

# Water & Sanitation Africa

Complete water resource and wastewater management



Alvin Anderson,  
country director,  
BORDA South Africa

**Corrocoat secures the future of  
Lesotho's Highlands Water**

## INDUSTRY INSIGHT

Closing the sanitation gap with  
BORDA and local partnerships



**WATER  
MAFIAS**

HOW THEY  
WORK AND  
HOW TO  
STOP THEM

**INVISIBLE WARRIOR  
MAKES POSITIVE IMPACT  
IN DROUGHT BATTLE**

# APE PUMPS & MATHER+PLATT

## FROM FAULTS TO FORESIGHT – HOW CONDITION MONITORING TRANSFORMS PUMP MANAGEMENT

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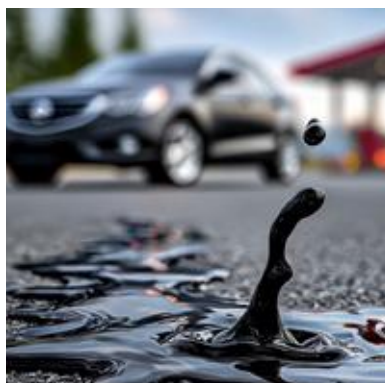
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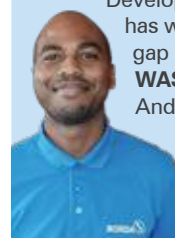


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WATER MAFIAS, HOW THEY WORK AND HOW TO STOP THEM

## INDUSTRY INSIGHT

Globally, 3.4 billion people lack safe sanitation, and untreated wastewater continues to pollute rivers and groundwater. Since 1977, BORDA (Bremen Overseas Research and Development Association) has worked to close this gap in over 25 countries. **WASA** interviews Alvin Anderson, country director of BORDA South Africa, on the organisation’s local initiatives. **P8**





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**WISA's Vision**  
Inspiring passion for water

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- Anaerobic Sludge Processes
- Industrial Water
- International Water Association-Southern Africa (IWA-SA)
- Innovation for Water Supply & Sanitation
- Mine Water Lead
- Process Controllers
- Small Wastewater Treatment Works
- Water Distribution
- Water Reuse Division
- Modelling and Data Division

### EMPOWERMENT PLATFORMS

- Women In Water
- Young Water Professionals



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# HAVE YOU HEARD OF WOMEN-WASHING?

It's not women doing laundry. It's when a company, organisation, or institution pretends to support women-empowerment, inclusion, or equality, but make only superficial gestures without real, systemic change.

Over the past month (women's month) I have been inundated by self-congratulatory press releases profiling women who work at various companies. If you read between the lines, it takes the tone of 'Behold – here is a woman, and she is also actually an engineer' or 'Look at us, we are a company who employs women'.

Its infuriating! Are these women paid equally to their male counterparts? What percentage of women are sitting at board level? And how do you treat the women who have children? The reality is that mothers are expected to work like they have no children, and parent like they have no jobs. Are eyebrows raised when they ask to work from home as they have a sick child? Can they watch a school concert and work in the evening?

### Women and water

But here is where the real gender inequality lies, and I really wish that there were more press releases on how companies are working to give women and girls better access to water and safe sanitation.

Women and girls suffer most where water and sanitation are lacking. Globally, women spend an estimated 200 million hours every day collecting water, often walking long distances that rob them of education and economic opportunities. In South Africa, many rural households still lack piped water and safe toilets, leaving women exposed to health risks, indignity, and gender-based violence when using unsafe or distant facilities. Without proper sanitation, adolescent girls are more likely to miss school during menstruation, with some eventually dropping out altogether.

During pregnancy, inadequate water and hygiene further endanger both mother and child. Ultimately, poor water and sanitation access reinforces cycles of poverty and gender inequality, with women paying the highest price for systemic failures.

### On a positive note

It has been a real treat to take part in women-themed webinars, breakfasts and cocktail functions. There is something powerful in the energy of women, in the space they hold, and in the grace with which they hold it.

I find myself marvelling at the incredible women in this sector. Witnessing the positions these women hold, the projects they are involved in and the obstacles they have overcome.

One quote has stuck with me from the great and inspiring Dr Esper Ncube: "I grew up in a rural village where people never believed a girl should be educated beyond Standard One. The chief even spat in my father's face for sending me to Grade 8."

Today, this incredible woman holds a PhD in Public Health, MSc in Water Utilisation, BSc (Hons) Water Utilization, BSc (Hons) in Chemistry, BSc In Chemical Sciences Education, Project Management, Management Advanced Programme and Master of Business Leadership (UNISA).

How far she has come. How far we have come. ●

Kirsten



## COVER OPPORTUNITY

In each issue, **Water & Sanitation Africa** offers companies the opportunity to get to the front of the line by placing a company, product or service on the front cover of the magazine. Buying this position will afford the advertiser the cover story and maximum exposure. For more information, contact Sindi Moni on +27 (0)82 212 4574, or email [sindi@infrastructurenews.co.za](mailto:sindi@infrastructurenews.co.za).

# You said it in WASA

The opinions and statements shared by thought leaders in the water industry to **Water&Sanitation Africa**.



“Often, condition monitoring exposes system issues such as poor valve performance, blocked suction lines, or resonance caused by neighbouring pumps. Vibrations from an engine may negatively affect the pump and vibrations from a pump may negatively affect an engine. In large installations, multiple pumps run side by side, and their resonance can affect one another. Skilled analysis is therefore critical to distinguish between equipment-specific faults and system-induced faults.”

**Johan van den Berg, service technician, APE Pumps**

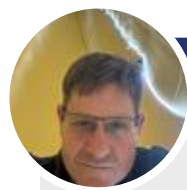
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“In South Africa, water-borne sanitation remains the “gold standard”, yet infrastructure and climate realities make it impossible to deliver this universally. By combining technical expertise, institutional strengthening, and a culture of partnership, BORDA South Africa is charting a path towards livable cities—one school, one settlement, and one municipality at a time. The only way that we can address these significant sanitation challenges is together. BORDA wants to work together with different stakeholders. We invite the private sector, municipalities, universities, other nonprofit organisations to partnership with us.”

**Alvin Anderson, country director, BORDA South Africa**

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“In 2019, engineers inspecting the Lesotho Highlands Water Project (LHWP) discovered severe corrosion on the steel liners inside its 82 km network of tunnels. These liners are essential for keeping the tunnels stable and efficient. Without urgent repairs, the system risked reduced water flow, structural collapse, and failure of supply. This posed a major threat since LHWP delivers about 60% of Gauteng’s water and generates hydropower for Lesotho. To prevent disaster, the system was shut down for the first major refurbishment in 25 years. The Transfer Tunnel, Delivery Tunnels North and South, and related structures were drained and closed, allowing teams to grit-blast, repair the steel, and install a modern corrosion-protection lining.”

**Louis Pretorius, MD, Corrocoat**

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“Water infrastructure investment needs to be equally matched by investment in skills and professionalisation within both the water sector and its external support partners. Infrastructure investment is critical, but without the right skills, it’s an exercise in futility.”

**Dr Lester Goldman, CEO, WISA**

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“From artificial intelligence and internet of things to citizen science, integrating high-quality, real-time data into decision-making is vital for Sustainable Development Goal 6. Bridging science, policy, and communities ensures resilient, sustainable water management in the face of climate and resource challenges.”

**Dr Harrison Pienaar, Chairman, WISA**

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“Our growth over the years have been driven by our commitment to innovation as well as the entrepreneurial spirit. Country managers are encouraged to run units like part of their own company, take calculated risks, and to innovate fearlessly. Globally, we have grown to over 2 500 employees, but we retain the flat organisations, streamlined processes, and quick decision-making of a company run by a family—lean and with a personal touch.”

