display, along with all the available consumables. We are also installing a CNC cutting machine and a robot installation that will couple our ESAB power packs with a Yaskawa robot.

"We will have a big conference and training room, where we intend to train our distributors and customers. Also, we are



ESAB South Africa has moved into an upgraded facility in Tunney Ridge near OR Tambo Airport.

establishing a walk-in retail centre where customers will be able to come in, browse the items on display and purchase what they need: there and then," says Saunders.

Modern warehouse and logistics functions take up the majority of the space. "All the stock for South Africa, for bulk and retail, will be housed here from now on, so everything we offer will be delivered and distributed from this central facility," he says, adding that the new facility will also house ESAB's national equipment repair and service centre.

ESAB's Johannesburg-based staff, many of whom have been working from home since the Covid pandemic, are also moving into the new premises, starting from November 28. "Nobody is going to be working from home anymore and, while a lot of the office space is open plan, each employee has been allocated their own workstation.

"There are also seven or eight modern offices for the senior managers, and we have boardrooms for meetings and in-house presentations, and such," Sanders informs us.

"It's going to be a big change, but we are all looking forward to it. I think the break from the Booyens area is going to be refreshing. Everybody is pretty excited about the move, which we all see as a good thing," he adds.

"Our MD, Chris Eibl, who initiated the move, has long wanted ESAB to be seen as a free-standing entity in its own right. Physically moving away from Howden does exactly that. From now, anyone who comes to our site is coming to visit ESAB, and this is sure to further strengthen our presence in the local welding market," Saunders concludes.

esab.com/sa/mea_en



The new facility's Innovation Centre will house a large demonstration room with all ESAB's newest and latest welding machines. to enable customers to come for a proper welding experience before deciding to invest.

Babcock performs under pressure

Babcock has been awarded a five-year contract to supply high-pressure boiler tubing to a power station as part of future planned maintenance that will be undertaken at the station. Babcock's Alton Naidoo, General Manager for Business Development, explains.



To the lay person, tubing may not be the first thing that comes to mind as an essential part of the thermal power generation process. However, it is the critical component of steam generation plants, which rely on steam boilers made up of hundreds of kilometres of tubing to ultimately create power.

Alton Naidoo, General Manager for Business Development at Babcock, explains that boiler tubes carry superheated steam that is used to feed a series of turbines. The superheated steam is generated by applying thermal energy to the tubes that contain water, thereby changing the phase of the water to produce very high temperature and pressure steam in the tubes.

"Boiler tubing is one of the critical areas in terms of power station availability and reliability. These tubes have to withstand immense cyclic operational conditions and if one of them fails, it brings the entire unit down," says Naidoo. "Therefore, the tubing has to be specified correctly and supplied to a high integrity to keep tube leaks and boiler failures to the minimum."

Babcock has over 130 years of experience in steam generation and industrial plants, and is the original designer of many steam boilers in South Africa and further afield into Africa – in fact, the company has one of the largest boiler installation footprints in Africa. Babcock specialises in the front-end design of steam generation plant and associated equipment, and provides safe, effective solutions for the entire lifecycle of power and industrial plants, from design and build, through operation and maintenance, to decommissioning and site remediation. The company's key focus, however, is on the feasibility of new build options, performance upgrades, efficiency improvements and emissions reductions.

Naidoo says that as an original equipment manufacturer (OEM), Babcock has embarked on a drive to encourage industry to return to the design base to help solve customers' challenges. "It is critical to have a fundamental understanding of OEM designs, and the design intent, to be able to address the issues that our customers face," says Naidoo.

Babcock utilises its OEM expertise to en-

sure that boiler tubing is specified correctly according to the required design codes and norms and that the detailed specifications are well controlled for the end product that is delivered.

"Because of the high temperatures and pressures it is subjected to, specialised material is required for boiler tubing, with specific certifications according to the relevant EN and ASME codes," says Naidoo. "This type of high-alloy material is not commonly available in South Africa and is generally sourced offshore. While it can be obtained from local stockists, there are limitations in terms of availability and quality."

Naidoo says that Babcock sources the tubing directly from an offshore tube mill that produces it according to its customers' unique and regulatory requirements, which allow for more specifications and tolerance according to the EN and ASME standards, customised sizing, a high level of quality control, and better pricing. Furthermore, it allows Babcock to help customers with the planning and scheduling of outages by providing the material in time.

"Through our long-standing partnerships with our suppliers, we can secure availability and ensure predictable lead times for these critical, long-lead items."

He adds the company's cus-

tomers are realising that long-lead items need a specific strategy to secure availability and better pricing, and that it is possible to have tubing specified according to their needs and maintenance plans instead of relying on availability from a stockist.

Naidoo points out that tubing is not used exclusively in power generation, and has application in any industry that requires high quality tubing, including the petrochemical, pulp and paper, sugar and mining industries. Babcock also OEM status in the sugar and paper industries, where the company has an installed base.

