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African Fusion catches up with Cosmo Group director, Pierre van Nieuwenhuizen; general manager, Petrus Pretorius; newly appointed sales manager, Jaques Botha; and training manager, Emma Britz, about adding eCommerce with online support services and training to its offering, while reinforcing its total solutions offering for welders and fabrication companies of any size.

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FEATURES

REGULARS

Lead the charge into the 4th Industrial Revolution with an SAIW Robotic Welding qualification

The SAIW's Robotic Welding Operators Training course is to start from April 2021. With space for only two candidates on each course, this is an ideal opportunity to join the welders of the future.

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SAIW
Southern African Institute of Welding

SAIW and SAIW Certification

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With the reduction of lockdown restrictions to Alert Level 1 in recent weeks, I have been more able to visit SAIW members, which I believe is vital if we are to continue to be a successful association that offers directly useful services to our members and to the welding industry at large.

As well as informing members of the benefits of membership and the products and services we are able to offer, my visits have also given me deeper insight into the state of our industry and to the different needs of members.

Ultimately, we want to be in partnerships with our members, clearly offering useful, value-for-money services based on a win-win approach. At the moment, many businesses are in survival mode, but I know that as we recover from the recession this approach will make recruitment much easier.

In talking to SAIW members, a few pointers have emerged into how SAIW products and services can be improved to make them easier to access.

With retrenchments, many companies have been left with fewer people to do the remaining work, so they cannot afford to release employees from the workplace. So after-hours courses, even if paid by the employer, become more viable. We are looking to emulate MBA-type hours with two days during the week from, say, 5.30 pm to 9.30 pm and full days on Saturdays for practicals, demos or tutorials.

We are also looking at modularising our training courses, to allow them to be completed, over two years, for example. This improves affordability because employers or candidates only need pay for one module at a time, rather than for the whole course. Also, this gives the employer flexibility with respect to releasing employees for training – if they miss an upcoming module, they can book for the next one.

Several days of a particular course can also be delivered virtually. This cuts costs for out of towners and even Gautengers, who no longer need to find funding for travel, accommodation and living allowances for these days. An employer can opt to have the candidate attend the course from work to allow for 'emergency' availability.

Another potential need I became aware was for short courses of one or two days that can be delivered at a member's premises. We already offer courses such as Welding Symbols and AWS D1.1, but we could easily offer others, such as Performance Qualification; Procedure Qualification; Materials and Welding; ASME IX, qualifying welding procedures according to ISO 15614; and welding imperfection levels in ISO 5817, which are all currently embedded in other longer courses but can be extracted to meet a company's immediate needs as they arise.

Also, I have discovered, there is very little awareness of our Laboratory and Technical Services amongst our members and prospective members, so my visits have been useful in communicating these. Of course, member visits are also useful to identify possible new offerings that members require, such as new courses, new personnel or company certification opportunities.

I am particularly pleased to report on some of the results of our student surveys. Student satisfaction with SAIW practical welding courses is in the top quartile of SurveyMonkey®'s global benchmarking and we have received some very nice testimonials. We have also seen a big improvement from our Welding Technology students, with close to 90% reporting high levels of satisfaction with respect to course value.

There is no doubt that change is needed, for the SAIW and for the country as whole. We are determined to change the SAIW for the better. If there is any positive outcome from the recent COVID crisis, it is the loud and clear wake-up call it has produced.

The SAIW has woken up with renewed determination to do things differently in future.

John Tarboton

Modular and virtual training opportunities

African Fusion talks to SAIW executive director, John Tarboton, about the need for a change in the way training courses are delivered to make qualifications more easily accessible to students and more convenient and affordable for employers.

"Back in 1979, the SAIW consisted of single office in Braamfontein managed by Chris Smallbone and his secretary. That was it. Chris slowly built up the Institute, developing services and courses and getting student numbers up until it became viable to build our City West premises in Johannesburg.

"In those early days, he believed that what industry most needed was short and very specific training, such as one day courses on Welding Procedure Qualifications, for example. So Chris developed collections of training course modules that could be accumulated towards different professional qualifications. Chris, himself a training consultant, would go into companies to present these short courses, typically to four or five employees.

"This was in 80s and, in spite of the very negative economic impacts of the political climate – PW Botha's Rubicon speech, sanctions, a freefalling economy and runaway inflation – Chris Smallbone managed to generate surpluses and growth for the SAIW for every year of that period, all the way into the 1990s," Tarboton informs _African Fusion_.

Following his departure to 'rescue' Australia's WTIA, Richard Dickinson took over, Tarboton recalls. "I sat on the training and technology committee representing Columbus Stainless at that time and, with Dickinson, we began to streamline the production of students and the training programmes. So the SAIW became a welding school, where students were able to study full time and leave with qualifications. In the mid-2000s, Jim Guild took over the SAIW and he grew SAIW training to the point where the SAIW was training and qualifying some 2 600 students every year," he continues.

But while this enabled SAIW to meet the welding industry's growing training needs, the flexibility of the modular approach was largely lost and employers simply had to fit in with SAIW's relatively rigid training schedules.

Advancing to current times, Tarboton points out that student numbers at the SAIW, while hit particularly hard by the COVID pandemic, have been in decline for several years. The rise of online and virtual learning options associated with the pandemic, however, are driving a complete rethink of training delivery options.

"Recently, I have been talking to fabricators about re-modularising our courses. One idea is to again do shorter courses of one to five days, followed by a class test, after which a student can return to the workplace. And if it takes two or three years to complete a full course, such as a Level 1 Inspectors qualification, for example, then that is fine.

"This model will help, in particular, privately funded individuals who will no longer have to save up based on the full complement of training required for qualification. A two-day module might cost R4 000,while a full Level 1 Inspectors course will be closer to R50 000. In addition, even if students do not complete the qualification, each completed module adds value to his or her usefulness in the workplace," he explains.

"What fabricators are now telling me is that, although there is still a dire need for training, the slowdown has forced them to cut back on staff, which leaves a shortage of people available to do the work. During a shutdown, for example, or in the event of an unscheduled emergency, it is often not possible to release staff for training for the weeks scheduled by SAIW.

"Fabricators need to be offered the flexibility to send their people for training when it best suits the work schedules. So the candidates need to be able to miss a module and then pick it up at a more convenient time. This means the modules required for a qualification need to be more independent of one other so they do not have to be completed in a rigid sequence.

"Above all, we need to find ways of minimising the amount of time-at-work interference so fabrication companies do not have to sacrifice income-generating work priorities to accommodate the training needs of their staff," Tarboton points out.

"One Middleburg fabricator told me that, in terms of training costs, it wasn't the course fees that were crippling for an

employer, it was the cost of not having the employee at work; and then having to pay for his or her accommodation; the per diem sustenance allowance, and the transportation costs there and back. These costs make away-training over several days very expensive for employees. With the modular approach, there is much more flexibility in terms of arranging modules, or even days within a module, into those that can be delivered virtually and those that require a physical presence," he adds.

Any 100% theoretical module can easily be done via live virtual contact or remotely online, saving on accommodation, travel and sustenance costs. Candidates can go to work as normal and do the course from their boardrooms or offices. They can start the course after morning meetings and, in an emergency, they are immediately on hand to leave or pause the training to deal with a crisis.

"Fabricators are telling us that if we get modularisation right, the demand for training is likely to be strong, which would make the SAIW much more robust and viable going forward," he suggests.

Citing a recent success, Tarboton tells of the fully reworked 5-day Welding Appreciation for Engineers course, which was transformed into four 2-hour sessions delivered as webinars in four consecutive afternoons. "On speaking to people who attended, we found that some had logged in from their boardrooms and told us that relevant welding people had been gathered together to watch as a team.

"This is a CPD-based course that isn't part of a bigger qualification, but from a position of marketing the SAIW services on offer to fabrication engineers, its excellent, as it deals with welding, NDT, laboratory services, welding procedure development, inspection, weld quality management and a whole lot more.

"And they loved it. The Net Promoter Score® (NPS®) from the feedback was at 74% and, from the two webinar-based courses delivered, we generated 77 leads to follow up," he notes.

Describing the webinar-based delivery technology, Tarboton says the idea was to keep the seminar as near as possible to a traditional auditorium presentation. "We have set up a high quality camera in our boardroom, along with a whiteboard to broadcast webinars. We have also invested in professional quality lapel mics for the lectures to wear to ensure high quality sound no matter where they are in the room, and we can share slides, PowerPoint presentations, pdfs and videos very easily.

"Our lecturers are already comfortable with the technology. It's also live, so people can ask questions and talk directly to the presenters as if in a classroom. It works very well," he adds.

"The technology is ideal for broader use to deliver virtual training which, he points out, is different from online learning. Virtual learning is equivalent to face-to-face classroom study with respect to IIW programmes rules," Tarboton notes.

Already planned is the delivery of IIW IWP training to 100 Ethiopian welding practitioners so as to overcome currently imposed international travel bans. While some face-to-face practical training will be required, all of the theoretical content of the IIW programme will be delivered to trainee welders in Ethiopia from the SAIW premises in City West.

"We must do something differently if we are to reverse the downward spiral in student numbers. And the SAIW was built on the idea of modular training, so it feels right to adopt this approach again. We aim to retain every aspect of value in our qualifications, but to change the delivery sequences and the style to better suit industry's modern and lean needs.

"In addition, we have the power of modern virtual technologies to make course delivery more flexible and more cost effective than ever," he concludes.

SAIW Robotic Welding Operators course

SAIW's new Robotic Welding Operators training course has been designed to give candidates the necessary theoretical and practical knowledge on welding technology by equipping them with the skills to manage all aspects of a robotic welding operation, including design and programming of the welding task, safety and troubleshooting of the welding operation.

This course serves as a foundation for more advanced robotic training by SAIW partners.

Topics to be covered include: Safety around the robot; Robotic components; Powering up and Jogging the manipulator; Creating programmes; Touch-up of programmed points; IO interfacing; Reset errors; and Making back-ups of welding programmes

Candidates are expected to have a qualification in GMAW (MIG/MAG) welding in both flat and horizontal welding positions, but candidates who not meet this access condition can undertake an additional one-week practical training course at the SAIW prior to commencing the Robotic Welding Operators course.

Interested parties are invited to contact Course Administration at SAIW for more details.

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SAIW's new Robotic Welding Operators training course will be conducted by Valencia Hendricks, with only two candidates being trained at any one time to maximise the amount of hands-on time students will have with the robot welder.

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Alleviating shortages of Level 3 NDT Personnel

The SAIW is gearing up to present its internationally recognised NDT Level 3 Workshop, which builds on pre-existing Level 1 and 2 NDT Qualifications to enable attendees to take on a more senior managerial role within an organisation. This includes the ability to oversee all NDT procedural and quality checks and the authorisation and management of individual staff NDT operations.

SAIW NDT Training Manager Mark Digby reports: "Currently the South African NDT industry is suffering due to the lack of enough competent Level 3 NDT personnel and with the growing demand from end-users to have them directly involved during outages and shutdowns, combined with the global movement towards ISO 9712, there is a massive shortage in the industry. This has resulted in high consultation prices and some individuals being over utilised and extended beyond their service delivery capacity."

In light of this, the SAIW Level 3 course seeks to address this challenge with a key target market for the course being senior personnel, engineers and managers wanting to improve their knowledge relating to NDT. The benefits of the course for attendees is that this course is nationally accredited and internationally recognised via ICNDT MRA Schedule 2.

Building on experience

This year will see a continuation of the highly-successful model whereby internal SAIW lecturers and respected industrial Level 3 NDT practitioners combine forces to present specific course components. They will present selected sections of the NDT Level 3 Basic and Main Method course content as well as a new Visual Training 3 module that will follow on the last week of the workshop.

Digby adds; "We are considering including a web-based presentation, pending interest; to run together with the actual courses. Students opting for this route would be able to attend from where they are located via MS Teams."

Examinations will be available in Cape Town, Durban and Johannesburg and depending on demand could be extended to anywhere in South Africa since SAIW Certification invigilators would facilitate these exams on allocated dates. This flexible, customer-friendly approach will also give students the option to choose exam times e.g. weekends to suit their workplace commitments.

The March 2021 Workshop will also provide South African attendees with a further benefit, namely the opportunity to interact with the initial three Cameroonian NDT students who have confirmed their attendance. A second workshop scheduled to start in August 2021 will cater for an additional three Cameroonian students. This will continue the 21 year partnership between the IAEA (International Atomic Energy Agency), SAIW and NDT practitioners across the continent and the globe that has seen the local institute train students from as far afield as Kenya, Ethiopia, Mauritius, Vietnam and Bangladesh.

SAIW's NDT Level 3 Workshop will enable NDT practitioners combine forces to present selected sections of the NDT Level 3 Basic and Main Method course content.

Future growth

Despite the current skill pressures facing the country, the future does indeed look brighter for the development of senior NDT management level skills in South Africa. Reasons to believe this include the fact that one of the country's leading NDT users has indicated that they will task the SAIW with training ninety 90 Level 3 practitioners during the next five years.

In addition, the SAIW is seeking to boost its NDT operations with the introduction of a Card System for Qualified NDT Inspectors that will allow them to present and prove their qualifications wherever and whenever they need to. There are also plans to restart the SAIW's NDT Consulting Services which are aimed at assisting small and medium-sized companies with their in-house NDT systems and their testing and examination processes.

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

SAIW awards two international welding bursaries

Two internationally recognised welding student training bursaries worth R120 000 each have been awarded to Fhumulani Netshakhuma (22) and Palesa Mokoena (28), who were each awarded a 28-week IIW International Welder (IW) training course that is globally recognised in 58 countries around the globe.

SAIW Business Development Manager, Etienne Nell, says the SAIW received 56 applications in total, each of which was required to be accompanied by a letter motivating why the applicant should be the winner of the bursary. "I and my colleague Mahlatsi Confidence Lekoane then compiled a shortlist of applicants, which we followed up with a telephonic interview.

"Fhumulani Netshakhuma and Palesa Mokoena were chosen for their purpose and enthusiasm. Both individuals meet the SAIW's commitment to the upliftment of our South African youth and our goal of sharing the SAIW's quality training opportunities," says Nell.

The International Welder Programme develops competence in the welding of carbon steel, stainless steel and aluminium using four main welding processes: GMAW, GTAW, SMAW and FCAW. The course follows an International guideline used across 58 countries and covers two weeks of theory, together with practical welding modules.

The winning candidates will exit the course as highly skilled welders with opportunities to diversify into Welding Inspection, Welding Coordination or Non-destructive testing.