**Darryl Macdougall, managing director, Verder South Africa**

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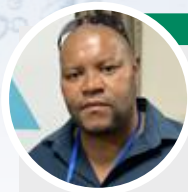
“Air valves are vital because trapped air inside pipelines occupies space and this increases pumping time and energy costs. Air is compressible, so you need to push harder to pump the water through your pipeline. Left unmanaged, this can lead to airlocks that disrupt flow and efficiency. Beyond operational inefficiencies, the presence of air in pipes can encourage the growth of organic materials in pipelines that sometimes leads to corrosion.” **Isaac Mahlangu, technical analyst, Dynamic Fluid Control (DFC)**

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“During the drought, Nelson Mandela Bay was struggling to balance on a water supply and demand knife edge. To cope with this, we had to be extremely agile and were constantly opening and closing valves, adjusting water pressures, and re-routing water to meet consumer demand. Coping with this challenging scenario called for a system that could remotely oversee and control the network while enabling fast, informed decisions and swift action. When reflecting on all of the NMBM’s drought mitigation projects, it was the new Telemetry-Supervisor Control and Data Acquisition (SCADA) system that made the most significant and positive impact.” **Matthew Hills, engineer at Nelson Mandela Bay Municipality**

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“Water-Efficient Sanitation Systems (WESS) are often managed apart from mainstream water operations. This separation gives the impression that innovation is something extra, rather than part of daily service delivery. Innovation should be built into routine operations, not treated as an add-on. By doing so, new technologies can access the same budgets and funding streams that already support day-to-day delivery. If we want to strengthen sanitation through innovation, we must plan and budget for it as part of normal practice.” **Dr Zakhele Khuzuwayo, manager: Innovation and Technology, Johannesburg Water**

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“Water is something that affects us every day, and Hach is playing a pivotal role in protecting the quality and quantity of water. We are a well-known, well respected brand that is dedicated to making water analysis better – faster, simpler, greener and more informative – so you get it right the first time, every time.” **Kagiso Ramoadi, regional sales manager, Hach**

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“Many still view oil water separators as simple concrete boxes, but evolving regulations and technology demand far more precision. Proper classification, correct sizing, and awareness of site-specific risks are essential. Without this, operators risk non-compliance, flooding, or costly retrofits. A new design mindset is urgently required” **Justin Kretzmar, sales engineer, Rocla**

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“We are one of the municipalities that do not owe any entities for the services, we pay service providers within 6 days on average and have fostered good relationships with our stakeholders to ensure we are always bettering our services.”

**Dumisani Mahlangu, a municipal manager, Thembisile Hani Local Municipality**

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“Water theft and vandalism has become a crisis of governance, a crisis of ethics and a crisis of enforcement of laws. If left unchecked, the trajectory could create a full-tier system: clean water for the wealthy without interruption, and hazardous, overpriced tanker water, often unsafe, for the poor.”

**Dr Henk Boshoff, commissioner, South African Human Rights Commission (SAHRC)**

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# *From faults to foresight –* **HOW CONDITION MONITORING TRANSFORMS PUMP MANAGEMENT**

Condition monitoring has become one of the most valuable tools in modern pump management. At APE Pumps, it goes beyond detecting faults and predicting failures – it's about extending a pump's life, improving efficiency, and building stronger, long-term customer partnerships.

“

In simple terms, condition monitoring involves checking the health of a pump by collecting baseline data during installation and then measuring against it over time. It involves an analysis of how the pump is performing over a period of time and may flag issues such as misalignment, cavitation and bearing wear. Very often, condition monitoring may detect a systems issue that is not related to pump itself,” explains Johan van den Berg, service technician, APE Pumps.

A pump never operates in isolation; it is one component in a larger system, where its performance is directly influenced by motors, piping, valves, and site conditions. Effective condition monitoring therefore considers not only the pump itself but the wider system interactions that affect reliability.

“Often, condition monitoring exposes system issues such as poor valve performance, blocked suction lines, or resonance caused by neighbouring pumps. Vibrations from an motor may negatively affect the pump and

vibrations from a pump may negatively affect an motor. In large installations, multiple pumps run side by side, and their resonance can affect one another. Skilled analysis is therefore critical to distinguish between equipment-specific faults and system-induced faults,” adds van den Berg

### The scope

Condition monitoring is a broad discipline. Vibration analysis and laser alignment form its backbone, supplemented by techniques such as oil sampling and ultrasonic testing when needed. Then there is the analytical or diagnostics part, that identifies the reasons behind, for example, excessive vibration or misalignment.

Van den Berg has successfully passed his VCAT-2 Vibration Analysis exams that has taught him to diagnose a wide range of fault conditions by collecting the right data and will continue to study up to the highest level – VCAT-4.

Some condition assessments can be done remotely, but this is often costly, as it requires installing multiple sensors across the system along with a reliable Wi-Fi connection. “However, data alone rarely provides the full picture – site visits are still essential to understand the real conditions. Often, the most valuable insights come not from instrumentation but from conversations with the people on the ground – like the floor sweeper who notices leaks and spillages that

others may ignore. Site conditions like water ingress, dust, and low reservoir levels often reveal the underlying reasons for pump inefficiency.

### Recognising the warning signs

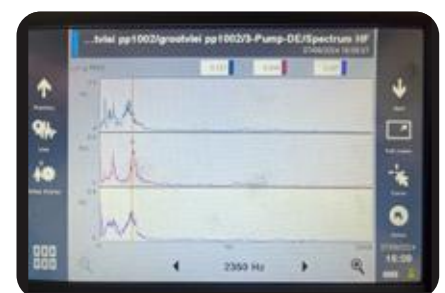
The most common red flags include excessive vibration, cavitation, and bearing failure. Cavitation, caused by restricted flow or faulty valves, produces a distinct sound – like stones rattling inside the pump. Left unchecked, it rapidly damages impellers and bearings. Over-greasing is another frequent issue, as operators attempt to prevent bearing failure but end up causing it.

Temperature rises are usually a symptom rather than a cause, signalling underlying issues such as lubrication failure or cavitation. In extreme cases, seized bearings can lead to snapped shafts, damaged couplings, and even structural damage. There was an instance where a failed gearbox coupling was propelled through the roof – an incident that highlights the dangers of unchecked vibration.



Johan van den Berg, service technician, APE Pumps

APE vibrometer measurement read-out indicating cavitation in the pump



### Tools of the trade

Condition monitoring requires investment in advanced, costly equipment. While the financial outlay for APE Pumps is significant, committing capital to technology reflects a strategic decision to go beyond traditional break-fix maintenance. "APE views it as an investment rather than a cost. Owning and operating advanced monitoring equipment enables the company to offer higher-value services," states van den Berg.

For condition monitoring, APE Pumps at times uses a flowmeter. This provides a direct measurement of the actual flow rate in the system. By comparing flow readings with pressure measurements, van den Berg can assess whether a pump is operating on its correct performance curve or if problems such as blocked valves, cavitation or other system restrictions are limiting efficiency.

A portable vibration monitoring data collector is also used on any rotating equipment as well as pressure gauges

This pump had bearings that were replaced after data collection indicated early stages of bearing wear



A valve did not regulate the water flow from a two stage pump at a power station, causing the pump to run in overload creating excessive cavitation inside the pump, eventually leading to a catastrophic pump failure. The picture of the vibrometer indicated the fault

that take suction and discharge readings so that technicians can assess the pump's head and efficiency.

### Report

Reports are designed to be accessible. Rather than overwhelming clients with technical graphs, technicians summarise key findings, add annotated images, and provide clear recommendations.