"Babcock can provide a competitive tubing offer, strategic planning for critical long-lead items, and specialised OEM knowledge to help customers across a range of sectors operate more effectively," concludes Naidoo.

www.babcock.co.za



Babcock has been awarded a five-year contract for the supply of high-pressure boiler tubing.



Babcock sources the tubing directly from an offshore tube mill that produces it according to the EN and ASME standards, and its customers' unique and regulatory requirements.

Air Liquide's simple electrode and wire choices

African Fusion talks to Air Liquide's product manager, Corrie Olivier, about the company's house brand welding consumables, namely Gemini and Ultra Arc™ filler materials. As with Air Liquide's ARCAL™ welding gas range, these two brands of filler materials have been developed to offer welding clients a set of simple options that can be used for over 80% of all welding applications.



Well known for its welding gas offering, most notably the ARCAL™ New Generation range of gas mixtures, Air Liquide's welding filler material brands are just as competitive. "To accompany our comprehensive welding offering, which includes several premium consumable brands, Air Liquide South Africa has been carefully developing a mid-tier range of exclusive, certified and cost-effective consumables for over two decades," says Air Liquide product manager Corrie Olivier.

Gemini and Ultra Arc™ are the two brands, the former being a range of stick (SMAW/MMA) welding electrodes while the latter is a range of MIG/MAG welding wires for the gas shielded and flux-cored arc welding processes (GMAW/FCAW). "These brands are exclusive to Air Liquide and together they can meet the majority

of the filler material needs for welding in the general industry," Corrie Olivier tells *African Fusion*.

Air Liquide's Gemini range of electrodes

Introducing the Gemini range, he says that these electrodes provide the industry with a cost effective and quality option. "Our AWS A5.1 E6013 general purpose Gemini RB36 electrodes, for example, offer very smooth welding, easy slag removal and low spatter in all positions," he explains, adding that they carry international certifications from the Lloyd's Register; American Bureau of Shipping (ABS); Bureau Veritas and Nippon Kaiji Kyokai.

The next consumable in the range is the basic low hydrogen AWS A5.1 E7018-1 electrode – simply called the Gemini LH 7018-1 – for use on thicker section base materials

to minimise hydrogen-induced cracking and achieve the desired mechanical properties. "We also offer high deposition rate Gemini E7024 electrodes, with iron powder in their flux coating, which are widely used for high deposition and have a recovery rate of approximately 160%," Olivier informs *African Fusion*.

"One of the best-performing Gemini products in our South African range is the nickel coated electrode, used for repairing and welding cast iron components," he continues. "We have two in our range, the Gemini Nickel Cast Ni 98 and the Nickel Cast Ni 55, with the 98 used universally for all types of cast iron. These electrodes are specially designed to operate at low currents, producing crack-resistant welds that are fully machinable."

For welding stainless steels, the Gemini range includes 308L, 309L and 316L welding electrodes to cover a comprehensive range of the corrosion resistant CrNiMo steels. These offer easy arc striking and restriking, excellent slag detachment, smooth arc performance and they produce clean weld edges. "For welding some of the higher alloyed austenitic stainless steels and Ni alloys, we have the Gemini 680, which is also ideal for welding dissimilar metals and/or difficult to weld steels. These are AWS A5.4 E312-16 electrodes that produce weld metal with a 29-9 Ni-Cr ratio," says Olivier.

For hardfacing applications, he cites the Gemini H600R, which is a general purpose hardfacing electrode that produces deposited metal in the Rockwell hardness range of 52 to 55 HRC. It is ideal for producing wear surfaces with excellent abrasion and medium impact resistance and is typically used to build up worn rollers in the cement industry, for tools in the agricultural industry and for surfacing of worn parts in the mining and civil engineering sectors – without the need for post weld machining.



Air Liquide Gemini and Ultra Arc™ consumables complement the company's ARCAL™ gas offering by striving to exceed the expectations of industry.

Ultra Arc™ welding wires

As with almost all wire consumable sup-



pliers, Air Liquide's Ultra Arc™ ER70S-6 wire is the core of its in-house Ultra Arc™ brand. "This standard copper-coated wire is widely used for everyday MIG/MAG welding of carbon steels. But we also have Rec-Man, a premium bronze-coated alternative for this wire for those seeking to optimise torch consumable life," Olivier continues, adding that the bronze coated wire also delivers better electrical characteristics.

The Ultra Arc™ wire consumables are also highly competitive in terms of performance and price and the ER70S-6 wires are available in 15 kg spools and 250 kg drums, the latter being for automated welding. These are available in all the most popular wire diameters.

"Furthermore the Ultra Arc™ ER100, which is a wire for use on high-strength low-alloy steels (HSLA), has a high yield strength with good impact toughness at low temperatures. It is widely used for structural and earthmoving equipment manufactured from materials such as S690 QL," he adds.