SAIW bursary students, Fhumulani Netshakhuma and Palesa Mokoena, developing basic welding skills using a Soldamatic welding simulator at the SAIW.

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

SAIW combination certification for ARCAL™ gases with Ultra-Arc™ wires

Mwali Kawawa and Michael Ashley from Air Liquide, along with SAIW's Shelton Zichawo, discuss a recent collaboration between Air Liquide and the SAIW to qualify and certify Air Liquide's welding gas and filler material combinations, which are designed to make welding consumable choices easier and more certain for South Africa's welding industry.

In collaboration with SAIW's state-of-the-art Materials Testing Laboratory, Air Liquide has begun to qualify and certify specific filler material combinations to enable South African fabricators to match precise welding wires with the most appropriate Air Liquide shielding gas. "The idea is to simplify consumable selection to best suit a particular set of base materials and welding applications," says Air Liquide's Mwali Kawawa.

"For several years, we have been on a campaign to simplify the selection of consumables for the gas shielded welding processes: gas-metal arc welding (GMAW), metal-cored arc welding (MCAW), flux-cored arc welding (FCAW) and gas-tungsten arc welding (GTAW). This began with the introduction of our New Generation ARCAL™ shielding gas range, which consists of four different and carefully developed mixtures. These premium blends can be confidently used for over 90% of the welding processes that require gas shielding," he tells *African Fusion*.

"We are extending this approach by matching specific welding wires with the most suitable ARCAL™ gas mixtures by qualifying and certifying gas and wire combinations for easy adoption by our clients," he adds.

The initial focus for qualification has been on high strength welding for materials used in heavy metal fabrication; typically utilised in the Witbank and Rustenburg coal mines for repairing mining and earthmoving equipment, for example. "These vehicles are often repaired using GMAW or FCAW using ER100-S solid wire or E71T1 flux-cored wire, respectively.

"These two wires have now been qualified and certified by SAIW for use in combination with our ARCAL™ Force New Generation shielding gas," Kawawa tells *African Fusion*.

ARCAL™ Force High Strength is now listed on a single data sheet as a merged single offer from Air Liquide.

The combination, aptly named ARCAL™ Force High Strength, is now listed on a single data sheet and is available as a merged single offer for any fabrication or weld-repair shop needing to join high strength materials while retaining optimal toughness.

Explaining the idea, Mike Ashley says: "While the initiative is new to South Africa, the explicit qualification of wire and gas combinations is commonly used by our subsidiary Air Gas in the USA. This has long been their approach, which is known to help companies achieve process and cost efficiencies.

"First off, fabricators are able to source gas and wire consumable combinations with ease. By doing so, we at Air Liquide are able to offer a complete technical support service, so clients can rest assured that the intended results will always be achieved.

"As consumable suppliers, it also enables us to target specific market segments where we have application expertise to accompany a qualified gas and wire combination. This takes away the stress of clients having to wade through datasheets to come up with workable combinations themselves," he says, adding that every consumable combination will be delivered with its qualification certificate and weld-material property specifications.

Kawawa explains further: "Typically, when choosing a wire, each manufacturer has a thick data book that lists all of its products. On each page there will be a different wire consumable with the details of the typical properties of the weld metal.

"Qualifying a combination with the welding application as the starting point – for high strength steel base material, for example – removes the need and the anxiety of having to find a suitable wire for the weld material and then having to separately choose a shielding gas that might work with that wire," he points out.

A combination test certificate enables one gas-wire combination datasheet to cover a wide range of similar welding applications. In the case of the ER100-S wire with ARCAL™ Force gas, for example, a whole range of differing parent material can be accommodated to meet the welding needs for high strength with good toughness," he adds.

So far, the SAIW Test Laboratory has qualified ARCAL™ Force with ER100-S solid wire and with the E71T1 high strength flux-cored wire, but Air Liquide intends to go a lot further: "With ARCAL™ Prime, our high purity (99.999%) argon gas, we are going to qualify combination procedures for most TIG welding appli-

cations as well as for GMAW welding of aluminium, copper, titanium and others, while our ARCAL™ Chrome product is ideally suited to 308 and 304 stainless steel wires and 2205 duplex stainless grades," says Kawawa.

"We intend to start by qualifying wire-gas combinations for most of the commonly used welding wires in the Air Liquid range, which will make choosing our products much easier for our customers," continues Ashley. "We are looking for improvements all the time, firmly focused on our New Generation gases and ever evolving customer requirements. Arcal™ offers efficiencies, improved process optimisation and genuine cost savings, while combinations offer customers peace of mind that they are using the correct gas with their filler materials and, furthermore, the combination is locally qualified and supported," he adds.

"In converting customers to the simplified New Generation gas range, it becomes crucial to ensure that the correct gas choice is being used with the correct consumable and welding application," Kawawa continues, adding that Air Liquide is also looking to develop and add a fifth Arcal™ gas, to be called ARCAL™ Flux, which he hopes will become the go-to gas for the majority of metal-cored and flux-cored applications.

Describing the qualification procedure at the SAIW, Zichawo says the work began when Air Liquide first supplied the ER100-S wire from its Ultra-ArcTM range for testing. "We have been using Air Liquide's ARCAL™ gas range in our welding school and test centre for many years now, so the gas used to perform the qualification was at hand.

"We prepared a weld coupon from a 20 mm plate of S355JR structural steel, which was welded by Dennis Bell, one of our qualified welders, using the Air Liquide gas and wire combination," he says.

The welded coupon was sent to the machine shop, where tensile and Charpy V-notch test samples were prepared for mechanical testing in SAIW's ISO 17025-accredited testing laboratory. "The qualification required tensile and Charpy impact toughness values, along with a chemical analysis, which we do using Spark analysers," he adds.

For certification, the actual results achieved from the real weld need to fall within the minimum and maximum specifications for the wire, which in the case of ER100-S is AWS A5.28: Specification for Low-Alloy Steel Electrodes and Rods for Gas Shielded Arc Welding.

"Since the samples were cut in the longitudinal direction, only weld metal remains in the machined test samples, and all of the tests results were found to be comfortably within the ranges required," he says. This enabled the combination to be qualified and certified to prove that a sound welding procedure completed with Air Liquide ARCAL™ Force gas and Ultra-ArcTM ER100-S wire will produce weld metal that meets the mechanical and chemical properties of the AWS specification.

A similar procedure followed, resulting in the qualification and certification against AWS A5.36 – the specification for FCAW and MCAW electrodes – of ARCAL™ Force in combination with Air Liquide's Ultra-ArcTM E71T1 flux-cored wire for high strength applications.

"Our qualified High Strength Combination offer with the ER100-S wire is now gaining momentum with Air Liquide customers, who are becoming more willing to look beyond our gas offering and towards the basket of goods Air Liquide can offer," says Ashley, adding that combined product development is also proceeding, starting with stainless steel applications and wires that will be qualified in combination with ARCAL™ Chrome.

SAIW qualified welding instructor, Dennis Bell, prepares a weld coupon for qualifying Air Liquid's ARCAL™ Force High Strength consumable combination certification of ARCAL™ Force shielding gas with ER100-S wire from Air Liquide's Ultra-Arc™ range.

When asked why Air Liquide chose to partner with SAIW for this work, Ashley points out that Air Liquide has long been a Corporate Member of the Institute and SAIW is one of Air Liquide's long standing customers. "Also, though, SAIW has one of the few ISO 17025-accredited Test Laboratories in South Africa and the one most dedicated to and knowledgeable about welding. SAIW has a full turnkey welding offering: it has the qualified welders and welding equipment, NDT specialists, the mechanical and chemical testing equipment and the technical services consultants to credibly validate test results," he says.

Zichawo adds: "We are currently accredited in four testing methods: tensile, impact, bend and Vickers hardness testing. Our intention is to extend the scope of our testing laboratory to include macro examination. We will then expand the chemical analysis service and accredit our hydrogen analysis offering," he says.

"We already do a lot of welder qualifications, welding consumable testing and welding procedure development – and we also have the high-end expertise to do failure investigations.

"The SAIW has qualified welding personnel available at every level to visit any fabrication site to resolve problems, or to identify opportunities for improvements," Zichawo concludes.

Typical chemical properties

	C	Si	Mn	P	S	Cr	Mo	Ni	V	Cu	Fe
Result	0.078	0.58	1.52	0.005	≤0.005	0.38	≤0.01	<0.01	0.037	0.15	Bal

Typical tensile properties

	Temp. (ºC)	0.2% YS (Mpa)	UTS (Mpa)	%EL	Type of fracture
As welded (AW)	23	615	690	32	Ductile

A snapshot of the mechanical and tensile results of the ARCAL Force gas and Ultra-Arc™ ER100-S wire combination as tested and verified by SAIW's ISO 17025 accredited independent laboratory.

Cosmo Group takes superstore

For 27 years the Cosmo Group has been on a quest to transform South Africa's welding market. *African Fusion* catches up with Group director, Pierre van Nieuwenhuizen; general manager, Petrus Pretorius; newly appointed sales manager, Jaques Botha; and training manager, Emma Britz, about adding eCommerce with online support services and training to its offering, while reinforcing its total solutions offering for welders and fabrication companies of any size.

The Cosmo Group's senior management team: Jaques Botha, sales manager; Petrus Pretorius, general manager; Rossouw van der Merwe, Group director; Emma Britz, training manager; and Pierre van Nieuwenhuizen, Group director.

Founded in April 1994 as a small business selling welding consumables, by 2009 Cosmo Industrial was opening South Africa's first one-stop welding and industrial superstore. In the last decade, several distribution businesses have been added: Cosmo Manufacturing Supplies; Cosmo Construction Suppliers; Cosmo Railways Supplies; Cosmo Mining Supplies; Cosmo Automation Solutions; and Cosmo Training Academy, which are all Level 2 B-BBEE companies that now operate under the Cosmo Group umbrella.

Even in the midst of the current COVID Pandemic, Cosmo's growth trajectory is set to continue with the launch of an eCommerce platform customised to suit the needs of the welding fraternity. "Welding is a very technical process, so it isn't easy for clients to make online equipment purchases. While it's is easy for a customer to log into an online eCommerce portal and buy a familiar product, such as a welding helmet or a pair of gloves, but it is never going to be easy to buy a R500 000 to R600 000 welding machine online. Any customer will need to be reassured by a technical expert that what they are buying will do what they want it to," says Van Nieuwenhuizen.

"Online customers are often not technical people. Our research suggests they are much more cautious about buying technical products online and returns can be as high as 30% on the types of products we sell. For us to be successful online, we believe we need to create the same type of interactive experience customers get when visiting our superstore in person, where specialists are on hand to answer questions, make suggestions and steer customers towards solutions that are best suited to their welding needs," he adds.

"Is it the chosen process best for the applications; is the consumable suitable; is there a better combination? Many details need to be considered before one can confidently decide on a solution for a welding application," he notes.

In designing an eCommerce platform for the Cosmo Group, a key future goal is to offer customers a positive and interactive online experience, where customers will have direct and immediate access to technical sales representatives. "Purchasing equipment involves investment, with customers expecting to enjoy the buying experience while being assured of value for money in the long term. For this to happen, they need to be able to talk to one of our people," he suggests.

In a further effort to validate the choice of online equipment transaction, welding customers often prefer to see a welding demonstration, to see for themselves that the proposed solution is fit-for-purpose. Petrus Pretorius explains: "We regularly do welding demonstrations for clients, in their workshops or at our technology centre, for example. We find out as much as possible about the client's application, then we set up a machine to weld a test piece that closely represents the job. Sometimes we go one step further by doing a qualification test, which would require the weld sample to be sectioned and tested," he says.

"So we are also looking at ways of converting the customer demonstration experience into an online service, where we still set up the welding trial in exactly the same way, but instead of us going to the client or them coming to us, we stream a video of the weld-demo live online. This can be broadcast to the client and his or her welding team to witness, from wherever they may be," suggests Pretorius.

"We have already done a pipe welding demonstration for one of our customers from the Lincoln Electric WeldTech

Cosmo Academy welding students doing initial welding skills training using Lincoln Electric's Virtual welding system.

concept online

As well stocking Lincoln Electric welding machines and consumables at its Superstore in Silverton, Pretoria, Cosmo Group is developing an online interactive experience that will enable customers to confidently buy welding equipment online.

A wide range of safety equipment – from head to foot protection – as well as a variety of specialised welding and other safety equipment is on offer from Cosmo Group's Dromex and Jonsson Workwear brands.

Centre in Dubai. Customers logged in to watch the demonstration, during which they could ask questions and make suggestions regarding different things to try, just like a real demonstration. Photos were also taken for sending to customers as a permanent record and to circulate and share. This opens up a whole new way of doing demonstrations," continues Botha. "It applies to power tools, hand tools, compressors and to all of our specialist equipment range," he says, adding that it is all about taking away the uncertainty from a purchasing decision.

"I see this online service as an ideal way of reaching into sub-Saharan Africa. We have an economically viable and attractive welding range that is ideally suited to markets north of our borders. The current industrial supply chain is still run through South Africa, but imports from Asia are becoming stronger and stronger. We need to respond," adds Botha.

"Through this new interactive online eCommerce service, we can offer excellent supply and support services out of South Africa, offering expertise to help people in remote areas to choose the right equipment and then to get the most out of that equipment. We will strive to build trust-based relationships, where clients know that even though we cannot visit each other in person, they have online access to specialists to help them resolve their welding issues," Van Nieuwenhuizen tells *African Fusion*.

Through its Training Academy, the Cosmo Group is also in the process of launching several online courses. According to Cosmo's head of training, Emma Britz, the first of these is customer service. "Customer service training is a vital part of any business and, ultimately, it can mean the difference between success or failure. Frustrated or unhappy consumers can have a negative impact on every aspect of business operations.

"Regardless of the nature of the company's business, it is so important to adopt the right strategies to improve customer service and our Customer Service Training Course provides the skills to develop customer satisfaction before, during and after a customer's requirements are met," she explains.

Also being developed are Conducting Meetings and Conflict Management courses: "Conducting a meeting training will deal with how to plan and lead successful meetings. Delegates will learn how to draw up an agenda and then facilitate a meeting following the activities listed in the agenda. Other essential skills include leadership, decision making and creative thinking, which all help establish a neutral atmosphere amongst participants in meetings, as well as how to deal with misunderstandings, while Conflict management training will introduce some practical conflict resolution techniques and strategies that managers and team leaders can effectively use to resolve conflict in the workplace," she adds.