Each report outlines the background and service history of the equipment, records key measurements such as vibration, alignment, pressure, and flow, and highlights any site conditions that may affect performance. Findings are presented with supporting evidence – including spectra, photos, and alignment data – to clearly show issues like cavitation, misalignment, or bearing wear. Importantly, the report always includes tailored maintenance recommendations.

Seized bearings can lead to snapped shafts, damaged couplings, and even structural damage



Thermal radar gun checking critical component operating temperatures

APE recommends conducting a monthly condition monitoring assessment on critical equipment and quarterly condition assessment on non-critical equipment.

"Sometimes, our customers deploy their own condition monitoring teams to conduct assessments on pumps. This then provides us with an opportunity to compare our data with their data to catch errors and ensure accuracy. Our role as an independent partner provides an additional layer of assurance," says van den Berg.

### Why it matters

The benefits for customers are clear. Condition monitoring prevents costly breakdowns by identifying early warning signs and allowing maintenance teams to intervene before catastrophic failure occurs. For APE Pumps, it eliminates the reactive scramble to fix pumps after they have already failed, replacing crisis management with planned maintenance.

Baseline reports also serve as evidence. Not all customers conduct regular maintenance on their pumps. When clients query sudden failures, APE Pumps can refer back to data collected months earlier to show the developing fault.

"This builds trust with our customers who see that we take long-term responsibility for our pumps. We don't simply sell a product – we commit to supporting the customer throughout the pump's lifecycle," adds van den Berg. ●

# CLOSING THE SANITATION GAP WITH LOCAL PARTNERSHIPS

Globally, 3.4 billion people lack safe sanitation, and untreated wastewater continues to pollute rivers and groundwater. Since 1977, BORDA (Bremen Overseas Research and Development Association) has worked to close this gap in over 25 countries. **WASA** interviews Alvin Anderson, country director of BORDA South Africa, on the organisation's local initiatives.

**F**ounded in Bremen, Germany, BORDA promotes decentralised wastewater treatment, faecal sludge management, and non-sewered solutions, while strengthening local capacity and partnerships for city-wide inclusive, climate-resilient sanitation.

## Strengthening institutional capacity

"BORDA aims to work closely with government institutions to strengthen their capacity for delivering sustainable sanitation. By aligning with ministries, municipalities, and water boards, we ensure that decentralised sanitation is not only technically sound but also institutionally anchored, giving local governments the tools to scale solutions, improve regulation, and provide reliable services over the long term. We offer guidance and support at the outset, creating an enabling environment for government institutions to take ownership of sanitation solutions so that, in time, they can serve as custodians without relying on BORDA" explains Anderson.

He adds, "As a non-profit organisation, BORDA does not sell anything. Our memorandum of agreements with municipalities are non-financial binding. We provide technical information and support for free in the form of



Alvin Anderson, country director,  
BORDA South Africa

feasibility studies and provide construction supervision as well as operation and maintenance manuals for troubleshooting and performance monitoring."

BORDA's primary funding is provided by the German Federal Ministry for Economic Cooperation and Development (BMZ). The organisation's headquarters in Germany function mainly as an administrative hub, and each country office operates independently, overseeing the direct implementation of its projects.

In South Africa and Zambia, BORDA is now implementing its 2025–2027 programme under the theme 'Livable Cities in Africa' and is focussed on three outcomes:

**1) Developing instruments and tools** – Practical guidelines and catalogues on financing, licensing, and technical options are being

created to help municipalities and developers navigate the complexity of decentralised sanitation. A digital dashboard is also under development, giving users an interactive way to match needs, budgets and regulatory requirements with technical solutions.

**2) Strengthening capacity** – At least eight accredited training modules will be rolled out through certain institutions. Over 400 specialists and 40 trainers are expected to be trained, with municipalities engaged through workshops and on-the-job sessions. New infrastructure, such as demonstration Decentralised Wastewater Treatment Systems (DEWATS) and faecal sludge treatment plants (FSTPs), will serve both as functional systems and training tools.

**3) Monitoring and evaluation** – Existing systems, like the recently constructed Julukandoda Primary School DEWATS located in KwaDulela, Howick and the Newlands Mashu DEWATS site in Durban, are being reassessed to ensure long-term performance. Well-performing systems will be upgraded into 'lighthouse projects,' serving as demonstration and learning sites.

## Partnerships at the core

Central to BORDA's model is collaboration. "Our two oldest partners are eThekweni



Julukandoda Primary School

Municipality and the UKZN R&D WASH Centre (formerly known as the UKZN Pollution Research Group). Together, we developed the Newlands Mashu site. This remains a flagship research and training hub. The partnership has enabled the municipality to gain practical insight into how Decentralised Wastewater Treatment Systems (DEWATS) function, while also creating a platform for the university to conduct research and evaluate the performance and applications of the technology,” says Anderson.

The Banana City Housing Project is another example. It is a DEWATS initiative that provides sustainable sanitation services to 106 households as part of phase 1 and 2 with the overall goal of 413 (phase 3 & 4). With a daily treatment capacity of 75.9 m<sup>3</sup> and an allocation of 500 ¤ per household, the system processes wastewater through a series of natural treatment steps – including a settler, anaerobic baffled reactor, anaerobic filter, planted gravel filter and planted sand filter – before safe discharge. By treating wastewater on-site, the project eases the burden on municipal infrastructure, supports healthier living conditions, and demonstrates an environmentally friendly, low-maintenance alternative to conventional sewer systems. Following a six-month monitoring period to confirm compliance with regulatory standards, the facility will be handed over to eThekweni Municipality-Water and Sanitation Unit for long-term management.

Banana City DEWATS Housing Project



Newlands Mashu DEWATS demonstration site

Anderson notes that one municipal official once described the site trainings and knowledge transfer facilitated with BORDA as ‘sanitation tourism’. “BORDA has indeed showcased these two projects to several municipalities as strong proof-of-concept demonstrations. They give credibility to the DEWATS concept within South Africa.”

More recently, memoranda of understanding have been signed with the City of Cape Town and local municipalities such as Emalaheni Local Municipality in Mpumalanga.

Partnerships extend beyond government. BORDA works with training institutions, private developers, and community-based organisations. It also convenes sector dialogues, such as ‘Sanitation Breakfasts,’ to align stakeholders on financing and regulatory issues.

According to project manager Mendy Shozi, successful partnerships are built on openness, readiness to engage, and shared responsibility: “We don’t push our technology. We look for partners who are eager, willing to learn, and committed to walking the journey with us. Because once we leave, they must own and maintain the system.”

Anderson notes that there is definitely an increased interest in DEWATS, faecal sludge treatment and non-sewered sanitation or what South Africa is referring to a Water Efficient Sanitation Solutions (WESS). “The amended Water Services Act will not allow municipalities to connect to sewer systems that are already overloaded and non compliant. This will encourage the uptake of decentralised systems. Furthermore, by providing guidance and standards for WESS, municipalities can adopt, regulate, and operate these systems with confidence, instead of depending solely on external NGOs or pilot projects. Over time, this mainstreams WESS into municipal service delivery,” states Anderson.

In South Africa, water-borne sanitation remains the “gold standard”, yet infrastructure and climate realities make it impossible to deliver this universally. By combining technical expertise, institutional strengthening, and a culture of partnership, BORDA South Africa is charting a path towards livable cities – one school, one settlement, and one municipality at a time.

“The only way that we can address these significant sanitation challenges is together. BORDA wants to work together with different stakeholders. We invite the private sector, municipalities, universities, other nonprofit organisations to partnership with us,” concludes Anderson. ●



**BORDA**   
SOUTH AFRICA

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# *Corrocoat secures the future of* **LESOTHO'S HIGHLANDS WATER**

The eight-month shutdown of the Lesotho Highlands Water Project tunnels was one of southern Africa's most complex maintenance projects. Corrocoat SA's corrosion protection expertise and experience ensured the tunnels were restored to secure Gauteng's water supply and sustain Lesotho's hydroelectric power for decades to come.