As with the Gemini electrode range, Ultra Arc™ 308LSi, 309LSi and 316LSi filler wire are also available for all common stainless steel welding applications. "We offer a E71T-1 flux-cored welding wire for those looking to raise the deposition rate, as well as weld quality," says Olivier.

"For each of these wires, we have a matching ARCAL™ New Generation shielding gas: ARCAL™ Speed for the ER70S-6 wires on thinner section steels; ARCAL™ Force on thicker sections and for the higher yield strength ER100 wire; ARCAL™ Chrome for the 308, 309 and 316 stainless wires; and for the flux-cored E71T1 wire, we can use either ARCAL™ Force or INARC 25, which is excellent for flux-cored welding," he tells *African Fusion*.

"Locally, the ER100 and the E71T-1 wires are independently verified in the SAIW's



Air Liquide's general purpose Gemini RB36 electrodes offer very smooth welding, easy slag removal and low spatter in all positions.



Gemini Nickel Cast Ni 98 and the Nickel Cast Ni 55 electrodes for welding cast iron, along with the 308L, 309L and 316L stainless steel range, are available as sealed packs or tubes.

17025-accredited Materials Testing Laboratory, where qualified welders prepare test samples with the SAIW engineers and technicians overseeing consumable testing and certification. To this end we know that the integrity of the product is important; fabricators need stringent testing requirements to be met, which we are happy to do.

With this relatively simplified range of filler materials, our Air Liquide Gemini and Ultra Arc™ consumables complement our ARCAL™ gas offering by striving to exceed the expectations of the industry. It is part of our 'Simply High Performance' value proposition," Olivier concludes.

www.airliquide.com/group/south-africa



Ultra Arc™ wire consumables are also highly competitive in terms of performance and price and are available in 15 kg spools and 250 kg drums, the latter being for automated welding.

Welding solutions for the fabrication of LNG storage tanks and carrier vessels

Pierre Gérard, LNG expert and global Vice President for key accounts at voestalpine Böhler Welding, introduces some of the innovative welding solutions and consumables developed for modern LNG storage tanks and carrier vessels.

Energy has become a key topic for many countries considering the energy transition and the necessity for low carbon emission energies, with liquid natural gas (LNG) being a key player in the energy market. Not only for carbon emissions but also in terms of energy security, LNG brings accessible reserves to markets where gas was not previously available. In addition, new regulations on sulphur emission for marine applications have driven the shipbuilding industry to increasingly consider LNG as a cleaner fuel.

The technology for LNG was established in the 60s, with the first LNG commercial shipments done from Algeria to France and the UK, and from Louisiana to Europe. Liquefaction, transport and gasification operations have been optimised since then and several international engineering and contractor companies are reliable partners to countries wanting to extend their energy source portfolio. Sizes of LNG tanks and tankers have increased in order to reduce transportation and storage costs, with current typical gas storage tanks able to contain more than 200 000 m³ of liquefied gas.

voestalpine Böhler Welding has been a reliable partner for high- and nickel-alloy consumables designed for the LNG industry for more than 20 years, having worked with most of the specialised EPC companies to deliver high quality welding consumables

to all continents: Europe, the America's, Asia, Oceania and Africa.

Different kinds of nickel (Ni) steels are available and applicable for storage applications requiring extremely low design temperatures. These are the materials of choice for cryogenic applications when liquid gas has to be stored or transported.

Between the 5% and the 9% Ni is the A645 Grade B, with nickel content slightly above the Grade A but having mechanical properties like those of 9% Ni. Lowering the nickel content has a direct impact on the material cost, which is the reason for the attractiveness of that grade. Mechanical properties are achieved thanks to a double heat treatment of the steel during production.

The first steel of choice for LNG containment tanks is the 9% Ni, which shows excellent fracture toughness at cryogenic temperatures. Typically, ASTM A553 Type I steel is selected.

But with current pressure on nickel costs, several engineering companies have been considering ASTM A645 Grade B, which contains a lower percentage of nickel – in the range of 6% – making this steel about 10% cheaper than the standard A553 while retaining the same mechanical properties.

Two of the main design codes for cryogenic tanks are the API 620 and EN 14620.



For design temperatures below -165 °C, material has to be tested at -196 °C and must meet the minimum requirements of Table 3.

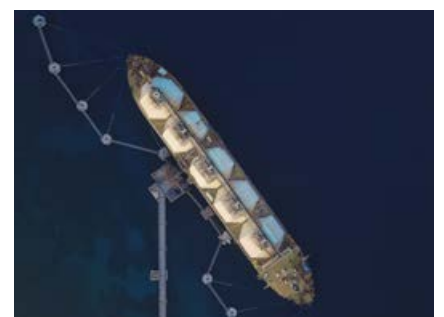
Typical Charpy impact tests are done on transverse specimens for which API requires a minimum of 27 J at -196 °C for a 10×10 mm specimen. In addition to these minimum requirements of the API 620 code, engineers tend to apply safety factors that often require a minimum value of 55 J or even 70 J at these extreme temperatures.