Van Nieuwenhuizen continues: "We should also note that we are now qualifying our Academy's first International Welders. So far, we have qualified two IIW International Welders and another three have completed the theoretical examinations and will start with their practical experience soon," he says.

Going back to online services, Pretorius notes that Cosmo intends to start delivering a series of online seminars focusing on pipe welding, different cutting processes and hardfacing, for example.

"Although we offer a host of some of the best welding brands available, Cosmo has evolved into a brand in its own right," believes Jaques Botha. "We can offer holistic solutions that combine the best available products and brands to get the most cost-effective welding results within the quality, skills and cost constraints of any project," he says, adding that Cosmo specialists are supported by people from the best OEMs in the world should they encounter issues they have never experienced before.

"The Cosmo Group is there for customers and in a position to service customers in a multitude of ways, which, from now on, will also include modern online services specially tailored to the needs of the welding industry.

"We have also adopted a new CRM software system, which enables us to look after customers better, making business-to-business transactions much easier. Cosmo sales personnel can identify opportunities by grouping customers in similar sectors that generally procure similar products. Our new CRM system can then identify what their needs might be and which Cosmo products will best meet those needs," Botha informs *African Fusion*.

"In all that we do, from a customer and a supplier perspective, we strive to generate trust. We believe this is why we have been able to sustain our growth, despite global recessions, political turmoil, COVID and many other negative economic drivers that have afflicted us over the years," Van Nieuwenhuizen concludes.

Small sample analysis of plant components subject to high temperature and pressure

In this technical article, *African Fusion* summarises work done by the eNtsa team at Nelson Mandela University, with Sasol Synfuels Operations and Eskom, around the development and implementation of small sample testing for critical components subject to high temperatures and pressures.

For middle to 'aged' industrial plants, advancements in metallurgical methods and analytical techniques have led to the reassessment of safety margins and, in some cases, the extension of operating plant life. Knowledge of material degradation and how it influences mechanical properties is essential when evaluating the risks associated with a plant life extension.

A barrier to the type of testing required for such assessments is often the large volumes of material required, which is usually not possible to obtain while plants are in service. Small sample testing, such as Small Punch Testing (SPT) and Small Punch Creep Testing (SPCT), presents an alternative means of obtaining the critical mechanical properties from small material samples.

Sample removal techniques, such as the scoop sampling process and the more recent WeldCore® procedure for the removal of a sample core followed by its immediate repair, now allow for in-service testing with semi- to non-destructive sample extraction.

The maturity of any degradation such as graphitisation or creep damage within structural components occurs locally within the bulk material of a component. The extent to which this degradation influences the service life can be examined on a small scale using small punch testing (SPT) for static properties and small punch creep testing (SPCT) for creep behaviour.

Time dependent properties, such as creep testing, as well as time independent properties such as yield stress, tensile stress, ductile to brittle transition temperature and fracture toughness are now being calculated using various methods associated with SPT. Being able to reliably measure fracture toughness is vital to the design, maintenance and life extension processes and is currently a research focus of the group.

Extraction of small samples can be divided into two categories, namely shallow and deep extraction. Shallow extraction is typically done by scoop sampling or electrode discharge machining (EDM). This type of extraction does not require a weld repair procedure post extraction as the structural damage is contained within the surface and is usually not considered detrimental for continued operation.

For *in situ* deep sample extraction, WeldCore® core sampling and repair is now widely preferred for extracting cores of 8.0 mm in diameter in the petrochemical and power generation industries in South Africa.

Figure 1: EDM Scoop Sampler with HMI and Control Trolley (Inset -EDM Scoop or 'boat' sample)

Sampling and repair procedures

The methodology of small sample extraction from engineering components is driven by the need to obtain a sufficiently large sample for extracting material data to inform engineering decisions. Preferably, the extraction must be done in situ and currently two possible methods are available; first, shallow sampling, in which a small amount of material is removed to obviate the need for a weld repair; and second, deep sampling, which involves a coring approach followed by an in situ weld repair procedure before bringing the plant back into service.

Both shallow and a deep sampling techniques are being used with great success by the eNtsa technology group in South Africa. The shallow sample technique makes use of a compact purpose-build EDM wire cutting device to extract 'boat' samples of material, while the deep sample extraction is done with the WeldCore® process, which extracts a cylindrical core 8.0 mm in diameter.

The small sample geometry needed for both SPT and SPCT materials testing is disc shaped, typically with a diameter of 8.0 mm and a thickness of 500 µm.

Sample extraction methodologies

EDM for shallow applications

eNtsa has developed an EDM platform for extracting boat shaped material samples (Figure 1), which has a dedicated control platform for site work and uses an easily reconfigurable installation strategy to match specific site conditions.

These platforms utilise a cam based system to extract shallow samples of a predetermined geometry. The excavated scoop sample geometry can have a flat base with a width ranging from 10 to 30 mm, a length of 20 to 40 mm and a depth from 1.5 to 5.0 mm.

WeldCore for deep sample extraction and repair

WeldCore® technology was developed as an in situ material sampling and repair procedure. Sample retrieval and associated hole geometry are crucial for extracting a representative core containing material information from the depth of a component wall.

The final hole geometry needs to accommodate the removal and extraction of an 8.0 mm core. This is retrieved using a patented removal tool, providing an undercut to the core prior to removal. The length of the core to be removed depends on the material thickness at the removal site. This depth is calculated to leave a ligament of material sufficiently rigid to

support the initiation of the solid state weld repair process.

Once the core has been successfully removed the final hole geometry is achieved by a custom made finishing tool, before repairing the extraction site. The repair weld associated with WeldCore® is based on Friction Hydro Pillar Processing (FHPP), a solid state welding process. This repair procedure has been adopted in ASME IX, where applicable it is applied with an appropriate pre- and post-weld heat treatment.

The WeldCore® sampling and repair platform has a modular design for ease of handling at heights and accurate positioning in various onsite configurations. Sample retrieval is done at an exact identified position to gain maximum data value from the core. On welded thick-walled steam lines, sampling is typically focused on the heat-affected zone adjacent to conventional circular and longitudinal fabrication welds.

The process generally commences by placing a positioning fixture over the identified sample area to ensure that the exact location is sampled. The platform is then assembled over the sample site and the WeldCore® sampling process sequence commences.

Figure 2: Schematic illustrating the WeldCore® process with photos of actual site procedure stages.

Figure 3: In-situ installation of WeldCore 3 Platform on a steam pipe.

SPT measurements from small disc test samples

From both cylindrical WeldCore® samples and boat shaped EDM samples, disc shaped test samples of 8.0 mm with a thickness of 500 µm are prepared for small sample testing. eNtsa at the Nelson Mandela University focuses on two methodologies: for static properties, Small Punch Testing (SPT) is used, while for time temperature behaviour the Small Punch Creep Test (SPCT) is employed. These small disc test samples are also used for obtaining metallurgical, chemical and hardness data.

Typically, the cylindrical or boat sample will be carefully evaluated prior to removing a disc for testing. When basing engineering decisions on a small volume of material, all information in the vicinity of final disc extraction must be known. Where applicable, eNtsa makes use of X- Ray tomography (CT scanning) as a decision making tool to identify regions containing defects to accurately identify the position for the removal of a test disc.

Static property analysis via Small Punch Test

The SPT method was initially designed to derive critical strain energy density measurements to quantify initiation fracture toughness on service exposed material. The method involves finite element modelling to estimate static material properties.

The testing apparatus and data analysis used comprises three major components: a static tensile/compression test platform; a specially designed small punch test fixture with an integrated digital microscope; and advanced software for simulation and analytical assessment. eNtsa uses a Universal Testing Machine with the required outputs from the machine: force and displacement. The SPT fixture also accommodates an integrated digital microscope in order to visually identify the occurrence of crack initiation (Figure 4).

The software used for the analysis component at eNtsa is Siemens' NX NASTRAN. Nonlinear material properties are generated using a purpose developed calculator built on the principals of the Ramberg-Osgood model, which is used to describe the non-linear relationship between stress and strain.

The procedure for testing SPT samples and arriving at estimated properties was adapted from the analytical approach suggested by Purdy et al: Increasing Reliability of Small Punch Fracture Toughness Testing

Figure 4: The SPT fixture, designed and fabricated by eNTSA for small disc testing.

with Acoustic Emission Monitoring. The first step is to perform a physical test on the disc (Figure 5), which is used to plot an experimental small punch curve, of punch load (N) versus displacement (mm) (Figure 6).

The next phase of analysis is aimed at determining the material's nonlinear stress and strain properties using the axisymmetric finite element model, before the actual physical punch test characteristics are modelled by calculating the nonlinear material properties via the Ramberg-Osgood functions. The nonlinear parameters are adjusted until the response suitably matches the actual load versus displacement results. This correlation in actual versus simulated results is shown in Figure 6. When the simulation results suitably match the test curve up to the region of crack initiation, then the calculated parameters are considered usable for further analyses.

From a very early stage in eNtsa's involvement with the SPT methodology it was decided to focus on strain energy density as a ranking tool rather than attempting to quantify fracture toughness. The ability of the eNtsa SPT platform to provide a synchronised video of the real-time digital microscope image with the load/displacement curve assists in accurately identifying critical crack initiation during post-test evaluation. With this information the critical strain energy density (wc) can be calculated, which can be used as a ranking tool for describing the qualitative toughness of plant material.

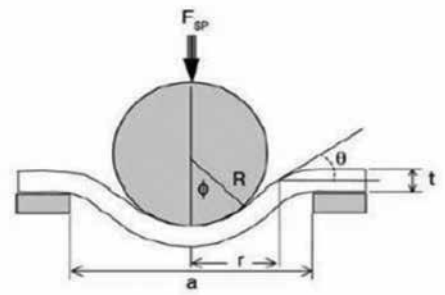


Figure 5: Schematic illustration of applying the punch load via a ball onto the SP Disc.

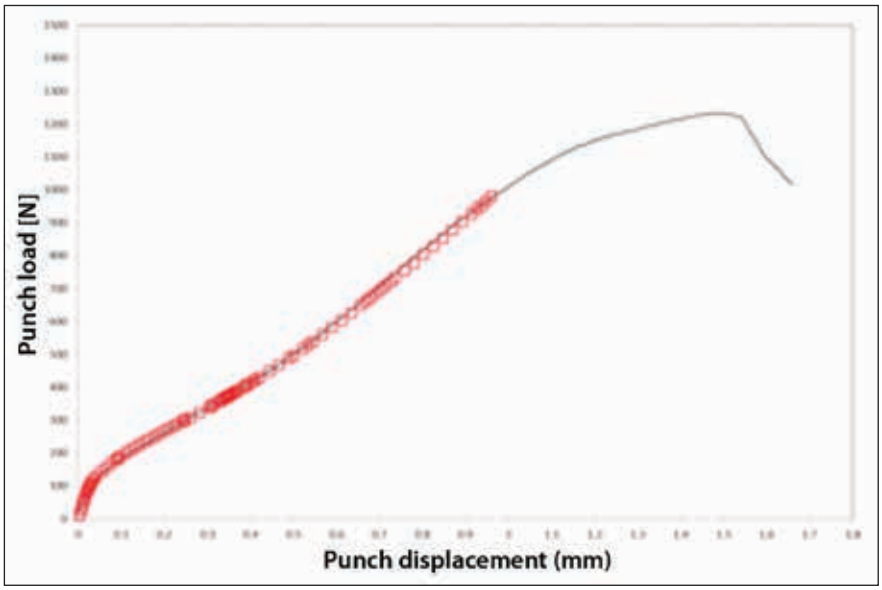


Figure 6: SPT load versus displacement data (blackline) with modification of the nonlinear material properties to achieve a suitable load versus displacement correlation superimposed (red circles).

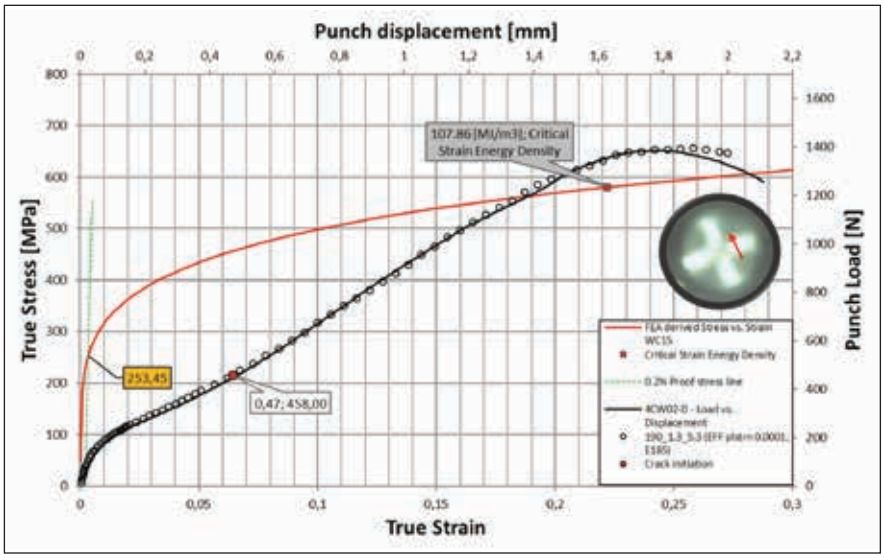


Figure 7: Typical Engineering data extracted from SPT after converting Punch load/deflection to Stress/Strain data.

In his work on the effect of graphitisation on the fracture toughness, Grewar – *Modelling the Effect of Graphitization on the Fracture Toughness (J_IC) of Service Exposed ASTM A-515 Gr. 65 material by the Small Punch Test Method* – also showed good correlation between Yield Strength measured by traditional methods versus Yield Strength estimated using small punch test analysis. The data as presented in Figure 7 shows the correlation between punch load and deflection data on the same graph as the true stress and strain plot, demonstrating that the simulation method enables SPT alone to be used to determine material properties for stress versus strain.

Creep property analysis and SPCT

A typical Small Punch Creep Testing (SPCT) sample is the same as that used for SPT (see Figure 8). eNtsa has developed and is running a fleet of sixteen SPCT platforms that use a ceramic ball and punch to generate creep data for both the petrochemical and power generation industries. Key design aspects of the include:

- A lever arm mechanism for dead weight loading.
- A ceramic ball-punch configuration.
- An argon purged sample furnace.
- Inline load monitoring.
- Deflection monitoring via the punch rod.
- Dual, indirect sample temperature control & monitoring.

Test sample preparation, calibration and meticulous loading and control of all parameters, variables and test environment are critical for obtaining repeatability in this type of test setup and environment.