**T**he Lesotho Highlands Water Project (LHWP) ranks among the continent's greatest engineering achievements. Established through the 1986 Treaty between Lesotho and South Africa, it delivers water to South Africa's economic heartland, Gauteng, while generating hydroelectricity for Lesotho. Phase I, completed in 2003, comprised Katse Dam, Mohale Dam, Muela hydropower station, and 83 km of tunnels, transferring 780 million cubic metres per year into the Integrated Vaal River System. Phase II is now underway, adding the Polihali Dam and a further 38 km gravity tunnel ultimately adding an additional 480 million m<sup>3</sup> of water per year into the current South African water system.

## **Need for maintenance**

A 2019 inspection revealed significant deterioration of the steel liners that protect critical sections of the 82 km tunnel system. If corrosion was left unchecked, the risks were stark: reduced hydraulic efficiency, potential collapse and loss of supply. Given that LHWP delivers around 60% of Gauteng's water, and underpins Lesotho's electricity grid, the stakes could not have been higher.

Officials from the Lesotho Highlands Development Authority (LHDA) and South Africa's Trans Caledon Tunnel Authority (TCTA) stressed that preventive maintenance was a necessity, not an afterthought.

For the first time in 25 years, the ageing tunnel system of Phase I was refurbished. The original liners had been coated in South African workshops prior to installation in the 1990s. The Transfer Tunnel, Delivery Tunnel North and South, and associated structures were closed for

Corrocoat imported 43 000 l of solvent-free, glass-flake epoxy from the United Kingdom

Louis Pretorius, MD, Corrocoat



grit-blasting, steel repairs, and full relining with modern corrosion protection.

### Grit blasting

Grit blasting is a surface preparation technique where small, hard particles (grit) are propelled at high speed using compressed air to clean a surface. As part of the tunnel refurbishment, grit blasting played a central role in preparing the ageing steel liners for recoating. Decades of biofilm, rust, and worn epoxy had to be stripped back to bare metal to ensure a clean surface and guarantee that the new glass-flake epoxy system would bond effectively.

“To carry out corrosion protection works across nearly 20 000 m<sup>2</sup> surface area, we imported more than 1 850 tonnes of abrasive blast-cleaning grit from Rustenburg in South Africa to Lesotho (630 km trip). This equates to around 50 interlink truckloads, each carrying 32 tonnes of blast-cleaning grit,” explains Louis Pretorius, MD, Corrocoat.

At each project site, the vast majority of all blast cleaning grit (in 25 kg bags) was loaded, carried and off-loaded by hand. That is 74 000 bags. Once used, all abrasive blast cleaning material had to be collected and loaded back into bags before being removed from the project site, mostly by hand. “This was undertaken with a smile and without too many complaints; a testament to the tenacity of the Basotho site teams,” adds Pretorius.

All blast cleaned surfaces were completed to a surface cleanliness of Sa 3 with a minimum of a 50 µm blast profile. Sa 3 blast cleanliness is the highest cleanliness standard possible with the definition of an Sa 3 blast cleaned substrate being that the substrate is cleaned to “white-metal”, a visually clean substrate with zero shadowing, misses, residual surface contamination or deleterious material

remaining. Sa 3 cleanliness represents the highest achievable standard.

Coupled with the interlink trucks for the blast cleaning grit, approximately 70 truck-loads of plant and equipment was shipped to Lesotho from Benoni in South Africa. Corrocoat employed a fleet of approximately 25 off 1-ton pick-up trucks as well as numerous other trucks, including tipper and crane trucks, fork-lift trucks, tele-handlers and other plant & equipment.

An additional 24 x 12 m long site accommodation and office modules were transported to both Muela as well as Ngoajane project sites, as well as an additional 18 site steel containers.

“Approximately 120 000 litres of diesel was consumed throughout the corrosion protection refurbishment project. It must be noted that the entire project was completed without any major vehicle accidents or incidents; a testament to the maturity and self-control of all staff during the project,” states Pretorius.

### Epoxy coating

To complete the works, Corrocoat imported 43 000 ℓ of solvent-free, glass-flake epoxy from the United Kingdom – 9 000 ℓ more than budgeted. Corrocoat absorbed the additional cost, ensuring thicker, longer-lasting protection. “With solvent-free coating materials, a thicker coating is directly proportional to a longer total life-cycle from a corrosion protection perspective,” states Pretorius.

They used Corrocoat Zip-E Coating; a two-component solvent-free epoxy glassflake coating designed for cost-effective, single-coat application to provide durable protection in harsh environments,

including aggressive atmospheric conditions and aquatic immersion. It offers excellent corrosion resistance for assets such as structural steel, bridges, marine structures, and pipelines. Key features include good cosmetic appearance, good edge coverage, and a higher temperature limit for non-immersed applications compared to immersed ones.

Once the coating had cured, dry film thickness was measured across all sections to confirm compliance before subjecting 100% of the surfaces to high-voltage spark testing. Any areas found below specification were reworked to meet the required standard.

The upgraded coating system is expected to last 30 to 50 years, compared to the original lining’s lifespan of around 25 years.

### Engineering and environmental challenges

Water ingress proved the greatest obstacle. Decades of seepage through saturated mountain rock meant the tunnels never stayed dry. At Muela Ridge alone, Corrocoat pumped water 24 hours per day, every second of every minute of every day from November 2024 until April 2025. “We pumped more than 320 000 m<sup>3</sup> of water between November 2024 and April 2025, installing 1.2 km of transfer piping and deploying more than 20 pumps. Across six sites, 15 coffer dams were constructed to isolate wet sections,” adds Pretorius.

Low temperatures (12–15 °C) and nearly 100% humidity further complicated epoxy coating application. To achieve the required curing, Corrocoat installed powerful heaters and dehumidifiers, and

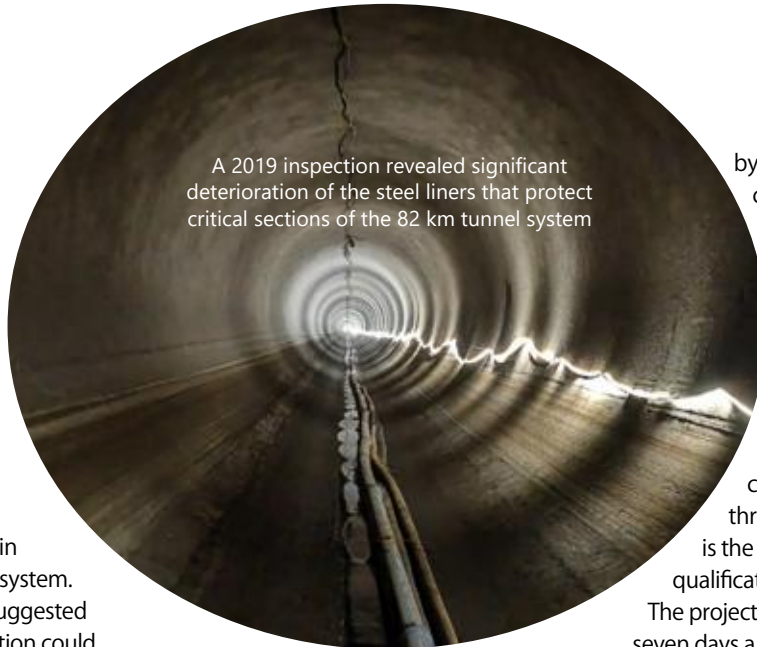
Corrocoat installed about 10 000 m of single- and three-phase electrical cabling across the project sites, complete with mini-substations and distribution boxes, to power air-drying, dehumidification, ventilation, extraction, compressors, and in-tunnel lighting essential for quality and integrity of the work.