Welding consumables for nickel steel welding

The selection of appropriate welding consumable is primarily done based on the requirements of the mechanical properties of the weld metal. Also, though, welding operations will have an influence on the mechanical properties of the heat affected zone of the base material as well as on the diluted weld metal. Due to this influence, the application standards will require a Welding Procedure Qualification Record (WPQR) to prove conformance of the procedure against the design standards.



Current typical LNG gas storage tanks are able to contain more than 200 000 m³ of liquefied gas.



IGC/IGF international standards for liquefied gas carriers cover the LNG carrier vessels as well as vessels using LNG as fuel.



Nickel base alloys are usually chosen for welding operations.

Three welding processes are usually considered for the welding of LNG containment tanks. The submerged arc process is used to weld the horizontal joints in the 2G position, while SMAW stick electrodes or flux cored wires are used for vertical welding.

The choice between flux cored wire or stick electrodes is based mostly on the welding capabilities of the welders and the automation experience of the contractor. When welding with flux-cored wires, the vertical up joints can be welded using tractors, which enables drastically increased welding productivity.

voestalpine Böhler Welding supports contractors with the welding procedures qualifications of the above consumables as well as with welding equipment and the mechanisation requirements. Table 6 outlines the impact properties that can be achieved for design temperature of -196°C

Liquid natural gas tankers

LNG tankers are used to transport liquefied gas from the region of extraction and production to the country of utilisation. Different designs exist, with some of them using nickel steels, as for the storage tanks.

Ultimate tensile strength, yield strength as well as impact toughness at design temperatures are key factors for the steel selection.

IGC/IGF codes are international standards for liquefied gas carriers. They cover the LNG carrier vessels as well as vessels using LNG as fuel. As for the storage tanks, design temperature defines the impact test temperature. According the IGC codes, for LNG carriers having a design temperature of -165°C, only three base materials can be selected for use: austenitic stainless steels and 9%-5% nickel steels. In addition, the IGC code allows special heat treated 5% nickel steel for design temperature down to -165°C, provided the impact test is carried out at -196°C.

For 9% nickel steels, the same welding consumables as for the onshore tanks can be used. The main difference with the onshore tank welding is that carrier vessels are welded in shipyards, and their LNG tanks are welded in roof covered workshops, which enables the use of welding processes not possible for on-site welding of onshore tanks.

voestalpine Böhler Welding has developed a unique welding consumable for gas metal arc welding (GMAW) of austenitic stainless steel structures, which is purpose

Table 1: Typical nickel steels – ASTM standard.

| Plates | Nickel content | Impact testing T° | Typical liquid gas |
|--------------------------|----------------|-------------------|--------------------|
| ASTM A645 grade A | 5% Ni | -140°C | Ethylene |
| ASTM A645 grade B | 5.5% Ni | -195°C | Liquid natural gas |
| ASTM 553 Type I | 9% Ni | -195°C | Liquid natural gas |

Table 2: Chemical analysis – ASTM.

| | C (%) | Mn (%) | Si (%) | Ni (%) | Cr (%) | Mo (%) |
|---------------------|-------|---------|-----------|-----------|-----------|-----------|
| A645 Grade A | 0.13 | 0.3-0.6 | 0.2-0.4 | 4.8-5.2 | - | 0.20-0.35 |
| A645 Grade B | 0.13 | 0.9-1.5 | 0.15-0.3 | 5.0-6.0 | 0.10-1.00 | 0.10-0.30 |
| A553 Type I | 0.13 | 0.90 | 0.15-0.40 | 8.50-9.50 | - | - |

Table 3: Mechanical properties – ASTM.

| Plates | Testing temperature (°C) | Min Energy Absorption (J) longitudinal – transvers | Lateral expansion (min) (mm) |
|--------------------------|--------------------------|--|------------------------------|
| ASTM A645 grade A | -140 | 27 -22 | 0.38 |
| ASTM A645 grade B | -195 | 27 - 22 | 0.38 |
| ASTM 553 Type I | -195 | 34/27 - 27/22 | 0.38 |

Table 4: Key products for welding A553 Type I and A645 grade B materials.

| Ni steel Grade | UTS MPa [ksi] | Process | Welding consumable | Classification AWS | Classification EN ISO |
|----------------------------|-------------------|---------|---|--------------------|-----------------------|
| X8Ni9 / A553 Type I | 690-830 [100-120] | SMAW | Thermanit 620 | ENiCrMo-6 | E Ni 6620 |
| X8Ni9 / A553 Type I | 690-830 [100-120] | SAW | Thermanit NiMo C276 (+ Marathon 104 flux) | ERNiCrMo-4 | SA FB 2 AC |
| X8Ni9 / A553 Type I | 690-830 [100-120] | FCAW | FOXcore 625-T1 | ENiCrMo3T1-4 | Ni 6625 P M21 2 |