As part of a validation process for the SPCT methodology, eNtsa first embarked on a zero creep life study by doing tests on a section of material known to have failed in service due to creep exhaustion. The zero creep life aimed to determine whether a decrease in life to rupture could be observed as samples are approaching the failure region. This rupture curve of zero-creep samples at the point of failure would then represent the zero creep life 'end point' for ongoing SPCT tests.

For the zero-creep test, a sample was removed from a ruptured carbon steel steam pipe bend as shown in Figure 9. Core

Figure 8: Two views of eNtsa's fleet of SPCT platforms.

samples were taken adjacent to the creep failure either side of point B2 where plastic thinning was clearly visible.

The SPCT Weldcore samples were removed in the radial direction and disc samples taken from mid-thickness, where the most damage was observed. Small punch creep tests were carried out on the samples using test conditions that would accelerate the failure.

Position B1, B4 and B5 achieved SPCT rupture times of 57, 60 and 56 hours respectively, while B3 achieved 40 hours and B2, where the rupture occurred, achieved 16 hours. Samples from the opposite side of the weld (A1 and A2) achieved in access of 1 000 hours at the same condition. From the data it was clear that areas that experienced the most creep damage achieved the lowest rupture time.

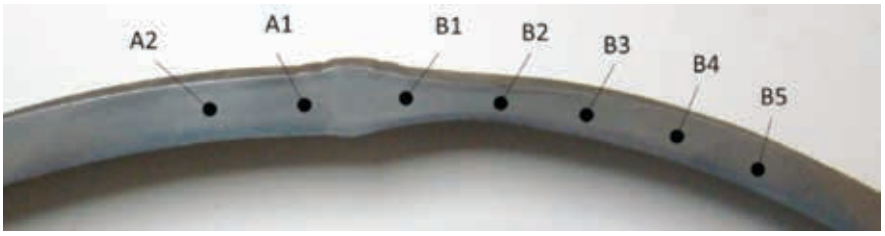


Figure 9: The ruptured pipe section used for the zero creep life study. Failure occurred at position B2.

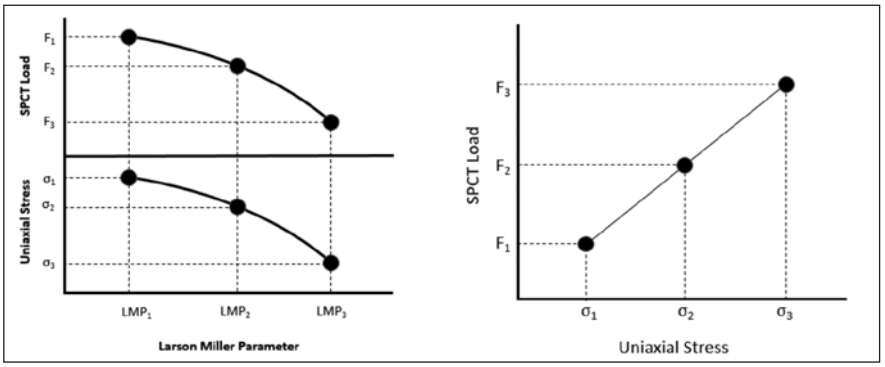


Figure 10: Derivation of the SPCT load versus Equivalent Uniaxial stress relationship using the Larson Miller Parameter.

Remaining Life estimation using SPCT data

The goal with creep testing is ultimately to reach a point where a remaining life can be estimated. In essence, SPCT methodology looks at the time versus temperature characteristic as a function of stress. The approach currently adopted for linking SPCT load data to uniaxial stress data, as described by Izaki et al – A creep life assessment method for boiler pipes using small punch creep test – entails obtaining SPCT data at various loads using a reference test material. From the test temperature and rupture time, the Larson-Miller parameter (LMP) is calculated for each load as described by the equation below:

$LMP = (\log t_r + C)\, T = f(\sigma)$,

where:

t_r is the rupture time (hours)

C is the Larson-Miller material constant

T is the absolute test temperature

Since a material exhibits only a single LMP value for each stress, the LMP value from the SPC Test is set equal to the corresponding LMP reference curve derived from uniaxial testing and the stress versus load relationship as derived for a wider stress range. The result is therefore a reference LMP curve expressed in both SPCT load and uniaxial stress. This method is illustrated in Figure 10.

Once the reference curve has been established for virgin (undamaged) material, the serviced exposed material can be tested and compared to the reference curve through the Larsen-Miller parameter to estimate the life fraction lost during service.

This LMP model is a simple and effective rupture model that presently yields fairly comparable results to remaining life estimations derived from uniaxial tests. Available uniaxial creep data for the steels being tested are fairly limited however, and the SPC test is still being refined and validated against uniaxial test data as it becomes available.

Conclusions

With acceptance of the WeldCore® process as part of the ASME IX welding code, the collection of representative bulk small samples followed by an immediate repair become a valuable tool for analysing the ongoing safety of plant components.

Initially used for the assessment of creep damage, developments in small punch testing for both static and creep purposes has enabled further value of small sample testing to be unlocked. Additionally, developments with regard to shallow sample removal by electro-discharge machining is now available.

Small sample testing has proved to be highly useful in determining both time independent and time dependent mechanical properties of mid-term and aging plant components.

Extracted from the paper: INTEGRITY AND REMAINING LIFE ASSESSMENT THROUGH SMALL SAMPLE ANALYSIS OF HIGH TEMPERATURE AND PRESSURE ENGINEERING COMPONENTS; DG Hattingh, S Grewar, D Bernard, IN Wedderburn, DJ. Erasmus and C Orsmond; 2nd International Conference on Structural Integrity for Offshore Energy Industry: 9-10 September 2019, Aberdeen

High impact laser metal deposition refurbishments for critical power equipment

Mark Newby of Eskom Research, Testing and Development, and Corney van Rooyen of the CSIR's National Laser Centre talk about the longstanding bilateral collaboration between ESKOM and the CSIR on high impact refurbishment projects, including the repair of PTR-tanks in the nuclear industry, a laser metal deposition tenon re-build on turbine blades, and other turbine rotor, blade and understrap repairs.

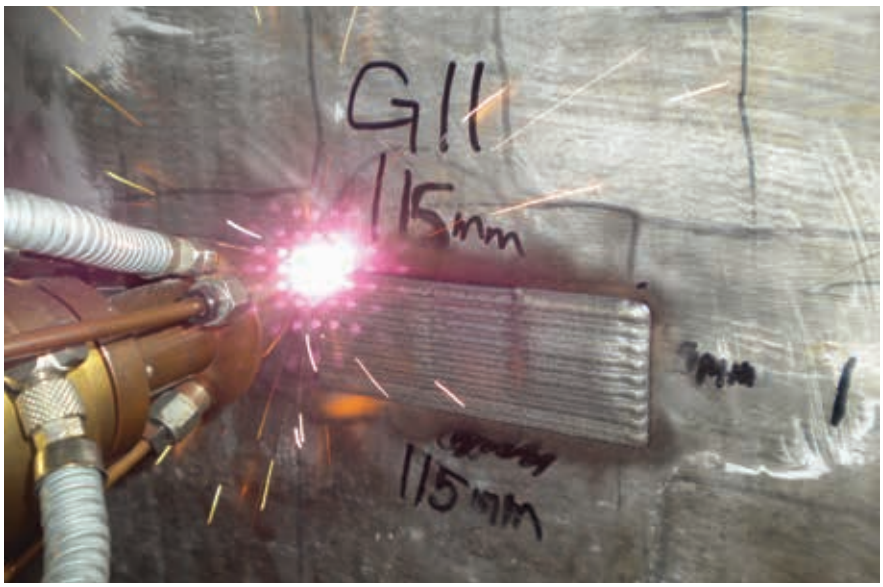
Mark Newby is part of Eskom's multidisciplinary research, testing and development group, one of the hundreds of technical people involved in physical metallurgy and material related research and development at Eskom's Rosherville site in Johannesburg. "I am a mechanical engineer who specialises in experimental stress and vibration analysis," he begins.

Newby began his career as an Eskom trainee and completed a Masters diploma of Technology at Port Elizabeth Technikon. "I joined Eskom as a bursar directly after completing national service and, apart from a three and half year 'break' as a lecturer at the Port Elizabeth Technikon, I have been with them ever since," he adds.

"Our team at Eskom Research, Testing and Development includes chemical, material and electrical specialists so we can offer a whole range of disciplines – and in my experience, the most successful research comes from multidisciplinary projects." Newby tells *African Fusion*.

The Eskom-CSIR Tenon laser weld repair project team, clockwise from 12:00 o'clock: Paul Stangroom, Maritha Theron, Mark Newby, Hardus Greyling, Dheshan Naran, Dewan Schoeman, Phathutshedzo Nemakhavhani, Danie Louw, Johan Visagie, Herman Rossouw, Devilliers Moll, Ronnie Scheepers, Corney van Rooyen, Andre King, and Eliza Dlamini.

His involvement with laser welding began in 2008 on a project with his late colleague, Philip Doubell, and a team from the CSIR National Laser Centre (NLC) headed up by Corney van Rooyen. "Our first project involved the repair of atmospheric stress corrosion cracks (ASCC) along the welds of the PTR cooling water tanks at Koeberg nuclear power station. We explored the use of friction stir welding with the guys at Nelson Mandela University (NMU) and laser weld repair with CSIR's NLC.



On the two Koeberg PTR tanks, a laser-based welding technique was used to seal leaking ASCC cracks before using a powder filler to build up and reinforce the surface area.

"With NMU, we developed a non-consumable friction stir welding technique using a lanthanum tool that did not need to penetrate the wall. Similar techniques are widely used for joining aluminium, but the PTR tanks are made from 304L stainless steel, and we successful qualified a procedure to repair these cracks on a full-sized mock up while they were in service.

"At the same time, we were working with Corney on a powder-fill laser welding technique to do the same job. With the laser, we were able to seal leaking ASCC cracks before using a powder filler to build up and reinforce the surface area," says Newby, adding that the laser technique was preferred and the two Koeberg PTR tanks were repaired in 2011 and 2012,

respectively, and put back into service for an additional six years.

"Based in this success, we started looking at turbine components in two key areas, turbine blades and turbine shafts. We have now successful applied laser welding techniques in both these areas, although the approaches required are very different," he notes.

Newby says that on a large turbine shaft, a localised rub from a seal often causes local wear damage. "Any slight touch on a rotating shaft spinning at speed will tend to cause a localised groove on the shaft. Performing a small repair without having to heat treat the whole shaft can be tricky. We have developed a technique that involves machining away material to a 3.0 mm depth before applying a laser metal deposition technique in layers of less than 1.0 mm each. The technique involves exceptionally low heat input, which avoids the post-repair need to heat treat the rotor, which can put the seal at risk," Newby explains.

The repair also retains the shaft's original dimensions, which avoids machining down and then having to accommodate oversized bearings or replace them with resized ones.

Turbine blade refurbishment

Steam turbine blades for power stations, according to Newby, are susceptible to erosion on the low pressure turbines from the relatively wet steam passing through them. "Typically, the aerofoils get pitted and worn, which led us to explore re-surfacing in the worst affected areas: machining away worn sections of turbine blades, building them up using laser metal deposition before machining the area back to the precise dimensions.

"Soon after we started to develop these techniques, however, we encountered this tenon problem," he says, describing how turbine blades are mounted between the rotating shaft and the outer shroud: Around the outside of the turbine blades, there is an outer shroud, supporting a 'packet' of turbine blades, typically 10 blades. These shroud segments are connected to each other by short titanium understraps, which are connected to the shroud via tenons on the two blades at the end of each 'packet'.

"The full ring of shroud segments interconnected by the understaps turns the whole row of turbine blades into a disc, which helps to control vibration while the turbine is running," Newby explains.

On assembly, he says that the turbine blades with tenons on their outer ends are first attached to the shaft in a straddle root configuration. Two understraps are fitted at the appropriate distance apart with the turbine blade tenons passing through aligned slots in the understrap. Then a shroud segment, which has similarly aligned slots, is fitted over each blade's tenons, with the two end blades of each 'packet' overlapping the understraps.

Above: A laser based repair being done on a turbine blade shroud of a low pressure turbine.

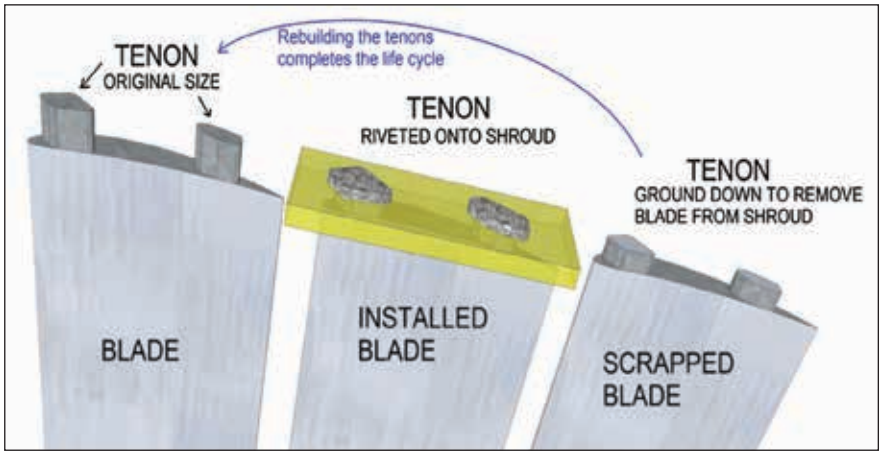
Right: An Initial test in progress on turbine blade shroud.

"The tenons are then mechanically peened to form rivets that securely hold the shroud segment and understrap onto the turbine blades. By repeating this process for each shroud segment, the complete shroud is formed around the shaft, securing the row of blades attached to the turbine rotor," Newby explains.

"Once fitted, any pit, crack or flaw in any of these interconnected components creates a problem, because you can't easily dismantle individual turbine blades. The peened tenon 'rivets' for a whole section of blades – sometimes more than one packet, depending on the access point and the component of interest – first have to be ground off so the shroud section and/or the understrap can be removed. This destroys the turbine blades, because without a tenon, they can no longer be refitted," Newby tells *African Fusion*.

To dismantle and replace an entire row of turbine blades, understraps and shroud packets on a steam turbine rotor, he points out, could take 12 to 18 months to complete, and the affected turbine rotor would be out of service in a workshop for the entire period.