A significant unknown at project inception was the degree of deterioration within the steel liners of the tunnel system

controlled airflow with over 20 axial and centrifugal fan systems. Even then, shifts of wind direction inside the tunnels could disrupt the environment.

Six project sites ran simultaneously, with some sites more than a two hour drive from each other.

“A significant unknown at project inception was the degree of deterioration within the steel liners of the tunnel system. While external inspections suggested general wear, the true condition could only be assessed once the tunnels were dewatered and made accessible. Detailed visual surveys, ultrasonic thickness testing, and magnetic particle inspection revealed varying levels of corrosion, from superficial surface rust to severe pitting and through-wall perforations in localised sections. In areas where metal loss had compromised structural integrity, coded welders installed steel patch plates



A 2019 inspection revealed significant deterioration of the steel liners that protect critical sections of the 82 km tunnel system

or carried out full-section weld repairs. Approximately 75 such interventions were executed, each subjected to stringent non-destructive testing (NDT), including ultrasonic and radiographic methods, to confirm repair quality and alignment with design tolerances. Only once the mechanical integrity of the liners had been restored were the surfaces grit-blasted to Sa 3 white-metal standard and prepared for epoxy coating application. This approach ensured that the refurbished tunnels not only received long-term corrosion protection but also regained their original hydraulic and structural performance characteristics,” explains Pretorius.

**Social impact, quality control, safety**

Approximately 300 people were employed throughout the project execution, with Basotho staff comprising more than 70% of the workforce. Furthermore, Corrocoat went beyond its contractual obligation to train 10 local staff, expanding the opportunity to 19 top-performing Basotho employees. These workers completed the SAQCC Paint Applicator’s Course (PA1), funded entirely

by Corrocoat at no additional cost to LHDA.

“This course is the only industry-recognised and certified Corrosion Protection Application Qualification available in South Africa and will without doubt allow the attendees to find work in the corrosion protection industry throughout Southern Africa, such is the esteem and recognition of the qualification,” says Pretorius.

The project operated around the clock, seven days a week – even through Christmas, New Year, Easter, and other public holidays – to sustain momentum and limit delays. Close to 652 000 man-hours were committed over the course of the project

Significantly, there were no major injuries or fatalities, despite the hazardous conditions of confined spaces, water ingress, blasting operations and heavy equipment. All personnel underwent confined-space training, medical checks, and site-specific inductions and were equipped with full PPE.

Corrocoat also refurbished community infrastructure, including the Likileng Lodge clubhouse, Muela Village accommodation, and water reticulation for the Muela police station and information centre

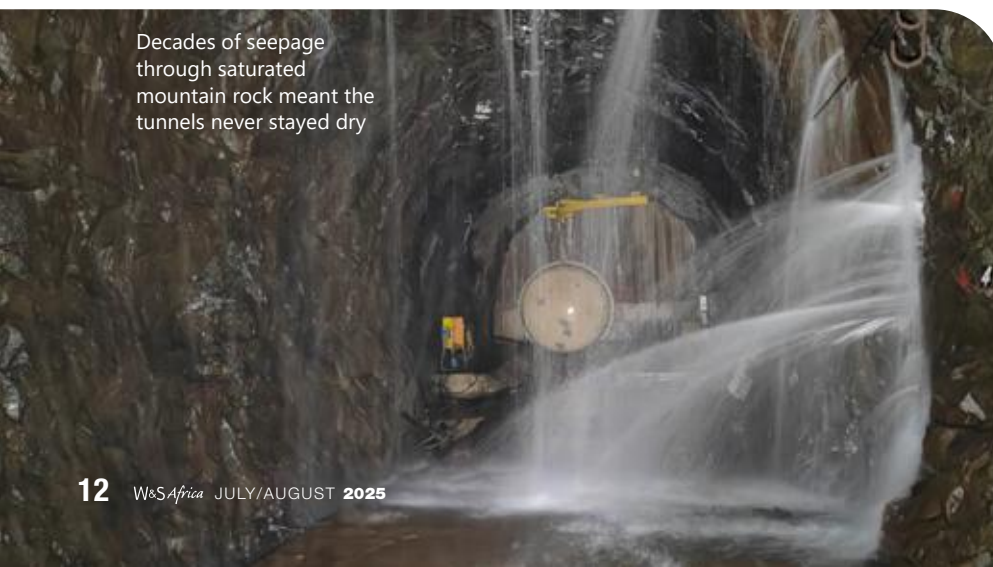
Quality control was uncompromising:

- 100% third-party inspection at every stage
- Dry film thickness (DFT) checks across all surfaces
- High-voltage spark testing to detect pinholes, with all defects repaired before final sign-off
- Non-destructive testing (NDT) on all 75 steel weld repairs

“LHDA’s exceptional support, alongside the 3rd Party inspectorate, ensured seamless collaboration and a unified focus on project success. Despite unforeseen challenges, Corrocoat embraced each one, delivering the refurbishment to full specification. We are proud to have played a role in such an important project,” Pretorius concluded. ●



At each project site, the vast majority of all blast cleaning grit (in 25 kg bags) was loaded, carried and off-loaded by hand



Decades of seepage through saturated mountain rock meant the tunnels never stayed dry



[www.corrocoat.co.za](http://www.corrocoat.co.za)

# DOES SA HAVE THE SKILLS TO BACK UP WATER SECTOR INVESTMENT?



The African Union-AIP Water Investment Summit 2025 held in Cape Town proved largely successful, raising US\$10 billion in investment commitments for the continent.

**By Lester Goldman, CEO, WISA**



**H**owever, water infrastructure investment needs to be equally matched by investment in skills and professionalisation within both the water sector and its external support partners. Infrastructure investment is critical, but without the right skills, it's an exercise in futility.

#### The human factor

Days before the summit, President Ramaphosa presided over the opening of the new System 5A Water Purification Plant at Rand Water's Zuikerbosch Station in Vereeniging. The plant adds 600 million litres of potable water per day – enough to supply 2.4 million people.

"We are celebrating the completion of a vital piece of infrastructure, and we are affirming our shared commitment to continuously provide clean, reliable and safe water," he said.

It's a commitment that must be backed by sufficient capacity and skills. Capacity is about the right mix of people, processes and policies, while skills are about professionals possessing standards-based expertise to perform effectively. There must be ample skills in three categories: leadership; management across departments; and technical expertise within water operations. Each is equally important and interdependent.

Leaders in the water sector are not necessarily water experts. They are decision makers, finance managers and administrators who depend on the expertise of technical professionals.

#### Professionalisation and training

Regulation 3630, gazetted on 3 June 2023, requires that water services

works be supervised by at least a Class V process controller. Professionals of this class and above must register with WISA, meet membership standards, and pursue continuous professional development (CPD). Lower classes must also continue education independently.

Yet there is resistance. Most process controllers work in municipalities and, despite having until 1 July 2025 to register, many have not. This stems from ignorance, budgetary resistance by decision makers, and reluctance from individuals themselves. Councillors and managers often oppose the relatively small training costs. Some individuals fear not meeting or maintaining the standard.

These concerns are misplaced – maintaining skills costs less than repairing failed infrastructure, and professionalisation is not an obstacle but a career enhancer.

#### A boon to the water sector

Regulation 3630 promotes accountability, transparency and performance – something many process controllers want. They are finally being acknowledged as professionals, like engineers and scientists.

The Blue Drop and Green Drop reports also show a direct correlation between municipal performance and capacity.