Table 5: Typical impact properties of voestalpine Böhler Welding consumables for LNG tanks.

| Consumable | Typical UTS all weld metal | CVN @ -196°C |
|--|----------------------------|--------------|
| Thermanit 620 | 700 MPa | 90 J |
| Thermanit NiMo C276 or Marathon 104 | 720 MPa | 110 J |
| FOXcore 625-T1 | 750 MPa | 90 J |

Table 6: Key products for A553 Type I and A645 grade B welding.

| Base material | Welding Position | UTS [MPa] | Fracture location | Average Impact toughness @-196°C |
|---------------------|---------------------------|-----------|-------------------|----------------------------------|
| A553 type I | PA /1G | 716 | Weld Metal | 82 J |
| | PC/2G | 736 | Weld Metal | 102 J |
| | PF/3G | 727 | Weld Metal | 96 J |
| | PE/4G | 736 | Weld Metal | 79 J |
| A645 grade B | PA /1G | 724 | Weld Metal | 90 J |
| | PF/3G (ceramic backing) | 719 | Weld Metal | 97 J |
| | PF/3G (with back gouging) | 745 | Weld Metal | 90 J |

designed for the welding of nickel steels with impact testing requirements at -196°C and a minimum ultimate tensile strength at room temperature of 690 MPa. The main advantage of this solution against nickel-based welding consumables is the cost of the product, being a stainless steel.

Both A553 Type I and A645 grade B steels have been successfully welded using this innovative solution and all the mechanical requirements specified in the standards have been met. This innovative solid wire GMAW solution produces typical mechani-

cal properties as shown in Table 6, where tensile test was performed on transversal specimens and the welding consumables wire used had a diameter of 1.2 mm.

voestalpine Böhler Welding has been a partner for the welding of LNG components for more than 20 years and closely follows market demand and technical trends, leading to the development of innovative and cost effective welding consumables and process solutions for LNG storage tanks and tankers.

www.voestalpine.com/welding

Unique Welding: the customer-centric welding service provider

Following its acquisition by Air Products of Weldamax – the integrated welding distribution holding company for Unique Welding – *African Fusion* talks to new CEO, Gaetano Perillo, about his company vision for an expanded, integrated, flexible, customer-centric and value adding welding solutions provider.

In May this year, Sanlam Private Equity (SPE) completed the sale of Weldamax Pty Ltd – one of the largest independent Welding Distributors in South Africa – to Air Products, who chose Gaetano Perillo from the finance division of Air Products to take the partnership forward.

“Weldamax is our corporate name, but across South Africa we trade with the welding market through our Unique Welding branches, through the Thermamax brand to our direct custom-

ers, while we also have a brand called Maxweld and Braze, which trades exclusively with Resellers and Distributors,” Perillo tells *African Fusion*.

“Air Products started supplying gas cylinders to Unique Welding about 15 years ago, after successfully winning the contract from a previous supplier. Today, Unique



Welding is Air Products’ biggest cylinder customer. From our 14 branches across South Africa, we circulate several thousand gas cylinders every week to customers all over South Africa: oxygen and acetylene for gas cutting, and the many different packaged gas mixtures, such as the Coogar and MagMix welding gases, for the gas shielded welding processes,” he continues.

Purchasing the Unique Welding business therefore made a lot of sense as it offers Air Products and Unique Welding customers a holistic and integrated welding and cutting solution from a single supplier.

“While we have always had a good relationship, Unique Welding now has seamless direct access to the gas expertise from Air Products’ specialists such as Sean Young and Gary Lombard, while Air Products has direct access to our welding machine and consumable specialists, along with our comprehensive range of welding and cutting hard goods and services. Together, we are a completely integrated welding and cutting service provider,” Gaetano Perillo points out.

“We have carefully selected and accumulated many product categories over the years, for welding machines, MMA electrodes, welding consumables and PPE, most of which are under our exclusive Thermamax brand. But we also offer some other brands, such as the Trafimet MIG, TIG and Plasma Torch brand from Italy,” he continues.

Other brands include Tier 1 Wilson gas cutting equipment, which comes with a very high specification and is sold in South Africa co-branded with Thermamax. “We tend to retain the name on Tier 1 brands, so customers are assured of their quality and origin,” he adds.

“We strive to consolidate our suppliers, which enables us to better control the quality and price of our range. We also favour working directly with the manufacturers,



The Apollo UltraMIG 500A synergic MIG welding machine, which is part of Unique Welding’s latest range of very heavy-duty industrial MIG/MAG welding machines with separate wire feeders.



which makes communication easier and reduces delivery timelines. It's not always easy, but the bigger we grow, the more leverage we have," he explains, adding that exclusivity in the South African market is also an essential aspect of this strategy.