Eskom Research, Testing and Development and CSIR's National Laser Centre therefore embarked on an extensive investigation to develop a repair technique for the turbine blade tenons after having removed them. "These are 12CrMoV steel and we started by building up suitably sized tenon shapes on test plates by fusing thin layers of powder using a laser. After machin-



A schematic illustration of the tenon problem on steam turbine blades that led to the development of a laser metal deposition rebuild procedure.

CSIR unveils world-class Photonics Prototyping Facility to support South African Industry

South Africa's photonics industry is set to benefit from the state-of-the-art Photonics Prototyping Facility (PPF) that was unveiled at the Council for Scientific and Industrial Research (CSIR) on Friday, 5 March 2021.

The PPF facility aims to enhance the development of photonics-based products, specifically for the prototype development phase, and to test the market for acceptance of planned products in the country. It offers Class 1 000 clean rooms with technical and optical equipment, including electronic, mechanical and diagnostic equipment for a variety of wavelengths.

The facility, which is funded by the Department of Science and Innovation (DSI), will fast-track photonics technology in line with market needs and stimulate the growth and competitiveness of the South African photonics industry. It further aims to address the current lack of commercialised photonics products in South Africa by providing world-class photonics facilities, technical support and scarce skills development in optics and photonics, as well as the networks needed to facilitate the development of prototypes.

Photonics applications are pervasive in all branches of 21st century science and engineering, and everyday life. These include fibre optic information and communication networks and systems; cameras; sensors and imaging systems; illumination systems and displays; applications in the energy sector, such as photovoltaic materials and systems; and applications in manufacturing where photonics plays an increasingly important role as a tool for supporting advanced manufacturing technology, such as 3D printing.

One of the projects focuses on optical coherence tomography for the 3D extraction of fingerprints. The novelty of this fingerprint acquisition device is that it is capable of extracting both the internal (sub-dermal) and external (surface) fingerprint, thus removing the possibility of fooling the detection system. It also offers a non-contact approach, which has applications that can be used in banks, mortuaries and forensic service facilities. The prototype has been developed and the team has received positive feedback from the trials.

Speaking at the launch event, the Director-General of the DSI, Dr Phil Mjwara, said the establishment of the Photonics Prototyping Facility is without doubt a significant milestone for the CSIR, industry and the national system of innovation as a whole.

Dr Mjwara added that the setting up of the facility is part of broader efforts by the DSI to support industrial and economic development that is driven by research, development and innovation.

"These initiatives are also key components of our contribution to national development imperatives as set out in the White Paper on Science, Technology and Innovation and the South African Economic Reconstruction and Recovery Plan. Most importantly, they are a fulfilment of our obligation as government to develop interventions in support of the creation and utilisation of knowledge and innovation for industrial and economic development."

South Africa's photonics industry is set to benefit from the state-of-the-art Photonics Prototyping Facility (PPF). From Left: T Dlamini, CSIR; P Mjwara, the Department of Science and Innovation; Cobus Jacobs, CSIR National Laser Centre.

At the unveiling of CSIR's Photonics Prototyping Facility are, from left: Dr. P Mjwara, Director General of the Department of Science and Innovation; and Dr. T Dlamini, CSIR Chief Executive Officer.

The Chief Executive Officer of the CSIR, Dr Thulani Dlamini, said the facility has a huge role to play in developing and supporting new and existing enterprises in the field of photonics, in order to improve their competiveness.

"This initiative is an important platform for the accelerated development of innovative products and technologies in photonics. This PPF will help to develop South Africa's expertise in the area of photonics product innovation and development, thus stimulating the growth of the country's photonics industry by supporting small, medium and micro-sized enterprises (SMMEs) and creating opportunities for new high tech jobs."

Dr Dlamini further called on South African scientists, researchers, engineers, industries, SMMEs, as well as entrepreneurs and investors to make use of this facility to develop photonic-related products.

science & innovation
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ing the shape, we found that the integrity of the steel with respect to the residual stress was good. This was validated at the *Institut Laue Langevin* neutron diffraction facility in Grenoble, France," says Newby.

Corney van Rooyen adds that, after some investigation, Inconel 625 powder was chosen for the tenon repair. "A matching low carbon 12% martensitic stainless steel requires too much energy to deform via peening. Inconel is widely accepted in the industry and is well suited because it is much more ductile and with adequate mechanical strength to secure the shroud," he notes.

Successful initial research enabled the process to be taken further with the CSIR's National Laser Centre and Van Rooyen being contracted to develop a viable welding procedure to perform an *in-situ* repair of the tenons: that is, to repair the tenons while still attached to the turbine rotor. "The process started with field trials on a scrap rotor. We attached a laser-based welding system to a robotic arm on a portable platform. We then developed a highly controlled additive laser-based welding sequence to rebuild the tenons on the ends of each turbine blade," says Van Rooyen.

With a typical near net shape profile of 10 by 10 with a 6.0 mm height for the shroud-only tenon connection and 9.0 mm for the tenons passing though both the shroud and understrap, Van Rooyen and his team chose to use a 2.0 kW IPG Photonics Fibre laser for the *in-situ* rebuild. "IPG fibre lasers offer good beam quality and high power, but they are compact and very robust," he tells *African Fusion*.

A small Kuka robot was chosen to manipulate the laser via a fibre optic and the powder through a nozzle to rebuild the tenons. "The robot was programmed to build a near net shape profile from a predefined tool path. All we had to do onsite was reference the starting point for each tenon. We could also easily reprogram the tool path for other tenon sizes, which were different depending on the location and stage of the turbine blade on the turbine," Van Rooyen adds.

Argon was used as the carrying gas for the powder, which was metered using a disc and groove type powder feeder. "Changing the rotating speed of the feed disc adjusts the powder feed rate very accurately, to within ±2.5% on a 0.5 kg/hour powder-feed rate," he explains.

Highlighting the onsite suitability of the process, the laser power source was installed in a truck to enable the repair to be applied outside. "Once the tenons were

ground off and a reference starting point for each one was established, the repair proceeded automatically at a rate of about 0.5 mm per layer. We could, in theory, have rebuilt all 10 tenons on a packet of turbine blades in a single two shift day, but with the necessary inspection required to ensure the integrity of the repair, it did take several days longer," he notes.

Following build up, intermediate ultrasonic inspection, and post weld heat treatment of the welded tenons, each tenon was hand dressed by skilled blade fitters to the exact size and finish required.

Once a packet of blades was assembled to its understrap segment, the shrouds were joined to reconnect the removed shroud segments to the remaining segments either side. Following intermediate non-destructive testing on the shroud welds, the tenons were mechanically peened so that they were firmly and permanently attached to the shroud.

"The shroud welds, which also have to be subjected to stress-relieving heat treatment, are more easily done using the TIG process, but we initially used the laser as we had the procedures in place to perform the repair," Van Rooyen continues.

Newby adds: "The tenon repair procedure involved very high levels of detail at every stage, ending up with ultrasonic

Above: A completed in-situ turbine blade understrap replacement after the rebuilt tenons have been peened.

Left: As welded turbine blade tenons.

and penetrant NDT testing on every part of the repair."

After a full field trial, the qualified tenon refurbishment process was applied to an *in-situ* understrap replacement on a 657 MW Majuba low pressure steam turbine in January 2020 at ESKOM-owned Rotek Engineering. Tenons on ten blades, five blades either side of the understrap, were removed. The two half shroud sections either side were cut after blade five, enabling them to be removed. The tenons were refurbished using laser metal deposition to near net shape before being hand-dressed. Following inspection and heat treatment, the understrap was replaced, followed by fitment, weld-joining and heat treatment of the removed shroud sections on either side. The repair was then completed by peening the tenons to firmly hold the turbine blades in place.

"We started the repair in December 2019, and we completed the work in January 2020. The actual implementation took place in a single month over the festive period. This is what we call an *in-situ* repair, and it costs a fraction of that associated with the replacement of a full row of 128 blades. Once optimised, this repair can be completed within a 15-day window, which will have a huge impact for power stations," says Van Rooyen.

"We also believe we can do this onsite with the rotor removed and mounted in the laydown space adjacent to the turbine floor, which will further simplify the logistics and reduce downtime at the power station," Newby concludes.

Rogue: ESAB's rule-defying MMA solution

ESAB South Africa has introduced its new compact and robust Rogue stick/lift-TIG welder into the South African market. ESAB's Jannie Bronkhorst takes us through the exciting new features of this very affordable premium MMA welding solution.

Underpinning the release of ESAB's Rogue welding machine, is overcoming entry-level mediocrity. "With an all-new industrial design, unconventional features and unprecedented performance, Rogue ushers in a rethink of everything a welder used to expect from an entry-level portable MMA machine," says ESAB South Africa's Jannie Bronkhorst.

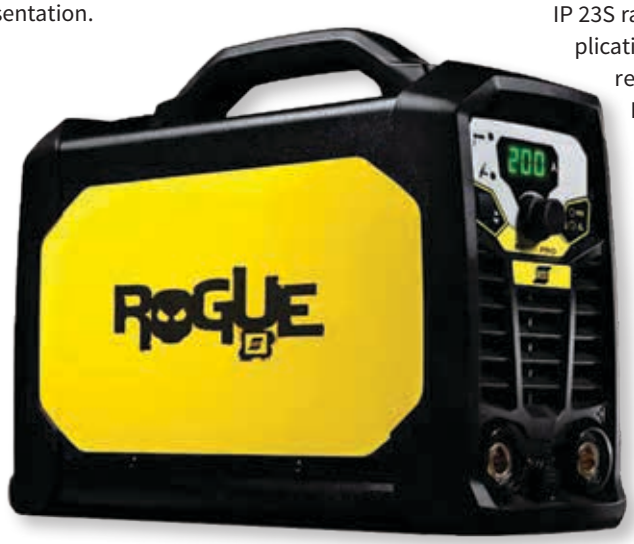
ESAB has embedded its next-level technology into this new machine to give welders precise, professional and consistent control for smooth, stable arc performance and low spatter levels in all weld positions using any type of MMA electrode up to 4.0 mm in diameter.

Adjustable hot start makes arc striking easier than ever, even with the most difficult electrodes, while adjustable arc force helps to increase penetration and prevent electrodes from sticking. Being digital the Microprocessor precisely controls all functions and provides best-in-class welding performance across the amperage range of the machine.

Scan this QR code to access an ESAB Rogue online video and presentation.

"Compared to other MMA welders, our Rogue units feature a higher open circuit voltage (OCV), which also promotes better arc starting. The Rogue ES 200i, for example, has an OCV of 78 V, which is significantly higher than most competitors. Never before has an entry-level welder included such high-performance features," suggests Bronkhorst.

The dc Lift-TIG function provides positive arc starts without the use of high frequency. All Rogue models deliver a stable TIG arc down to 10 A, giving welders the control they need to work on thin metal or delicate components.



ESAB's new compact and robust Rogue MMA/lift-TIG welder offers premium performance at entry level prices.

Power and strength

In terms of power, Rogue's output current stacks up against competing machines at twice its price. The Rogue PRO also includes Power Factor Control (PFC) technology, which is ideal for use in South Africa to allow for an efficient and steady welding arc regardless of power fluctuations. The machines can run on 115 V or 230 V (Rogue PRO) with flexible automatic input voltage compensation, which makes them ideal for use from mains and generator power. With a 25% duty cycle at 200 Amps, tested at 40 °C ambient temperatures, Rogue ES200i has the power to cope with most jobs on thicker materials.

"In terms of robustness and strength, no other machine at this price comes close to matching Rogue. Its robust and rigid housing is built to withstand impact after impact, in the workshop or on site. With an IP 23S rating for use in tough outdoor applications, Rogue is durable and weather resistant. It also comes with our ESAB global one-year warranty for unbeatable peace of mind. There is no longer any reason to tolerate cheaply constructed welders," Bronkhorst advises.

The Rogue is a robust and durable power source for the professional welder. The machine provides state of-the-art welding performance and reliability through use of the latest high performance power electronics and digital control; ensuring a precise consistent arc in all industries, including repair and maintenance; civil construction; agricultural equipment; and industrial and general fabrication.

With the largest ESAB ES200i PRO weighing only 8.2 kg, Rogue's compact and lightweight design makes it easy to lift and carry.

Portability

Weighing only 8.2 kg, Rogue's compact and lightweight design makes it easy to carry from job to job. It has a sturdy handle and a shoulder strap is included to make it comfortable to carry the machine around a worksite.

Stable arc performance and voltage compensation on the Rogue PRO mean long extension cables can be used, even in the most remote locations, without affecting weld quality. "Once again, in spite of its entry level price, ESAB's new Rogue MMA machine has all the features usually associated with a much more expensive portable compact," he adds.

A summary of the key features of the ESAB Rogue ES200i PRO include:

Superior arc characteristics: smooth, stable performance.

- Generator compliant: suitable for use with generators (recommended 7 kW).
- Easy to use: set the welding current and weld with excellent results.
- Practical design: makes the power source easy to carry which enables use at almost any work site.
- Robust design: IP23S-designed for fabrication shop or site application.
- PFC ensures a stable arc, resistant to power fluctuations even while working on long extension cables up to 100 m.
- An optional analogue remote control is available.

Testing in laboratories around the world has proved that ESAB's new Rogue MMA power source meets global performance and usability standards. "It has an easy-➤

Welding solutions from BMG Tools and Equipment

Andrew Johns, business unit manager for Tools and Equipment at BMG, talks about the division's extensive range of welding products and systems to enhance efficiencies and ensure safety for fabricators servicing all business sectors.

"BMG is committed to assisting industry **create a healthy, clean and safe environment for welding procedures through** the supply of the latest equipment and advanced technologies, supported by technical expertise," says Andrew Johns, business unit manager, Tools and Equipment division, BMG. "Our welding products and services are tailored to meet specific customer requirements and include carefully-selected fume extraction products, **designed to reduce risks associated with** welding and cutting fumes, grinding dust and oil mist. The company's portfolio of welding related products also comprises a wide range of inverter welders, accessories, electrodes, welding wire and personal protection equipment (PPE).

"To enhance our services to the metal manufacturing industry, we have extended our range to include Jasic welding equipment and tools. Jasic is a leading international developer, manufacturer and supplier of welding inverters and integrated welding solutions that represent value, reliability, durability and innovation," continues Johns.

The Jasic welding equipment range comprises welding inverters for manual metal arc (MMA), tungsten inert gas (TIG) and metal inert/active gas (MIG/MAG) welding. These include MMA welders from 140 to 630 A; dc TIG inverters of 180 A to 400 A, including pulse units with water cooling; ac/dc TIG units from 200 to 500 A water cooled pulse units; MIG/MAG inverters 160 A to 500 A dual pulse water cooled units.