So yes, water investment is welcome, but people are just as critical as pipes and plants. South Africa must invest in both to secure water resilience.

I invite municipalities and process controllers to engage WISA, air their concerns and understand the real benefits of professionalisation. ●

# HARNESSING DATA FOR A *water-secure* FUTURE

From artificial intelligence (AI) and internet of things (IoT) to citizen science, integrating high-quality, real-time data into decision-making is vital for Sustainable Development Goal 6. Bridging science, policy, and communities ensures resilient, sustainable water management in the face of climate and resource challenges. **By Dr Harrison Pienaar, chairperson, WISA**

**F**ollowing the recent African Union–Africa Water Investment Summit 2025 in Cape Town: Third International Conference on Earth and Environmental Sciences 2025 (ICEES 2025) in Durban, a strong call emerged to enhance cooperation and strengthen institutional support mechanisms to achieve the Sustainable Development Goals, particularly SDG 6.

A central theme was the necessity for united, collaborative action and deep reforms to foster a resilient and water secure future. It is encouraging to see a strong focus on strengthening data and information systems to improve decision-making and to better track sector performance in relation to SDG 6.

### Data-drive approaches

Data and information linked to identified strategic water security support mechanisms (policy, technical and financial institutional interventions, as well as behavioural change programmes) still lack high-predictive accuracy. Therefore, data-driven approaches, like AI, machine learning (ML) and IoT architecture are becoming even more crucial.

Moreover, while the challenges of climate variability in water resource planning and infrastructure design are being studied, the lack of high-quality primary data in water risk assessments and management plans often leads to poorly informed decisions, particularly when scaling water security measures

in resource-constrained areas. The need for real-time data-driven adaptive AI frameworks as well as the integration (and interoperability) of large and often complex IoT is thus self-explanatory.

While demands for more systems-thinking frameworks and procedures by water utilities are equally gaining importance, data-driven approaches that translate large complex (and real-time) high-quality datasets into practical information is key for improved water resilience.

Over the past few decades, advancements in data collection techniques, digital platforms, decision-support tools, including increased awareness and need towards citizen science, have enhanced our ability to consider water security interventions in considerable detail.

Nevertheless, the value of such advancements remains inadequate unless these are effectively applied in decision-making. Data-driven approaches or frameworks thus highlight the dire need for water centres of excellence focusing on water security interventions that link science, engineering and technology outputs with stakeholder needs and priorities. Bridging this gap requires co-produced knowledge, data-driven approaches that take stakeholders into consideration directly, and iterative engagement processes that promote mutual knowledge, understanding and trust among water

science-engineering-technology (SET) practitioners, policymakers, civil society groups and local communities.

While water management networks are complex and challenging in nature, the development of integrated data-driven systems would enable faster responses to complex water management and operational needs, as well as supporting policy and business operating decisions through streamlined access to relevant high-quality (and fit-for-purpose) water use data. Harnessing data-driven approaches in water management is therefore key, as it further encourages decision-makers to embrace innovative technological solutions and tools that are crucial in achieving planned aligned to SDG 6. ●



# FUTURE READY SKILLS AND BOLD VOICES: YOUNG PROFESSIONALS

*spotlighted*

## AT NATIONAL YOUTH INDABA



The Young Water Professionals (YWP) of WISA hosted a workshop and participated in panel discussions at the Department of Water and Sanitation's (DWS's) National Youth Indaba.

**H**eld under the theme "Empowering Youth for a Water-Secure Future", the Indaba aimed to provide a collaborative platform for youth voices, innovations, and aspirations to help shape sector priorities and national development goals.

The purpose of the Indaba was to:

- Promote youth inclusion in shaping the water and sanitation agenda
- Identify and address gaps in skills, mentorship, and professional development
- Foster collaboration between government, industry, academia, and youth networks to support participation and leadership
- Create a safe, dynamic space for the youth to share their challenges, co-create solutions, and build strategic networks
- Highlight success stories and role models who are actively transforming the sector through innovation, resilience, and impact-driven work

### Future-proof youth skills workshop

Facilitated by Boitumelo Matshediso and Bomkazi Vava, YWP hosted a high-impact workshop that aimed to bridge the gap between academic preparation and real-world readiness in the water and sanitation sector. It

WISA Young Water Professionals at the National Youth Indaba (from left): Boitumelo Matshediso, Bomkazi Vava, Felicia Diale, Mariah Malatji, Tshireletso Madumo, Kgadi Makgakga, Craig Tinashe Tanyanyiwa

provided a platform for open discussion, storytelling, and peer-to-peer learning among students, graduates, and early-career professionals.

Bomkazi Vava conducted the opening presentation that highlighted the skills gaps facing young professionals and emphasised the importance of lifelong learning, adaptability, and mentorship. Vava also introduced practical strategies for staying relevant in a rapidly evolving sector shaped by technology, climate change, and policy shifts.

Boitumelo Matshediso joined other workshop facilitators in the main plenary to share reflections from the Dialogue Café. The recap highlighted:

- The honesty and vulnerability shown by participants
- Youth concerns around employability, representation, and recognition
- The need to transform institutional barriers into pathways for youth success

### Youth progress and panel discussion

Mariah Malatji and Lindiwe Nkabane gave a joint presentation on how the youth platform is progressing and the role young professionals continue to play in the sector. They shared some of the exciting work the youth have been involved in and encouraged continued participation and engagement. Craig Tanyanyiwa joined a panel discussion that focused on how to bring more youth perspectives into decision-making spaces.

The National Youth Indaba served as a powerful reminder of the energy, insight, and innovation that young professionals bring to the water and sanitation sector. Through workshops, honest dialogue, and active participation, the YWPs of WISA demonstrated that the future of the sector is not only in capable hands – but in bold,

determined, and collaborative ones. By investing in youth voices today, the sector is actively shaping a more inclusive, agile, and water-secure tomorrow. ●



Bomkazi Vava, YWP-Western Cape Lead, presenting on "Future-Proof Skills for Water and Sanitation Careers"



Opening day of the National Youth Indaba – Youth as Catalysts in Achieving SDG 6



Mariah Malatji gave a presentation on how the youth platform is progressing and the role young professionals continue to play in the sector

# COLLABORATE AND CONNECT:



## PARTNERSHIP AND POSSIBILITY IN THE WATER SECTOR

The WISA Gauteng Branch, in partnership with the University of South Africa (UNISA), hosted a Collaborate and Connect: Water Sector Career & Networking Day. The event brought together aspiring professionals, seasoned experts, and academic leaders, showcasing what the future of the water sector could look like.

**By Freddy Rasifudi, WISA-GP**

Opening the floor, Dr. Lester Godlman, CEO of WISA, encouraged attendees, “to approach your careers with more than ambition. You will need to lead by example and seek out wholehearted connections. Careers are built on more than just output, but on passion. The sector needs you. It needs your fresh ideas, character, questions, solutions, and ethical compass. Think of your career as a platform where your presence, not just your productivity, makes a difference.”

The water sector relies on the academic community for rigorous science, and Professor Vhangwele Masindi of UNISA provided reflections on the current state of South Africa’s water sector. Emphasising skills and ethics as a focal point for change.

### The job market

Artificial Intelligence (AI) is set to disrupt many industries, including water and Landry Matumbo from InspHired Recruitment Solutions says, “AI is a tool that can amplify your skills. The world is shifting, and embracing new technology and staying relevant is a matter of staying curious.” Speaking further on AI, Matumbo gave some practical examples of how AI is used in HR and how to best interact with it. “Your CV is no longer just read by a person; it’s scanned by a system. Make sure it’s clear, structured, and speaks the language of the job you want. Don’t rely on templates alone, customise what AI gives you and ensure you are reflected in your CV,” he adds.