Over and above its business ethos, Perillo says that Unique Welding builds relationships with the manufacturers of the equipment and consumables in its range. "We work really closely with the people in these companies to customise our product range and to make sure that we have the best mix possible. So the Thermamax brand has grown in leaps and bounds over the past five or so years. It is now recognised as a cost-effective, excellent quality brand," he says.

Every machine that comes in is already tested by the manufacturer against 11 different quality control tests: passing metallic dust through the fan; dropping it from two metres; bounce-vibrating it for 48 hours; submerging it in water; and much more. The machines all arrive in South Africa calibrated with certificates. "And, before we launch a new product, our own people are trained to use it properly, while our after-sales service technicians are sent overseas for training overseas in how to service the equipment," he assures.

Describing some of the latest additions to the Thermamax range, he cites the new submerged arc welding system, the Apollo SAW 1250, along with the UltraMIG 350A and 500A synergic MIG welding machines, which are a range of very heavy-duty industrial MIG/MAG welding machines with separate wire feeders.

Also very important, is after-sales service. "We have a main service centre for our equipment at our head office in Boksburg and at some of our other branches in the main centres around South Africa and at partner supplier sites in neighbouring countries. At these partner supplier sites, trained and qualified technicians are available to support clients and to repair our welding machines and those from many other OEM brands," Perillo points out.

"I believe in continuity. I am not about to change everything, but I know the importance of reviewing procedures and striving for continual improvement: aligning procedures and systems for maximum efficiency and cost effectiveness, for example.

"Unique Welding has a strong, flexible, agile, customer-centric focus and a solutions-driven sales culture. All I need to take care of is the organisational efficiency and the margins," he concludes.

uniquewelding.co.za



Zakhele Sobesho, one of Unique Welding's trained service technicians working at the company's Van Dyk Road head office in Boksburg



Weldamax's Thermamax brand is now recognised as a cost-effective, excellent quality brand.



Unique Welding, Air Products' biggest cylinder customer, circulates several thousand gas cylinders every week to customers across South Africa.

ESAB's Electra Mining Africa success

At Electra Mining Africa this year, ESAB changed the concept of its display stand to focus on newly available solutions rather than simply presenting its products range.

A cornerstone of the stand was the company's new InduSuite Digital Solutions, which strive to help customers take production efficiency to the next level by optimising their workflows. The collection of software applications associated with the platform is compatible with all major welding, cutting, and robotics systems – from single operations to multiple locations – so as to enable fabrications companies to deliver best fabrication quality and performance.

Demonstrations of ESAB Weld Cloud functions were done by ESAB co-workers from the UAE, who presented the technology's capabilities and used mock-ups to simulate the results that could be achieved. "We had a full display of the new equipment, but our focus was on solutions – and specifically digital solutions – because the quality and tracking of welding procedures and performance is becoming more and more important. We had a lot of interest and follow ups and are now busy with a couple of installations in companies around Johannesburg, including a system at our sister company, Howden Africa," says Keith Saunders of ESAB Southern Africa.

"InduSuite with WeldCloud takes all the data collected from a welding machine directly online in real time. The system can monitor and analyse exactly what's happening with production. It can monitor and diagnose faults, and record and manage the use of consumables, including gas consumption," he adds.

It can also manage compliance issues such as adherence to the Welding Procedure Specification (WPS). "A welder can scan the job and the welding procedure, and this can automatically be uploaded for validation," he notes.

Other innovations on display included:

- **Aristo 500ix:** ESAB's latest portable heavy-duty pulse power source, an ideal solution for demanding pulse applications.
- **Robust feed U6/Pulse:** with its ergonomic, robust and enclosed design, this wire feeder is the ideal partner whenever portability and durability are key.
- **ESAB GCE manual gas equipment:** With almost 100 years of experience in the oxy-acetylene cutting and welding market, GCE now offers world leading



An ESAB Aristo 500ix with a robust feed wire feeder connected to WeldCloud via ESAB's InduSuite Digital Solutions platform.

high-pressure welding, cutting and fabrication solutions. Industrial solutions include regulators, flow meters, valves, torches, nozzles and tips.

- **ESAB ECM Cutmaster plasma cutting systems:** Ideal for heavy fabrication, ship building, construction, demolition, pipes and pipelines, ESAB Cutmaster systems are compact, light and portable, offering the comfort and reliability typical of ESAB solutions.
- **ESAB Rogue:** A robust and durable power source for professional shielded metal arc welding. (SMAW).

"In spite of current challenges in our markets and in those all over the world, we are still steadily growing. At Electra Mining Africa, we made a statement: we are here to stay," says Saunders.

esab.com/sa/mea_en/

Kemppi introduces the new X5 FastMig Pulse

Kemppi's new X5 FastMig Pulse welding system is specifically designed for industrial use. This modular welding solution is designed for various applications and environments, enabling customers to assemble the welding system that best suits their real needs.