Jasic plasma cutters – from 45-160 A hand-held units all the way through to units with complete CNC capabilities – are also available.

BMG specialists work closely with every customer to ensure selection of the correct equipment and the appropriate and safe use of each system. Factors for careful consideration include choosing the correct welding process and equipment based on the materials to be welded and the material thickness. The most commonly welded materials are aluminium, mild steel, stainless steel and other alloys.

BMG's range of Jasic welding equipment includes inverter-based welding equipment for manual metal arc (MMA), tungsten inert gas (TIG) and metal inert/active gas (MIG/MAG) welding.

BMG specialists also encourage businesses to be mindful of the hazards of welding fumes and how important it is to protect workers' health through the extraction and control of welding fumes. Toxic welding fumes can contain a mixture of manganese, chromium VI, carbon dioxide, nitrous oxide and ozone, which can cause serious short and long-term health problems. For this reason, it is critical that PPE and workplace safety equipment is suitable for every welding and cutting application.

All Jasic products are subjected to rigorous testing, including vibration and drop, waterproof, safety, comprehensive parameter and EMC tests, as well as harmonic wave and flicker testing.

"BMG supports all its Jasic welding products with a comprehensive 3-year warranty. These products are suitable for safe and dependable use in many industries, including mining and quarrying, rail, aviation and shipping, power generation, chemicals and petrochemicals, agriculture, construction and general engineering.

"Our products and services are tailored to meet specific customer requirements and encompass dependable welding and cutting processes, welding fume extraction and filtration systems, as well PPE, safety equipment and general accessories," Johns concludes.

www.bmgworld.net

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to-use interface with a large, precise digital display that can be easily read from up to 25 m away. "The optional remote control on the Rogue PRO allows the welder to adjust current settings without needing to go back to the machine and, no matter where it is welding or what is being welded, Rogue simply welds well," Bronkhorst assures.

Service and support

"Rogue, like every ESAB machine, is backed by our commitment to superior customer service and support. Our skilled customer service department is prepared to answer any questions, address problems and help with maintenance and upgrading of machines," Bronkhorst assures, adding that the machine is backed by ESAB's 1-year warranty.

"Unlike other machines in this class, Rogue comes with a range of premium accessories, giving welders everything they need to start welding right out of the box," he concludes.

Clean air welding technologies from KEMPER

Harmful ultra-fine particulate matter generated during welding operations is a major health risk to welders. Extraction and filtration systems such as those available from KEMPER can provide effective protection from this hazard.

Modern innovations in welding technology are said to lower health risks by reducing levels of welding fume, but this can be misleading. At the nano level, impenetrable to the human eye, the concentration of particulate matter associated with some modern processes has actually increased, adding risk to employees in the metal processing industries.

Studies show that most welding fume particles are smaller than 0.1 µm. Nearly all of these are respirable and can penetrate deep into the alveolar region of the lungs (alveoli) during inhalation.

Welders exposed to welding fumes on an ongoing basis run a significant risk of health-related problems. Common symptoms include fatigue; breathing difficulties; bronchial diseases; manganese, lead or cadmium oxides poisoning; metalworkers' fever from welding galvanised materials; and even damage to the central nervous system.

The harmful particulate matter generated when welding nickel, chromium or cadmium compounds can even be carcinogenic and significant health risks are associated with filler materials, with 95% of harmful substances in fumes originating from consumable metal, while only 5.0% come from the parent plate.

Extraction systems such as the KEMPER VacuFil 125 or 500 can also be integrated into welding torches.

Safety measures to protect against fumes

When selecting an adequate extraction and filtration system, of crucial importance is a risk assessment, which helps to identify the risks involved in the specific working conditions. At the heart of the assessment lies the question of what materials and welding procedures are being used. The most widely used gas-shielded welding procedures (MIG and MAG), as well as manual metal arc welding (MMAW) with coated electrodes, are associated with the highest risk potential, while the most hazardous particulates in fume are generated in welding processes involving chrome- and nickel-containing steels.

Technical ventilation measures must be used for processes in the medium hazard class, starting from TIG welding of toxic and irritant materials such as manganese or copper oxides. Although using a different filler material can help to mitigate risks, welders and other workers are advised always to use extraction and filtration systems to eliminate harmful particulate matter from the ambient air, especially since parent materials, consumables being used and welding procedures change from job to job.

Direct extraction of welding fumes

The most important principle for successfully implementing clean air technologies is to contain welding fumes directly at the point of origin. To achieve this in practice, KEMPER's low vacuum source extraction systems such as SmartFil, MaxiFil or MaxiFil Clean are frequently used. These extraction systems enable the capture of harmful substances using extraction hoods and flexible extraction arms at distances of 30 cm from the point of origin.

Extraction hoods from KEMPER are designed with integrated lighting and a flange-shaped cover customised to the welding seam.

Extraction arms connected via the extraction and filtration system or a pipe system on a centralised ventilation system are self-supporting devices. Extraction hoods from KEMPER are designed so they remove the harmful particles present in the air. This is made possible by a flange-shaped cover customised to the welding seam, which ensures a particulate reduction efficiency of 40% better than oval extraction hoods. Integrated lighting also improves workpiece visibility, which allows welders to adjust the hood more effectively.

Extraction systems can also be integrated into welding torches. These include the KEMPER VacuFil 125 or 500. Also available are the MiniFil systems that use funnel- or slit-shaped high-vacuum source extraction systems that are held in place by magnets, which offer an alternative to low vacuum source extraction systems.

When automated welding is used, extraction hoods with lateral plates for protection against crossflows are additional safety devices of choice, their size being customised to suit the operating area of the welding robot or automated system.

Source extraction systems typically reach their limits when welding large workpieces at multiple sites or due to a lack of extraction efficiency. The alternative to ensure industrial safety is to adopt a room ventilation system as an addition to source extraction systems. Room systems help to

protect non-welders in the production facility from exposure to harmful substances, while further improving the quality of the air in the working space.

With the launch of CleanAirTower, KEMPER is making this new layer of ventilation and protection readily available to those in need of mixed-mode fume-extraction. CleanAirTower is a stand-alone solution that can be installed anywhere in the working area, without the need to connect to an existing piping system. It is easy to position and extracts fumes from 360o around the area enclosed by an approximate 10 m radius. Welders directly exposed to welding fumes should still use personal protective equipment or welding helmets with auto-darkening filters and built-in ventilation units, which are also available.

Filtration and the disposal of pollutants

For effective industrial safety, filtration quality should be considered in addition to a high extraction coverage. This affects the dust reduction efficiency, which determines if the air supplied from the filtration system can be recirculated into the working area.

Welders need only use W3 filters, which offer the highest efficiency, when welding chrome-nickel steel. These provide a particulate reduction efficiency greater than 99%. Such filters have already been integrated into KEMPER's entry-level fume extraction units. An important component of occupational safety for fabricators is the disposal of pollutants. During the replacement of dust containers in conventional systems, the separated and unfiltered particles can easily be re-released into the air.

KEMPER now offers a solution with a dust discharge system based on cartridges that ensures contamination-free dust disposal for surface-filter applications. The company has also developed a solution for devices with disposable filters that ensures the filters can be removed and replaced without contamination.

In order to monitor the effectiveness of occupational safety measures, highly sensitive sensor devices are able to measure particles being produced, down to the fine dust range. AirWatch, for example, is capable of detecting ultra-fine particles below 0.3 µm. Such systems are also capable of automatically controlling extraction systems and room ventilation systems. On the basis of stored limit values, these air monitoring systems are also able to automatically start up extraction systems when necessary.

KEMPER's AirWatch particle monitors are capable of detecting ultra-fine particles of below 0.3 µm.

Industrial safety is not only a question of cost. Fabrication facilities need to understand the benefits of using air quality control measures. Effective protection against inhaling hazardous particles minimises the impact on human health, which in turn reduces work interruptions and health-related absences.

Better air quality also results in improved job satisfaction among employees, high work quality and increases in productivity.

The holistic approach to NDT

With its local presence in South Africa, Dekra RSA, the global mother company, Dekra International is one of the world's leading industrial inspection and non-destructive testing (NDT) specialists. South African operations director, Johan Gerber, presents the company's credentials.

Dekra, one of the world's leading experts in industrial inspection and non-destructive testing (NDT), is backed by 95 years in the industry, delivering on its vision of being 'the global partner for a safe world'. With a presence in more than 50 countries and on five continents, Dekra is committed to ensuring long-term safety, health, quality and environmental protection globally, across a broad spectrum of sectors and industries.

In this highly competitive field, the company has an established reputation as a leader in inspection services, NDT, material testing, laboratory services, advanced NDT, asset integrity services and industry training.

"Industry's expectations of NDT and inspection are the highest they have ever been in terms of the accuracy, reliability and quality of inspections. This is because big industry, such as mining, power generation and petrochemical, has realised that there is a wealth of strategic information available from high-quality NDT and inspection services – of the type and standard Dekra Industrial produces," says Johan Gerber.

On the training side, Gerber believes that Dekra Industrial's training arm – the Dekra Institute of Learning – is well-positioned to offer HSE training through its various online courses, and that the Mozambique LNG and other pan-regional projects will boost this demand.

"Dekra Industrial was previously Raysonics, an industry stalwart with a long-standing track record in NDT, established 36 years ago in 1984. In 2013, Dekra Global acquired Raysonics, officially changing the name to Dekra Industrial RSA in 2014," explains Gerber, one of the original founders of Raysonics.

Dekra RSA is comprised of Dekra Industrial and the Dekra Institute of Learning, a separate division within Dekra Industrial. "Our corporate tagline is 'On the safe side' and, as a service-orientated company covering all things safety, we practise this in everything we do. As such, we deliver NDT, Advanced NDT and inspection services to various industries, including power generation, nuclear, oil and gas, construction, petrochemical, manufacturing, fabrication, pulp and paper, rail, mining, the steel industry and foundries," Gerber advises.

"In addition, through our Institute of Learning, we deliver HSE-based online and classroom-based learning across the industrial and private sector, as well as to some public sector entities."

Dekra Industrial is the operations side of the company, ensuring that deployment of NDT and inspection equipment and resources is optimised – locally, nationally, and globally – and always with safety and customer service top-of-mind. "Regardless of where we need to deploy resources, we make sure we have the best solution for our clients," Gerber explains.

C-Scan Corrosion Mapping Inspection using phased-array UT technology can help increase productivity.

"Demand for our services is steady, but also tends to be industry-dependent," he says, commenting that out of approximately 300 companies in South Africa offering NDT services, only a handful of these are active in the advanced NDT sector, including Dekra Industrial.

While Dekra Industrial's goal is to move from being a service provider, to a holistic testing and solutions provider, Gerber is confident that, "apart from our 95 years within the industry, there are also number of differentiators which set us apart.

"For example, we are in the really fortunate position to be able to call on our parent company's international pool of expertise, research and development (R&D) and resources for support. This strategic advantage is complemented by our extensive experience in pan- and sub-Saharan Africa, having successfully completed projects in Tanzania, Namibia, Mozambique, Botswana, DRC, Ghana and St Helena Island.

"In addition, we have recently registered a legal entity in Northern Mozambique – Dekra Industrial Inspection LDA – offering NDT services to the LNG sector and currently associated construction projects. The company is also registered on local tender portals as an approved supplier on the various local gas projects: Achilles and the SAIPEM CCS JV, for work on Area 1 and ExxonMobil, Area 4," Gerber points out.

"We also have a paperless environment and an electronic reporting system; and a live, interactive, totally electronic, cloud-based NDT quality management system (QMS), which expedites our strategic and accurate report generation. These capabilities are market differentiators, which are all of significant benefit to our clients," he adds.

To further enhance client service, he notes that in the pipeline, and due for roll-out, is a cloud-based, Dekra NDT reporting tool for customers.

The other arm of Dekra Industrial RSA

is the Dekra Institute of Learning, offering mainly HSE-related training across multiple industries; as well as being open to the general public and corporates. The Institute is the best choice in online and HSE classroom-based training and HSE consulting locally, and within pan-Africa.

Christopher Mörsner, Head of Training at Dekra Institute of Learning, explains what sets the institution ahead of the competition: "When a Skills Development Provider (SDP) offers training, or wishes to provide training in short skills or occupational health and safety, NQF level 1 to 5, occupational and/or part-qualifications, they must be accredited with both the Sector Education Training Authority (SETA) or QCTO (Quality Council for Trades and Occupations); and they must comply with the minimum criteria for accreditation.

Mörsner points out that the Dekra Institute of Learning is QCTO-approved and is also in the process of re-registering with the Health and Welfare SETA (HWSETA) to provide Level 02 and Level 03 full national qualifications – and that this is a major market differentiator.

He adds: "The Dekra Institute of Learning is also registered as a corporate member of the South African Institute of Occupational Safety and Health (SAIOSH), which is recognised as one of the professional registration bodies for occupational health and safety practitioners in South Africa. While most of the training courses we offer are online – with demand having grown during the national lockdown – classroom-based and distance learning is also available.

"The Dekra Institute of Learning ensures that – while staying within the requirements of legislation and the OSH Act – we recognise that not 'one-size-fits-all'. We therefore develop training that is suitable for all levels, including for those who prefer face-to-face learning or do not have access to the Internet. Recently, we have also been investigating the viability of live streaming/digital learning," he explains.

"While our main focus is training in HSE, we are also looking at offering different options in ISO training, including ISO 9001 – Quality, ISO 14001 – Environmental Management, and the latest Safety standard, ISO 45001. CPD-accredited courses are also available," he elaborates.

"Dekra Industrial and the Dekra Institute of Learning will, we believe, stand the test of time, and continue to evolve in line with industry's demands and challenges – while retaining a poll position in NDT and inspection services locally and pan-Africa: ensuring that industry remains 'on the safe side'," Gerber concludes.

Electro-magnetic acoustic transducer (EMAT) technology is used to quickly and very accurately measure the thickness of boiler tubes.

www.dekrarsa.com

Dekra Industrial attains Level 3 B-BBEE

Following an 18 month transformation process, Dekra Industrial in South Africa has recently attained a Level 3 B-BBEE accreditation, with 51% black woman ownership. The agreement with the new majority share option holder, established B-BBEE ownership consultancy Transformation Shared Services (TSS), became effective from February 2021.

"We regard our B-BBEE level upgrade as an extremely important and very positive change, in that it represents an authentic collaboration with a well-respected, value-adding B-BBEE partner, with whom we share many synergies. Furthermore, in moving up to Level 3 B-BBEE accreditation, a vital gateway is now open to many new tenders and projects – particularly given our new black woman ownership status," says Johan Gerber, managing director at Dekra Industrial RSA.