Joyce Muya, also from InspHired Recruitment Solutions, added to Matumbo’s speech by guiding early career professionals on the importance of crafting a CV that speaks to the skills and capabilities of the individual.

Zoe Norton, WISA Gauteng Branch Lead, added to the conversation by emphasising interpersonal skills and preparedness. She says, “Success isn’t just about having the qualifications, it’s about knowing how to communicate your value clearly.”

Professor Mamokgethi Phakeng, Vice Principal of Research and Innovation at Unisa, extended the AI conversation, saying that if AI is becoming a necessary tool to navigate, then we can all benefit from upskilling ourselves in that department. She highlighted free courses from Microsoft and NetCampus, providing attendees with a direct and accessible starting point to begin their AI learning journey.

The event also encouraged those in attendance to speak to each other, as collaboration is a key tool in moving the water sector into the future. ●



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- 1 Dr Lester Bangs, CEO of WISA
- 2 Professor Vhangwele Masindi, UNISA
- 3 Landry Matumbo from InspHired Recruitment Solutions
- 4 Joyce Muya from InspHired Recruitment Solutions
- 5 Zoe Norton, WISA Gauteng Branch Lead
- 6 Professor Mamokgethi Phakeng

# TRAINING MAKES THE TECH WORK

The latest water solutions would go nowhere without the correct training. South Africa cannot afford to pour money into good technology without backing that technology up with skills.

**E**nsuring that people who operate their pumps are in the know, KSB Pumps and Valves has invested in a specialised training centre designed to equip internal and branch staff, as well as certified partners, with in-depth knowledge of KSB products and systems. Clients are also catered for with the provision of first-line maintenance and operator training

According to Craig Hawkins, who heads up the SupremeServ Academy, the initiative was started due to the growing need for skills development across KSB's service value chain, particularly in support of the company's broad pump portfolio. "Our academy is designed to arm our people and partners with the knowledge and skills needed to successfully repair, maintain, install and fault-find KSB products and related equipment. It also aims to ensure that end-users are educated in how to operate our pumps efficiently and reliably," says Craig.

He explains that the training offered at the SupremeServ Academy has been created to suit a wide audience, including artisans, technicians, engineers, sales teams, certified service partners and clients. It encompasses over 280 training modules, covering everything from basic pump theory, pump selection and industry-specific applications to

model-specific maintenance, value-added products like Pump-Guard and even site installation and set-up simulation training.

These modules vary in duration, ranging from one-day sessions to week-long courses and offer a blend of theoretical and interactive content depending on the needs of participants. While the Academy is currently not a profit-generating centre, course costs are structured to cover facilitator fees, training materials and related travel or accommodation expenses, particularly when sessions are delivered off-site.

"Knowledge is power, and by completing our courses our staff improve their skillsets and meet personal development goals. Certification also assures our clients that our work is being carried out by qualified professionals," adds Craig.

He continues that training is mainly held at the company's Jet Park-based facility, where a well-equipped lecture room accommodates up to 16 participants. The room features a Clevertouch screen, individual workstations, display models of pumps, components and amenities including tea, coffee and light meals.

Although still in its early stages, the academy has already hosted several successful courses, including SAPMA's advanced pump training and API



Craig Hawkins heads up the KSB SupremeServ Academy

standards overview. Upcoming sessions designed for specific industry personnel, such as for boiler water circulating pumps for our energy partners, are already scheduled.

Phase two of the Academy, which is currently underway, will include a dedicated practical workshop at KSB's SupremeServ Jet Park centre, allowing for hands-on training and product familiarisation. These sessions are tailored to needs and will also benefit field service teams who support critical installations such as power stations, water reticulation, the petrochemical, paper industry, as well as other industry sectors.

Internal training is coordinated through department heads, while its clients typically make contact via sales or contracts/projects teams, or directly through SupremeServ. ●

KSB SupremeServ Academy was established to provide knowledge and skills to people and partners needed to successfully repair, maintain, install and fault-find KSB products and related equipment





# BIG

## GREEN PUMPS &

## BOLD SOLUTIONS

Born as a Dutch company in 1959, the Verder Group is renowned for its signature green peristaltic hose pumps. With a global presence in 27 countries, Verder's South African operation – led by managing director Darryl Macdougall – brings innovative thinking and engineering to Southern African shores.



Darryl Macdougall, MD, Verder Pumps SA

**T**he Verder Group is underpinned by two divisions: Verder Liquids, a high-tech pump-manufacturing specialist, and Verder Scientific, a leading laboratory and analysing-equipment supplier. "Our divisions are two sides of the same coin. While Verder Liquids moves fluids, Verder Scientific measures them. And that gives us a position of offering end-to-end solutions – whether it's mining, where we have pump and laboratory offerings, or, e.g., in water treatment, where our pumps and test equipment go together perfectly."

"Our growth over the years has been driven by our commitment to innovation as well as the entrepreneurial spirit. Country managers are encouraged to run units like part of their own company, take calculated risks, and to innovate fearlessly," says Macdougall. "Globally, we have grown to over 2 500 employees, but we retain the flat organisations, streamlined processes, and quick decision-making of a company run by a family – lean and with a personal touch."

### Industry shifts

The pump market has changed dramatically over six decades. The new

systems are now incorporating smart systems, sensor systems, and artificial intelligence to build fluid-handling nerve centres out of pumps. "Today, the pump is part of a connected ecosystem," says Macdougall. "Sensors and analytics are employed for predictive maintenance, energy optimisation, and delivering our customers real-time remote performance information. That's a leap from yesterday's mechanical workhorses."

### Local solutions, global influence

Unlike the European configuration, with centralised warehouses and local offices to cover local sales, Verder Pumps SA operates as a nimble, independent business unit. "We keep stock, assemble locally and are free to respond quickly to our market's demands," says Macdougall. This philosophy has been especially successful in mining, but its implications go deeper. South African expertise helped design the internationally acclaimed Verderflex Dura pump range – evidence that it is a two-way stream of innovation.

South Africa's refurbish- and repair philosophy is another characteristic aspect. "Here, we specialise in pump refurbishment, boosting pump longevity

and encouraging a circular economy. Our European equivalents are following now," Macdougall goes on.

### Pumps for the toughest wastewater applications

The company offers a wide range of pumps for a variety of industries, and has recently launched the Verderflex Dura 100 that is well suited to the wastewater sector. It is part of the flagship industrial peristaltic hose pump range specifically developed to excel in water treatment, chemical processing, and high-density slurries. "The Dura 100 is an improvement on the reliable VF 100, but next-generation design and tech upgrades have been implemented," according to Macdougall. "Our Dura range is available to accommodate applications anywhere from very small 2.8 mm tube pumps up to 125 mm hose pumps – so we're actually covered in almost every circumstance."

But Verder goes further than peristaltic pumps. Their progressive cavity

pumps deal with viscous sludges, and Verderhus screw centrifugal pumps – intended originally to transport live fish – now are used in a modified configuration for foul and abrasive sewage mixtures. “Sewage contains a lot of sand and grit, so you need good abrasion resistance,” says Macdougall.

Verder’s diaphragm pumps – electric or air-operated – remain a stalwart in dosing and bulk chemical transfer applications. The product portfolio was further enriched when Verder acquired ITC, a specialist in dosing pumps based in Spain, enhancing their offering in agriculture and water treatment sectors.

The recent launch of the Verderflex Ds4F is a testament to Verder’s drive to go digital. The next-generation tube dosing pump is equipped with IoT connectivity, specialist software, and a choice of tubes – offering remote tracking and accurate dosing through any device. “Accurate

dosing is critical in wastewater to protect freshwater, reduce pollution, and ensure sustainability,” says Macdougall.

