

# **SAIW's** expanded technical services

African Fusion visits SAIW's Material Testing Laboratory and talks to the Institute's new technical services manager, Riaan Loots.

> orn and bred in Pretoria, South Africa, Riaan Loots studied met-University of Pretoria and graduated with a BEng in 1997 and an MEng in 2003. "I started specialising in welding during my MEng, which involved research for Eskom on creep resistant materials for power stations: 1/2Cr 1/2Mo 1/4V: 21/4Cr 1Mo; X20; and P91. I looked at aspects of welding these materials, more specifically, at the post-weld heat treatment procedures to overcome concerns with respect to reheat cracking," he informs African Fusion.

Between 2000 and 2003, Loots spent some years with Philip Doubell at Eskom's Rosherville Research and Innovation Centre and, after a short period away from welding, he returned as a contractor to do replica evaluation work – analysing etchings of microstructures lifted from *in-situ* pipe surfaces for creep damage.

"In 2008, I joined Zwane Inspections, a replication lifting and NDT company, and in 2012, I completed an honours degree at Tukkies and received the IWE diploma. From 2013 to 2016, I worked as a lecturer at the University, first under Madeleine du Toit and then under



SAIW's technical services team, from left: Surekha Krishnan, project manager; Confidence Lekoane, welding consultant; Riaan Loots, technical services manager; Nicoline Kgoedi, material laboratory assistant; and Kegomoditswe Letlole, materials laboratory technician.

current head, Pieter Pistorius," he says. Loots joined SAIW in August 2016 as

a senior welding consultant in technical services and he was appointed to his current post as technical services manager in April 2017.

#### SAIW's technical services offering

Through the technical services department, the full range of technical skills at SAIW's disposal – welding; material and NDT testing; weld inspection; and all of the engineering analysis and investigation skills – are made available to members and non-members for productivity and quality improvement, problem solving and research and development work. "We offer consultancy services in several specialist areas, which include: failure analysis, welding related research and development, welding consumable evaluation, weld procedure gualification, welder gualification, post weld heat treatment and positive material identification," Loots notes.

In addition, SAIW now has its own fully equipped materials testing laboratory, which is SANAS accredited to ISO 17025. "We can now offer full-circle services to clients. For welding procedure qualification, for example, we can witness the welding required at a clients premises and bring the samples back to our own laboratory, where we can do all of the required mechanical and metallurgical testing and analysis. We can cut and prepare samples, perform the mechanical tests required by the standard, prepare and analyse micrographs, perform diffusible hydrogen tests and fully record and report all the results needed for a procedure qualification record (PQR) or consumable verification," he tells African Fusion. "Along with the welding parameters and other critical variables, the test results are compiled into a full PQR document, which, within the range of the parameters used, is used to compile a welding procedure specification (WPS)," he explains.

"As a starting point for this process, we like to engage with welders on the practical side of producing a weld, so that we know that the developed procedure will be easy to implement in practice. In this regard, we also have skilled welders here to call upon," he says.

"Performance testing is another one of our routine offerings," he continues, "testing welders according to a given WPS for code approvals. After witnessing the welders following the procedure, we take the test plate, cut the test pieces required and then perform the qualification tests. Also, because we have welding facilities onsite, we are able to bring welders into SAIW, where we perform all aspects of the performance tests," he suggests.

SAIW technical services is also doing more and more consumables testing. "When a consumable arrives from the manufacturer, it comes with a 3.1 certificate, which certifies as-manufactured composition and compliance to consumable standards such as AWS A5. Many companies such as Sasol, however, require additional verification, which involves retesting a consumable sample from each batch and producing a 3.2 verification certificate.

"Consumable testing involves a lot of welding, because mechanical test pieces must be cut from the weld-metal only, so even if a consumable is only going to be used for a root weld, weld metal as thick as the test specimen has to be deposited," Loots explains. "Our advantage is that we can do all of this work in-house. We have the skilled welders; the machines and operators to cut the test pieces; the mechanical testing equipment, including tensile, Charpy toughness and hardness testers; the equipment needed to produce micrographs; as well people skilled in micrographic analysis," he adds.

On the consultancy side, Loots says: "Few people are aware that we can assist with failure analysis and complicated repair procedures. We can offer fitness for service and remaining life analysis as well as feasibility studies and cost analysis of repair procedures, which are often complex because they are not directly covered by any of the construction codes, and acceptance criteria do not apply in guite the same way as for new-build fabrication," Loots points out.

He describes some current consulting work being done to reduce reject rates on an ongoing site construction project. "We hope to find a way to optimise the onsite welding operations so as to achieve lower reject/rework rates and better first-time quality.

"This might involve, for example, identifying some welders that need better training, or adjusting the welding procedure to make it easier for welders to achieve flaw-free welds. We can do this by analysing the data already being

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Above: SAIW's fully automated MTS Criterion tensile testing machine.

Right: The sample receipt bench outside of the SAIW weld test laboratory.

collected through the quality and NDT testing processes. All we need is enough data from the client to analyse for causal trends," he explains.

"We believe we are ideally resourced to offer short-term contract research and problem solving services such as these," Loots adds.

He says that more and more fabricators are adopting ISO 3834 certification to raise their welded-product quality and to improve global competitiveness. Meeting ISO 3834 requirements, however, requires proof that WPSs, consumables and welders are qualified to meet the minimum standards required.

At the same time, cost pressures and the increased availability of lower cost imported consumables and equipment is creating increased levels of uncertainty with regard to the validity of the certificates being issued by the 'middle-

### Service

**Mechanical testing** Tensile & Bend testing Charpy V notch Impact testing Vickers hardness testing Rockwell hardness testing **Chemical Testing** Spectrographic analysis

X-Ray Fluorescence analysis ( positive material identificatio Diffusible hydrogen analysis Microstructural evaluation an All equipment needed for test

The testing services available from SAIW's Material Testing Laboratory.



The SAIW Technology centre is equipped to produce consumable samples using any process, to test welders and to machine the samples necessary for mechanical and metallurgical testing.

## **SAIW technical services**





men'. "The issue is easily resolved by getting a batch tested and a 3.2 verification certificate issued - and this can be a very cost effective options if a low cost consumable proves adequate," he notes

"At the end of the day, our members are the life blood of SAIW and we are always striving to improve our service to them. We want to know what our members would find useful, so that we can tailor our service to best meet their needs.

"We are happy to consider offering new services that we cannot yet accommodate, even if we have to employ outside consultants to get started," he concludes. 🔳

|   | Equipment available                            |
|---|--|
|   |  |
|   | MTS Criterion 64.305 (300 kN)                  |
|   | 450 joule SANS Charpy impact test machine      |
|   | emcoTEST Durascan 70 (10 grams to 10 kg load)  |
|   | Wilson Rockwell hardness tester                |
|   |  |
|   | Bruker Q2 Ion spectrometer                     |
| (RF) &                                    | Bruker S1 Titan XRF analyser                   |
| า   |  |
|   | Bruker G4 Phoenix diffusible hydrogen analyser |
| d reporting                               | Nikon microscope Eclipse MA-200                |
| sample preparation is available in house. |  |