Designed and manufactured in Finland,



X5 FastMig is a 360° modular welding solution that allows users to build the best setup to match their needs. Choices include: 400 and 500 A power sources, manual, auto and auto-pulse welding options, and add-on packages with SuperSnake GTX sub-feeding system, welding software and a wide range of accessories.

X5 FastMig Pulse is a multi-process welding machine developed in collaboration with professional welders. Using energy-efficient inverter technology, power sources are available in 400 A and 500 A versions, and with pulsed MIG welding capabilities if required. Eight wire feeder models are available, including new APC models that support digital connectivity and HD models for demanding conditions.

"The ease of use, efficiency of production processes and good ergonomics guarantee a successful result, without compromising the excellent welding quality. Welding using a TIG, MIG or MMA process on the same system has never been easier," says Product Manager, John Frost.

"In addition, the X5 FastMig Pulse's built-in data collection of welding pa-

rameters enables real-time monitoring of welding quality and work phases," Frost continues. Digital data collection of welding parameters requires an X5 FastMig APC wire feeder.

WeldEye ArcVision

Kemppi's WeldEye ArcVision is an integrated Industry 4.0 solution that collects welding parameters, arc-on time, and filler material consumption. Data is collected from digitally connected welding stations and transmitted wirelessly to the WeldEye ArcVision cloud service. WeldEye ArcVision visualises welding data in clear tables and graphs that can be filtered according to different needs.

"WeldEye ArcVision helps to measure welding machine operation and arc-on time and record welding parameters. Welding data visualised in tables and graphs is easy to interpret in WeldEye ArcVision, and real-time data makes welding quality monitoring more efficient and speeds up work phases," says Vesa Tiilikka, Manager, Digital Services at Kemppi.

www.kemppi.com



Augmented-reality reduces welder training costs

“In addressing IR4.0 in the engineering and manufacturing markets, augmented-reality welding training is a cost-effective, green alternative to traditional training. It provides the same level of traditional skills training but offers significant cost savings that can run into millions of Rands per annum. This is an example of IR4.0 in action for education,” says Bez Sangari, CEO of Sangari Education.

The Soldamatic welding simulator, which has won top honours at the Worlddidac Awards for the most innovative educational product, requires no costly welding consumables and reduces training time by half.

“As we move into the 4th Industrial Revolution the Soldamatic welding simulator offers training officers and learners the opportunity to constantly upscale their capabilities without the costs normally associated with welding activities. Organisations choose Soldamatic based on the cost comparison to traditional, non-simulation training, and the software is continually being updated with additional functionality.

Cost saving benefits include less electricity consumption, less material wastage and, depending on the learner numbers, the classroom serves as a safe, environmentally friendly workshop. “Consumables such as welding rods, steel plates or oxygen are not needed, and because the equipment has no gas emissions, it is eco-friendly. The simulator can be used in any environment with no need for special clothing or ventilation. The welding can be done in a classroom or even an office. It is 100% safe, simply because it provides an augmented-reality welding environment which is hyper realistic.”

Payback for a large training institution is about 18-24 months and training can continue without full supervision of the lecturer, which means more practice time for the trainee.

The headgear generates hyper realistic welding graphics and



The Soldamatic welding simulator from Sangari Education.

sound such as the weld pool and beam. It emits simulated smoke, sparks and heating of the affected area, all through the student’s headgear. It also simulates cracks, filler material, gravity and undercutting. Welding skills can be learnt for specific applications and the student’s performance measured in a fair, reliable and unbiased manner. The unit includes 93 different training lessons, and customised lessons can also be added.

The facilitator and trainees are able to analyse and assess the trainees’ welding performance in a video afterwards and evaluate their skills level such as the welding velocity, stick-out, travel and working angles. The system will report on each student’s progress and retains a detailed portfolio of their learning progress.

www.sangari.co.za

Dekra’s highest ever 8th NOSCAR score

Dekra Industrial SA is pleased to announce the achievement of its 8th annual NOSCAR safety award. “This award highlights our ingrained ethos of ‘living the safety culture’ across our company, country and around the clock. The recent NOSA ranking furthermore reflects our highest ever score of 97.48%, compared to our first 2013 score of 92.28%,” says Dekra Industrial’s Health, Safety and Environment (HSE) Manager, Carina Kleinhans.

Kleinhans adds that Dekra Industrial is a company that is committed to safety from management level through to each team member throughout its nationwide branches. “Every Dekra Industrial employee and contractor is encouraged to keep identifying areas for improvement and risk mitigation and management within the workplace. You could say that every branch and department is interlinked by our safety mindset; while our management team members operate a true open-door policy to hear and attend to any areas of

concern,” she notes.

Categories that are audited annually by NOSA include: leadership and worker participation; planning, support and operational; performance evaluation; improvement; safety; health; environmental; risk management; systems; compliance and effectiveness.