"In addition, this collaboration will support us in the empowerment and transformation of many areas of the business," Gerber adds.

Director of TSS and new majority share option holder, incoming non-executive director of Dekra Industrial RSA, Ashmini Singh agrees: "Our respective ethos and approach is convergent in so many ways: always seeking to add value, in terms of skills and people empowerment, client service and enterprise development. We are therefore confident that we can continue to grow trust both internally and externally, as a dynamic and mutually beneficial partnership," Singh enthuses.

Speaking to the empowerment aspect of the collaboration, Gerber advises: "In effecting this transformation process, among other things, we have ramped up our company-wide skills and enterprise development initiatives; and we are excited about the prospect of making a difference for previously disadvantaged South Africans.

"On our Koeberg project, for example, many of the general workers or brush hands – all of whom are sourced from local communities – did not have experience working in the non-destructive testing (NDT) or nuclear sector. We undertook a comprehensive mentoring and training process, which facilitated skills empowerment and development of these candidates. As a result, six additional unemployed young people were trained in NDT at Koeberg and an additional two at Dekra Industrial in Middelburg."

In addition to giving the value of her substantial legal experience, Singh and her team at TSS will be networking and opening up opportunities for Dekra Industrial via their client portfolio, many of which could potentially benefit from Dekra Industrial's NDT and inspection services; and could also utilise the safety, welding and other training offered by the Dekra Institute of Learning (IOL).

"Dekra Industrial is proud to be driving change in South Africa, and we look forward to a long and prosperous partnership with TSS. Our revised B-BBEE status – supported by the strong value-adding partnership with TSS – is an important step in proving our commitment to doing business the right way in South Africa," Gerber concludes.

Signing the Level 3 B-BBEE agreement for Dekra Industrial RSA are, from left: Johan Gerber, Ashmini Singh, and Gavin Wright.

Fronius Agency in SA targets Africa-wide penetration

African Fusion **talks to Robert Drumm, Fronius export sales manager for sub-Saharan Africa, about the new Fronius Agency in Midrand, South Africa, set up as an entry point for expansion across Africa, and the new financial and access models being considered to ease market penetration for the premium brand.**

According to Robert Drumm, the Fronius Agency in Midrand represents a new business approach for the company. "Agencies are different from subsidiaries, in that their core purpose is to support our local representatives and to seek growth opportunities. We now operate Fronius subsidiaries in 28 countries worldwide, but the Agencies are still new and constantly evolving concepts. So far, South Africa is one of only three countries in the world to have a Fronius agency, the others being Vietnam and Argentina," Drumm begins.

The starting point of the initiative is to be able to offer better support for Fronius distributors and representatives in South Africa: Bolt and Engineering (BED) and Port Elizabeth-based Pro-Arc Engineering, which was appointed at the end of 2019 as a conduit into the automotive sector.

"Fronius machines have a long history in Europe, USA and China, which is now our 2nd biggest market for robotics and automated welding. Our systems are designed to be able to hook up with robots from any OEM and, over the years, we have had longstanding relationships with MOTOMAN/Yaskawa and ABB, both here in South Africa and across the world," he tells *African Fusion*, adding that TPSi systems are now being installed in Yaskawa and ABB demonstration rooms in South Africa.

Highlighting the core purpose of Fronius agencies, he says that the idea is to make skilled Fronius employees available to support local markets. "We believe a direct presence in the local market will tighten and strengthen our relationships with our Fronius distributor network. It also gives us onsite access, which helps us to get a better understanding of situational needs and difficulties so that we can recommend or develop appropriate and cost effective solutions," Drumm suggests.

In addition, he sees the Fronius Midrand Agency as the entry point into sub-Saharan Africa. "We have already identified partner network opportunities in Nigeria, Kenya and Zimbabwe. Nigeria is particularly exciting. We are establishing a much better distribution network there and, through Jevant Spencer, a 10-bay welder training school has been set up with Fronius equipment," he tells *African Fusion*.

The new Fronius Agency in Midrand, South Africa has been set up as an entry point for expansion across Africa.

Fronius' South African Agency is housed in a two storey building in Midrand. "We currently have three permanent employees, two for Perfect Welding and one for Solar Energy. We have set up a demonstration centre, with a robotic welding cell and a turn table, along with several welding booths for multi-process manual welding.

"We have access to the full spectrum of Fronius of products, starting with small portable systems for MMAW and GTAW, and going all the way to the big automated systems used by the automotive and heavy fabrication sectors," says Drumm, adding that this centre is available to local distributors for customer demonstrations and for training of their representatives and end users. "Our local representatives can use this demonstration facility as an extended arm in terms of practical training and manpower," he says.

On the upper floor of the Agency, as well as the offices, there is a seminar/training room that can accommodate up to 20 people attending presentations or theoretical training. "We can cover all aspects of Fronius welding equipment, including the underpinning welding theory and the practical welding implications. We are also able set up training and demonstrations to represent clients' on-site needs to prove the equipment capability on their workpieces," Drumm assures.

"Our first course has now taken place with employees from different BED branches. The course involved our new TPSi welding platform, which embraces many different welding processes, most notably, GMAW, MCAW and FCAW, but the platform also accommodates MMAW and GTAW, as

well as many process variants," he says.

Originally built around Fronius' TPS synergic pulse GMAW welding system, Drumm notes that the new Fronius TPSi has gone well beyond the idea of synergic pulsed-MIG/MAG welding.

"Our TPSi solution is a software-driven modular welding platform that enables one power source to be used to access a multitude of welding processes and variants. Depending on customer demands and changing requirements, we can upload different parameters and processes to achieve an arc perfectly suited to the application," he says.

The TPSi platform is designed as a set of interconnecting modules that can accommodate a whole range of processes from a single power module with a software-upgradeable TPSi controller. As well as accommodating the various different welding processes and hundreds of synergic lines for different wire, base material and shielding gas combinations, the TPSi's output current and voltage waveforms and other parameters can be precisely defined to suit different circumstance.

Drumm cites Pulse Multi Control (PMC) as an example: "Within the pulsed wire processes we have added PMC, which offers additional arc stabilisation features. Here, a penetration stabiliser or an arc length stabiliser are available to make it easier for a manual welder to achieve the desired result.

"The penetration stabiliser adds an additional wire control parameter so that penetration does not vary if the distance between the welding torch and the component changes. The arc becomes significantly more stable and the penetration is much more constant.

"The Arc length stabiliser, on the other hand, uses the welding voltage to maintain a short and well directed arc length, guaranteeing accurate transfer that is not susceptible to interference. In addition, low-spatter control (LSC) is used, which relies on the power source's rapid response rate to minimise the current and duration of short circuits, quickly restoring arc length while minimising spatter.

"Our signature CMT (cold metal transfer) process is also now available as an add-on module on the TPSi platform, as is our whole range of waveform and arc control innovations," Drumm informs *African Fusion*.

Another technology being featured at Fronius' South African Agency is the new WeldCube Industry 4.0 solution being introduced to simplify and modernise the documentation, traceability, part identification and collection of welding data. "WeldCube is a Fronius-developed software solution for the management, communication and visualisation of welding data," explains Drumm. All TPSi solutions, and most of our other digitally controlled machines, can be connected to an ethernet network. Pre-set parameters as well live welding data can be uploaded to WeldCube for processing and further analysis," he says.

Above: Within the pulsed wire processes, Fronius has added PMC (pulse multi control), which offers a penetration stabiliser or an arc length stabiliser to make it easier for a manual welder to achieve the desired result.

Right: WeldConnect combined with WeldCube enables actual weld data to be captured, analysed and documented, even when welding manually.

"With WeldCube, welding co-ordinators and engineers can visualise ongoing welding operations from multiple welders and welding machines. They can identify defects and welding problems in real time, enabling much faster response times.

"WeldCube supports quality assurance (QA) and traceability initiatives: validating via real data that a welding procedure has been completed according to specifications. It can also be used for accurate costing, because welder time, wire and energy consumption data can be stored and made available for every weld performed by every welding machine being used," notes Drumm.

Business models for Africa

The other key role of Fronius Agencies is to develop alterative business models better suited to the African market. "Selling a premium Fronius machine into economies with low incomes is always going to be difficult, so we are looking at rental, licencing and microfinancing possibilities to make the introduction of our world-class welding offering possible.

"We know we cannot sell into Africa in the conventional 'Western' way, but we are sure that the potential is big, which makes investing for the longer term worth our while. Oil and gas, mining, energy, agriculture and infrastructure opportunities are all opening up and we see a huge market for quality welding equipment in these fields.

"High-end equipment is designed to help welders succeed, while older low cost technologies make it harder and slower, even for welders with good skills. We hope to offer people all over Africa the opportunity to produce quality products using equipment designed to best suit the needs on the ground.

"We are setting up Solutions Hubs across sub-Saharan Africa to make Fronius equipment easier to access, while at the same time setting up accessible financing options to make the products affordable in the short term and cost-effective as a long-term investment.

"Africa is a very important market for us and we are determined to find ways of adapting our marketing and sales strategies to best suit the continent, by building a robust sales distribution network with easy access to Fronius welding technology and to financial models that will make our solutions easy to adopt," Drumm concludes.

The Kemppi Master 315 for premium class MMA welding

Kemppi has announced the launch of the Kemppi Master 315, a new state-of-the-art welding machine for manual metal arc welding (MMAW).

Kemppi's state-of-the-art welding machine for MMA welding, the Master 315, includes several new features that make it exceptional compared to most MMA welding equipment. Digital and programmable, the machine promotes modern usability and personalisation, with key benefits coming from excellent welding performance and flexibility.

The Master 315 is a stylish and practical machine for workshop or on-site use, capable of absorbing the knocks and impacts of everyday welding. Lightweight and compact, this machine is constructed from tough injection-moulded plastic with impact bridge protection structures.

The Master 315 features wireless remote control. Via the HR45 Bluetooth hand remote unit welders can control welding power and select memory channels from a distance of up to 100 m. This eliminates the need for remote cable repairs and improves worksite safety.

Weld Assist for productive welding

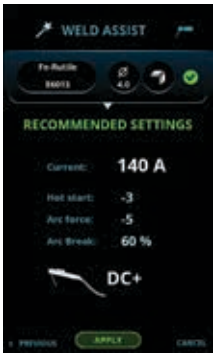
Kemppi's Master 315 comes ready-equipped with a full-colour 7-inch TFT display, where a company logo or favourite image can be uploaded to personalise the screen saver. The easy-to-use buttons and multi-function controls make it easy to find the optimal welding parameters for every job. Welders can either manually select the settings from the panel or allow Weld Assist to select them automatically.

Weld Assist for MMAW is a wizard-like function for setting the optimal parameters for each welding task. Using simple on-screen steps, welders can select electrode type, electrode size and joint configuration, enabling Weld Assist to select and set the best available parameters. This guides welders towards accurate, productive welding – and Weld Assist can also be used to create preliminary welding procedure specification (pWPS) documents.

Pulsed MMA for welding quality and productivity

Kemppi's Master 315 also features the pulsed MMA welding process, which brings various benefits for the welder: lower heat input; better control over the welding arc; improved welding speed; cleaner welds and reduced heat deformation. This premium class MMA welding feature is also characterised by reliable ignition, arc stability, and suitability for all electrodes, including cellulosic ones.

Memory channels make it easy to set up the machine for customary welding jobs. The MTP35X control panel offers 99 memory channels per process to save the best parameters or WPS values. Stored WPSs can also be copied, deleted or updated, as needed.



Above: Kemppi has announced the launch of a new state-of-the-art Master 315 digital MMA welding machine that offers features usually only associated with premium pulsed GTAW or GMAW welding equipment. Right: Weld Assist for MMAW is a wizard-like function for setting the optimal parameters using simple on-screen steps.

TIG welding with Flexlite TX torches

Kemppi's new Mater 315 can also easily manage basic dc TIG welding tasks, simply by plugging in a Flexlite TX torch and a shielding gas. Suitable welding parameters can then be selected and the welding arc is ready for ignition following a gentle touch on the workpiece.

Flexlite TX series TIG torches are for professional quality welding. Model 223GVD134 includes a gas valve for adjusting the shielding gas flow and a high-strength and flexible moulded silicone handle that minimises wrist loading, reducing welder fatigue and improving comfort.

Fume extraction welding gun enhances welder safety

Kemppi's Flexlite GF MIG welding torches with built-in fume extraction offer improved levels of welding safety. "We want to do our utmost to design products that improve work performance and provide the welders with the best protection for their occupational health and safety," says Florian Hegemann of Kemppi.

Kemppi Flexlite GF and GC MIG welding guns are designed with welder fatigue and ergonomics in mind. The Flexlite GF MIG welding torch offers excellent balance to reduce wrist loading, while the Flexlite GC's are equipped with a flexible coaxial cable enabling these torches to be accessorised with a detachable pistol grip handle, which further improves welding ergonomics. Another GC accessory is a rotatable neck to give easier access to challenging workpieces.

Also in the Flexlite GF MIG welding torch product family is the Flexlite GF fume-extraction, which guarantees efficient fume extraction by collecting welding fumes as soon as they are generated and before they reach the welder's breathing zone. As the welding fumes are collected directly from the gun nozzle, this torch provides the entire workshop team with a safer environment.

All Kemppi fume extraction guns and their extraction efficiencies have been measured in accordance with the new standard ISO 21904-3, to which Kemppi was among the first to be certified.

As the welding fumes are collected directly from the gun nozzle, the Kemppi Flexlite GF fume-extraction torch provides the entire workshop team with a safer environment.

Wear liner plate: a green alternative

As a market leader in wear solutions for the mining and related industries, R-C700 long-life liner plate from Rio-Carb offers the benefit of significantly reduced greenhouse (GHG) emissions for its customers. Rio-Carb design engineer, Roshalan Govender, explains.

According to design engineer Roshalan Govender, Rio-Carb R-C700 long-life liner plate, which features a chromium carbide (CrC) overlay, will typically outlast quenched and tempered liner products by a factor of eight. "Therefore the carbon footprint of this 'green steel' is seven times smaller per installation, translating into a massive reduction in environmental impact and greenhouse gas (GHG) emissions," he argues. "An indirect benefit as a result of its immediate and obvious carbon reduction is that transportation of all implied products is reduced by the same factor, thus saving significantly on indirect emissions," he adds.

Roshalan Govender.

Jabulile Mlambo.