“In addition,” says Kleinhans, “legislative requirements can change from time to time, and we are required to remain abreast of these. A good example is how 2020 brought in new additional reporting factors relating to Covid. Dekra Industrial complied with all new requirements, while not only maintaining but in fact improving our NOSA ranking.”

Dekra Industrial Managing Director Johan Gerber adds: “These audited NOSA results are very pleasing, and we are extremely proud to have improved upon our results – from an already-high benchmark – in line with our desire to be true ‘the heroes of safety’. I congratulate Carina and the



‘Living the safety culture’: Dekra Industrial achieves its 8th consecutive NOSCAR Award with highest-ever score.

entire HSE team, as well as each individual employee throughout the company,” concludes Kleinhans.

www.dekrarsa.com

Getting real about virtual reality welder training in SA

Joash David and Peter Hughes of JTB Industrial Solutions argue the benefits that virtual reality (VR) and augmented reality (AR) can bring to local welder training.

From pilot simulation in the aviation industry to learning how to operate heavy machinery, virtual and augmented reality training has long since proven its practical value across a number of industries, from a safety, cost and operational efficiency perspective. Now, it is time for the welding industry in South Africa to embrace the significant advantages that virtual reality (VR) and augmented reality (AR) can bring to local industry.

This is according to Joash David, Managing Director of JTB Industrial Solutions, an importer and distributor of engineering consumables, equipment and accessories to a wide variety of industry sectors, both locally and pan-Africa.

"We pride ourselves on offering 'next generation' technology and engineering solutions to our customers: and we believe that it is time to 'get real' about virtual reality and its huge possibilities within the welding space," says David. "As counterintuitive as this might seem for an industry discipline that is so physical in its operations and applications, welding simulation training can offer incredible training advantages.

"While it is already used quite widely elsewhere in the world, virtual reality welding training is not yet widely used in South Africa. We believe it is time to embrace its advantages more extensively, particularly with regards to our local learner education. We see virtual and augmented reality welding training as being an excellent value-add

to the traditional welding training that currently takes place in our secondary schools and educational institutions."

JTB Operations Manager Peter Hughes adds: "JTB is extremely committed to playing our part to improving the Further Education and Training (FET) space in South Africa. In line with this, we support selected schools with ongoing equipment and material supplies. Welding simulator training is a sophisticated, next-generation offering that resonates, not only with our ethos and tagline of providing 'next-generation solutions', but also with JTB's values of innovation and 'out-of-the-box' thinking. As such, it can play a very important part in upskilling learners at secondary schools and FET institutions.

"Welding is a highly technical skill, and we believe it needs to have a greater value placed on it in local industry. Welders in other parts of the world are respected as extremely skilled industrial artisans," says Hughes.

David concurs, adding that welding simulation solutions can assist in attracting more young welders into the local market. "Welding simulation can offer bigger-volume, basic welding training that is safe and effective: to larger groups of trainees simultaneously, than if only physical training is available," he explains. "At the same time, the trainers and learners alike will benefit not only from the educational but also the safety aspects of the training. This is due to the absence of a physical flame

and compressed gas. Training institutions will also be able to save on costs in the long run – because the requirement for welding consumables such as compressed gases and welding electrodes will be greatly reduced.

In short, VR welding training offers significant safety advantages to trainees, while saving time and money. The requirements of real-life, hands-on welding training will never be replaced entirely; however, welding simulation technology as a supporting resource is an excellent complement to fast-track learning for larger numbers of learners at the same time."

An effective digital training solution to safely upskill multiple learners

The use of virtual and augmented reality-based welding simulators allows for training sessions to be offered across the welding discipline spectrum: including arc welding, gas metal arc welding, flux cored arc welding, MIG (Metal Inert Gas) and TIG (Tungsten Inert Gas) welding.

While the trainee is busy welding in the virtual environment, data such as feed rate, advance angle, operating angle, position and arc length distance can be seen and reported.

Data such as welding positions, joint methods, materials, material thicknesses and welding type can all be altered safely.

Errors are analysed to help the trainer and learner move onto the next steps.

The welding simulation equipment includes: Welding machine; welding table; a stand system, adjustable for height and position; Welding torches and pliers designed according to real-life specifications with regards to length, weight and shape; and the virtual/augmented reality welding mask.

"We are passionate about education and training and committed to uplifting the youth of South Africa and playing our part in helping to upskill the next generation," enthuses David. "We fully support the government's plan to move forward with the industrialisation of our country, which will pay a key role in helping our economy and our people move forward. This includes the highly technical skill of welding, which plays a vital role across multiple industries.

"We believe that welding simulation training has a key role to play in both secondary schools and FET institutions - and we are extremely pleased to play our part in bringing this exciting and innovative educational resource to the attention of the local welding and education sectors," he concludes.

jtbind.co.za



Welding simulation using virtual reality (VR) systems can offer big-volume, basic welding training that is safe and effective.

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