Reducing GHG to combat climate change is an important goal of the 2015 Paris Agreement, whereby 190 countries have committed to carbon neutrality by 2050. A major focus in this drive is the steel industry, which is among the top three producers of carbon dioxide, a major contributor to global warming.

The World Steel Association (WSA) reports that every ton of steel produced in 2019 emitted approximately three tonnes of carbon dioxide on average, equivalent to about 8% of global CO_2 emissions. In addition, the WSA highlights that recycling steel plates produces three times the mass in GHG, or three tonnes for every kilogram of steel that is melted. Thus on a chute with 1 000 tonnes of R-C700 liners, the total lifespan saving in terms of GHG is an astonishing 21 tonnes.

It is for this reason that Rio-Carb has aligned itself with the ISO 14001 environmental management system to benchmark its manufacturing processes. The aim is to manufacture R-C700 long-life wear liners that conform to the highest possible quality standards, from the stainless steel studs to the Rapid Removal system, tight cutting tolerances and ease of movement, coupled with plasma-etched part numbers for easy identification and replacement.

"An important criterion for ISO 14001 is resource conservation. Our long-life wear solutions play a critical role in boosting materials-handling efficiency and cost-effectiveness," comments Rio-Carb marketing and branding director, Jabulile Mlambo.

In particular, the CrC liner-plate OEM will be looking to implement ISO 14062 with a focus on concepts and current practices relating to the integration of environmental aspects into product design and development. "Such standards offer an environmentally positive option to the mining, steel and cement industries, all of which are under severe pressure from both shareholders and the government to drastically reduce their carbon footprint," explains Mlambo.

Modular chutes and bins, assembled and lined with Rio-Carb's R-C700 wear panels, will typically outlast quenched and tempered lined products by a factor of eight.

Rio-Carb has therefore launched a campaign to make its customers and the broader industry aware of the negative impact of GHG and how this risk can best be mitigated. All R-C700 wear plates produced by Rio-Carb will carry a green four-sided logo highlighting the principles of reduce, reuse and recycling.

This will also assist in positioning Rio-Carb as a total solutions provider, with CrC providing the lowest total cost of ownership for complete wear solutions in the mining industry. "We believe this is the most cost-effective material to combat severe wear. It does present a challenge in terms of those customers who are set in their ways, but this presents a big opportunity to change the mindset of customers and to show them the myriad advantages of using CrC, which makes a significant contribution to carbon reduction in line with our environmental obligations," concludes Mlambo.

www.riocarb.com

Afrox invests in a new speciality gases plant

Afrox has recently completed a new made-to-order speciality gases plant in response to rising market demand for complex gas mixtures.

The complex gases produced at Afrox's new gravimetric filling plant will be main source of all made-to-order gas mixtures, supplying customers throughout South Africa and its neighbouring countries.

Designed for improved accuracy and efficiency, the new automated facility in Germiston allows for up to 16 fixed line input components, which can be increased by introducing premixed components on separate filling rigs for oxidant and flammable/toxic mixtures. The filling and component selection procedures are pre-programmed and digitally controlled in a process that also operates actuated control valves integrated into a scale.

The modern, mechanised facility allows for the blending of high accuracy multiple part gas mixtures, with a blending tolerance of 2% to 5% and an analytical uncertainty of 0.5% to 2%, depending on the concentrations of components required and the varying levels of certification needed.

Tony Flude, project manager at Afrox, says the need for an improved, automated facility arose as customer needs evolved and the demand for complex gas mixtures increased, which had previously been processed at Afrox's Special Gases manual gravimetric filling plant. The original plant's ability to produce complex mixtures within acceptable lead times and within acceptable tolerances had become a challenge and some gas mixtures had to be imported to meet customer requirements. Safety was also a consideration and the total separation of oxidant and flammable mixtures is an additional benefit of the new facility.

"The new facility is capable of producing many of the multipart mixtures that were previously imported," says Flude, explaining that local complex gas production not only improves lead times but is also safer, because of the risks involved in importing hazardous and volatile gases.

"The semi-automated fill valves reduce material wastage, while a booster pump that increases the pressure of low pressure gases significantly reduces filling time," continues Flude.

He adds that Afrox's staff have been trained to operate the new equipment, and the specialist skills from the original plant have been transferred to the new facility.

Planning the design of the automated plant began two years ago. As a member of the global Linde group, Afrox was able to draw on the technical expertise gained from other members within the global gases group. Following in-depth investigation, it was identified that technology used at the new Special Gases gravimetric filling plant commissioned in Australia most closely matched Afrox's requirements, and was adapted to suit Afrox's requirements and meet local conditions.

"After thorough analysis, our engineering team concluded that Afrox could design and construct a filling plant utilising a process description based on the facility at BOC Australia. While our process was 100% locally designed, being part of the Linde Group gave us access to the latest technology and international experience," says Flude.

He comments that the brownfields project was logistically challenging as the new facility had to be built without affecting the operation of the existing plant, and stringent safety measures were vital owing to the proximity of toxic and flammable gases.

The nationwide COVID-19 lockdown further complicated the project, halting the installation of new equipment for several months. Despite these delays and challenges, Flude says the new plant is now fully operational, with only a few minor works to complete.

Afrox's database of speciality gas mixtures contains over 4 000 individual product recipes, ensuring an end product that is fit for purpose. Customised blends are available to meet individual needs, with each mixture unique to application and industry requirements. Multipart gas blends range from simple two-component mixtures to more than twenty components, with concentrations ranging from parts per million to percent levels.

Afrox's experienced technical team formulates the mixtures, and is supported by the latest thermodynamic software to ensure safety, accuracy and stability. The new speciality gases facility will be certified to ISO 17034, ISO 17025 and ISO 9001 standards, which will enable Afrox to blend and analyse Certified Reference Standards, Primary Gravimetric Standards, Calibration Standards, and standard gas mixtures.

Afrox's extensive range of special gases is widely used in the automotive and petrochemicals industry, and plays an important role in mining and metallurgy. Afrox also has longstanding partnerships within the healthcare and pharmaceutical industries supplying precise, bespoke gas mixtures. The company is at the forefront of environmental management, providing products, services and expertise to help customers tackle environmental challenges.

Afrox's new gravimetric filling plant will be main source of made-to-order gas mixtures.

www.afrox.co.za

Welding proximity sensors from OMRON

RS Components has added the OMRON E2EW series welding proximity sensors to its portfolio. Featuring improved sensing technology and robust construction, the E2EW series can significantly reduce downtime and improve productivity in automotive welding applications by reducing the risk of sudden stoppages as a result of material misidentification or sensor failure.

A key feature of the E2EW series is its ability to identify iron and aluminium accurately at the same distance. This is particularly useful in modern automotive applications, where the trend towards lighter vehicles for improved fuel consumption and the increase in demand for electric vehicles is prompting a change in component material specifications from heavier iron to lighter aluminium. As a result, production lines are increasingly using a mix of the two.

Previous full metal proximity sensors have struggled to differentiate efficiently between these metals because the sensing distance for aluminium is shorter than that for iron. This makes the design, start-up, and maintenance of production lines complicated and can lead to production errors and inefficiencies.

These problems are greatly reduced with the E2EW series, which offers sensing distances that are approximately twice as long as previous models for iron and approximately six times as long as previous models for aluminium. This enables the E2EW sensors to use the same distance for detecting both metals, making machine setup and changeover much simpler and quicker, as well as reducing false detection rates – even for unsteady sensing objects. As a result, there are far fewer unexpected stoppages, improving productivity.

Omron E2EW sensors can now be used to detect both aluminium and steel from the same distance.

A full metal body equips the E2EW series for use in the harshest environments. In addition, the sensors feature technologies to prevent coating abrasion: achieving spatter resistance for up to 60 times longer than previous models.

The OMRON E2EW series is also equipped with I/O Link, which means it can be connected into wider production line networks. ***www.rsonline.africa***

New Vantage diesel welder/generator with field-proven ruggedness.

Lincoln Electric has introduced its latest addition to the Vantage line of diesel engine driven welder/generators with the new Vantage 441X. Built to deliver power, dependability and flexibility operators can count on, the Vantage 441X welder/generator is loaded with features to help keep jobsites welding at peak performance.

Equipped with a 41 hp, turbocharged Perkins® diesel engine, the Vantage 441X welder/generator provides true IEC rated 400-amp, 100% duty cycle dc welding output. Engineered for enhanced power and performance, this fuel-efficient, Tier 4 Final engine packs all the necessary power for running heavier electrodes and carbon arc gouging rods with excellent cold weather and high-altitude performance.

Built to withstand demanding environments, the rugged design of the Vantage 441X provides field-proven dependability with features such as encapsulated GFCIs, stainless steel panelling, strain-relief wiring, and potted PC boards.

For welding performance, the Vantage 441X delivers superior SMAW capabilities and features customised weld modes for carbon steel, aluminium and stainless steel. For more advanced applications, the Vantage 441X also includes dedicated SAW and orbital pipe modes, along with synergic pulse capabilities for better arc performance in GMAW welding.

To back it all up, the Vantage 441X comes standard with CrossLinc® Technology, which enables precise voltage control at the arc without the use of an extra control cable for improved productivity, safety, and quality.

The Vantage 441X is available to order as a standalone machine, or in Ready-Pak® options that come assembled on heavy-duty trailers directly from the factory. ***www.lincolnelectric.com.***

Lincoln Electric's Vantage 441X diesel engine driven welder/generator.

Eliminate porosity during welding

The presence of moisture on a joint surface can create porosity in weld metal. It is therefore important that the dew point is monitored so welders are made aware when moisture is likely to be present.

Innovator in Weld Purging, Huntingdon Fusion Techniques HFT®, has recently developed a dew point sensor, an important predication instrument for when water will form on metal surfaces in the welding environment.

Ron Sewell, Chairman for HFT® says: "Under arc conditions, water is broken down into hydrogen and oxygen in atomic form which, when present in weld metal, cause porosity and are known to create cracking in the weld joint. Water can form as moisture on metal surfaces while welding, so it is crucial to be able to measure the dew point while welding lengthy critical joints, as conditions can change during the welding process.

"The PurgEye® dew point sensor accessory has been designed to integrate with most of the Argweld® Weld Purge Monitors® via the PurgeNet™ lead that is supplied with them, thereby giving values for oxygen (0_2) and water (H_20) on the same screen. In this way, the user is not forced into the purchase of an expensive, separate dew point monitor that will give its reading elsewhere."

The Dew Point Sensor is designed to fit any of the Argweld® Weld Purge Monitors® that read down to 1.0 ppm, which includes the PurgEye® 200, PurgEye® Desk, PurgEye® 600, PurgEye® 1000 and the PurgEye® Site.

Data is displayed on the OLED screen of the Weld Purge Monitor® in split format, so both 0_2 and H_20 content are shown as ppm value. ***www.huntingdonfusion.com***

Reasons to adopt greenWave® welding inverters

voestalpine Böhler Welding's Selco research centre has developed an innovative inverter design called greenWave® that combines all the benefits and reliability of inverter technology with a power factor equal to, or approaching, unity.

Conventional inverter power sources draw three-phase current in pulses, leading to a high level of harmonic distortion with a large reactive component. The result is a low power factor (PF) typically around 0.65. Compare this to modern greenWave® inverter technology from voestalpine Böhler Welding where, in greenWave® welding inverters, the current drawn is kept almost sinusoidal, with the result that power factor for three-phase machines approaches unity, that is, PF≈0.95, while single phase power sources deliver a PF = 1.

This makes the technology ideal for discerning users wishing to combine respect for the environment with the significant benefits offered by modern inverter-based welding technology. Some other advantages include:

- Reduced levels of pulse spikes and harmonic distortion ensure better protection for internal electronic circuits and keep the welding process independent of electrical supply conditions. This is particularly important when fluctuating mains supplies or on-site gensets are being used.
- greenWave® welding power sources adapt automatically to three-phase mains supply voltage without any manual intervention.
- By adopting greenWave® technology, the mains supply can be sized for a lower current draw, or an increased number of welding machines for the same installed power. As an example, on a 64 A mains supply, a 400 A pulsed MIG/MAG welding process using a conventional inverter power source (PF = 0.65) would draw a current of 59 A. An equivalent greenWave® power source would only draw 32 A.
- International bodies have long been advocating the enforcement of standards aimed at reducing harmonics. With the introduction of standard EN 61000-3-12, limitations have been placed on harmonic current disturbance in professional and industrial welding industries. greenWave® welding power sources already conform to EN 61000-3-12 and do not, therefore, require any further verifications.
- A unity of near unity power factor means lower current draw. This in turn means less stress on circuits and components, with clear benefits in terms of power source durability and reliability.
- Owing to the reduction in current draw, Joule effect losses are also reduced along power lines. To power, for example, three conventional MIG/MAG welding inverters each working at 200 A, would draw 15 A from the network. If that power is distributed using a 6.0 mm power cable 200 m long, an energy loss of about 1 150 W would result – equivalent to a total annual loss of 1 380 kWh based on five hours of welding every day for 230 days a year. Three greenWave® power sources, drawing only 10 A per machine reduce this power loss to 510 W, 612 kWh/year, delivering an annual saving of 768 kWh.
- Another indirect benefit is the ability to improve the overall availability of the electrical supply. The use of welding equipment that draws less current helps to avoid exceeding maximum permitted load, thus avoiding peaking surcharges or costly shutdowns.
- greenWave® welding power sources completely eliminate reactive power consumption with single phase power supplies, and dramatically reduce it with three phase supplies. Reactive power causes unwanted current flows and additional losses on ac transmission lines, helping utilities such as Eskom to deliver power more efficiently.
- Because greenWave® power sources draw less current, they make a major contribution to reducing energy losses along power lines. This means lower CO_2 emissions. Choosing an ecological greenWave® power source is therefore a way of taking collective responsibility for the environment – a choice that should be made not only by government agencies, but also by companies and industry in general. 1 000 greenWave® power sources operating at 200 A/28 V for 1 200 hours a year deliver a reduction of about 110 t in CO_2 emissions.

URANOS series machines are powered by greenWave® inverters and are easily recognisable from the greenWave® logo (Inset).

voestalpine Böhler Welding's greenWave® range of power sources is designed to interconnect across a network using Weld@Net® software, so a number of machines can be controlled, with their welding parameters displayed and programmed simultaneously.

With over 100 years of experience, voestalpine Böhler Welding is a global specialist in delivering welding joints, weld repairs, hardfacing, cladding and brazing solutions.

www.voestalpine.com/welding

In a constantly changing world, success depends on creating the perfect balance.

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