**After sales support**

Verder Pumps SA works closely with its clients to obtain the proper pump for every job. With its test bay, service centre, and in-house workshop, quick, specialist maintenance and repairs are always possible. With spare parts in stock for its most frequently used models, Verder Pumps SA minimises downtime and keeps things running smoothly – backed by sound service level agreements and responsive support teams.

For Macdougall, it’s finding innovative solutions and providing real-world products – we’re providing complete engineering solutions to several of the country’s largest problems. That’s what gets us excited every day.” ●



Verderflex Dura 100



Verderflex Ds4F



Dosmart pumps are stepper motor metering pumps with advanced control functions to accurately and efficiently automate the dosing of liquid chemicals



# VERDER

Pump solutions for water and wastewater treatment applications



# PRESSURE PERFECT: THE VALVE TECHNOLOGY THAT KEEPS PIPELINES *efficient and leak-free*

Valves are vital in water systems, controlling flow and access, preventing backflow, as well as managing pressure. Air valves specifically release trapped air to improve pumping efficiency and admit air to avoid vacuums, protecting pipelines from collapse while safeguarding the integrity of water and wastewater systems.

**D**ynamic Fluid Control (DFC), a leading valve manufacturer, is committed to developing innovative solutions that address real-world challenges. One such example was in America, where heavy fines for low pressure-related sewage leaks prompted the design of a new range of valves (RGXII).

### Low pressure sealing valves

Jonathan Suter, research and development engineer at DFC, says, "Our latest innovation, the RGXII low-pressure sealing valve can seal effectively at very low pressures to prevent sewage leaks." He explains that the RGXII is shorter, lighter and more buoyant with improved O ring seals than its predecessor and seals at pressures below 0.21 bar. "The result is low-pressure sealing without sacrificing high-pressure performance. The design is patented in America, Canada, the United Kingdom, Australia, and South Africa. In fact, the

low-pressure sealing works so well we are rolling it out on other models."

The initial focus was on a DN50 version that could seal effectively at less than 21 kPa. Following its success, the design was expanded to include larger sizes: DN80, DN100, DN150 and DN200. The RGXII concept also allows retrofitting into existing RGX bodies that use the original polyurethane lower floats.

Advantages over older and competitor designs include:

- Sealing at pressures as low as 7 kPa
- Improved lower float buoyancy from trapped air and increased float volume, resulting in low pressure sealing
- Shorter overall height for confined chambers
- Proven durability in sewage and wastewater environments'

"The lower height of the RGXII valve is particularly useful in underground closed valve chambers where chamber cover height restrictions are imposed. Its unique float cage allows for easy float extraction maintenance," explains Suter.

Isaac Mahlangu, technical analyst at DFC



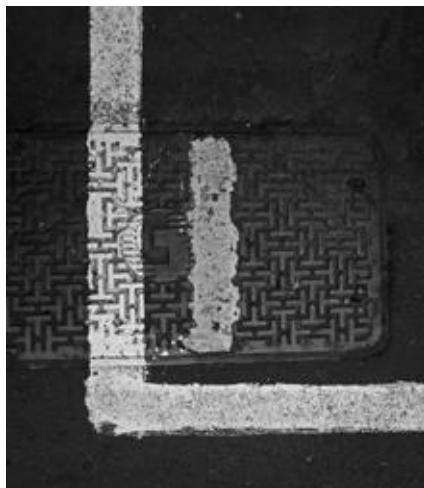
Jonathan Suter, research and development engineer at DFC



Furthermore, the anti-surge float technology is a pressure spike alleviation mechanism that protects the pipeline in the event of sudden air valve closure. The anti-surge or anti shock float does not



The RBX range is used for potable water applications



The turbulent conditions within sewage systems means that the anti-surge mechanism on the RGXii is put to work



The new low pressure RGXii was designed to meet real world concerns

fully close or slam shut when a sudden rush of fluid and air comes through the pipeline. The air valve continues to vent air through the small orifice while creating an air cushioned accumulator or gas spring that decelerates the fast-approaching fluid over a longer distance. It also ensures that the fast-moving liquid does not come to a sudden stop.

#### Feedback from real-world application

In South Africa, Siza Water, a water utility in KwaZulu-Natal, received the RGXII as part of their operations and report that, "Before partnering with DFC, we encountered challenges related to air accumulation in pipelines—leading to inefficiencies, pressure fluctuations, and increased strain on critical infrastructure. Traditional air valves required frequent maintenance and were prone to premature failure, causing operational disruptions.

From installation there has been 60% less interventions in terms of maintenance in 3 months, and the valves' 15-year lifespan puts Siza Water at ease.

#### Other valve applications

As the RGXII is designed for sewer applications, Isaac Mahlangu, technical analyst at DFC adds that for potable water applications, the company offers the RBX and RBXc (ast body) valves. "The RBX comes in a variety of materials, including stainless steel grades 304 and 316, duplex, super duplex, and materials suitable for seawater or brine applications."

Irrigation systems utilise RC and RPS valves, with the former featuring a cast iron body and the latter made from nylon 6 plastic, tailored for durability in diverse environments.

#### The problem with air

According to Mahlangu, air valves are vital because trapped air inside pipelines occupies space and this increases pumping time and energy costs. "Air is compressible, so you need to push harder to pump the water through your pipeline." Left unmanaged, this can lead to airlocks that disrupt flow and efficiency.

Beyond operational inefficiencies, the presence of air in pipes can encourage the growth of organic materials in pipelines that sometimes leads to corrosion.

To counter these issues, air valves are strategically placed at the highest points along pipelines where air naturally accumulates because air bubbles and pockets always move to the highest points. This makes these locations ideal for valve installation to ensure timely release and vacuum breaking, thereby safeguarding the system.

With pumps, valve arrangements are carefully designed for optimal performance. For example, with turbine or centrifugal pump setups, a non-return valve prevents backflow while an air valve promptly releases entrapped air to reduce turbulence. "You need to release air immediately from the pump," Mahlangu emphasises.

Sizing these valves correctly is critical. Unlike standard gate or butterfly valves that are sized based on pipe diameter, air valves must be sized based on their capacity to admit and release air. Using a 600 mm diameter pipeline with a flow of 424 litres per second as an example, DFC recommends an 80 mm valve size. The company provides detailed sizing charts available in their catalogues and online.

#### CATT Program

To assist engineers and designers, DFC has developed the Controlled Air Transfer Technology (CATT) software, a free, globally accessible program for precise valve sizing and placement. After registering, users input pipeline coordinates, fluid type, flow parameters, and pipe material into the software.

The program analyses the data and recommends optimal valve locations, considering critical factors such as the hydraulic gradient line, which affects valve function and prevents siphoning. Users can also manually input scour and isolation valves to tailor the system further.

"The software allows you to optimise your valve placement and produces detailed reports, including economic assessments and pipeline profiles," the representative explains.

"Valves may look simple," concludes Mahlangu, "but their design and placement are critical to keeping pipelines efficient, reliable, and protected from damage. That is why, beyond manufacturing and designing valves, DFC also provides technical support, valve repair, site audits, and training." ●

# INVISIBLE WARRIOR MAKES POSITIVE IMPACT IN DROUGHT BATTLE

When the taps of the Nelson Mandela Bay Municipality (NMBM) were perilously close to running dry, one of the most impactful lifelines didn't come from building a new dam or a flashy pipeline. It came from the flow of data through a new Telemetry-SCADA system.



Matthew Hills, engineer at Nelson Mandela Bay Municipality

“**D**uring the drought, Nelson Mandela Bay was struggling to balance on a water supply and demand knife edge. To cope with this, we had to be extremely agile and were constantly opening and closing valves, adjusting water pressures, and re-routing water to meet consumer demand. Coping with

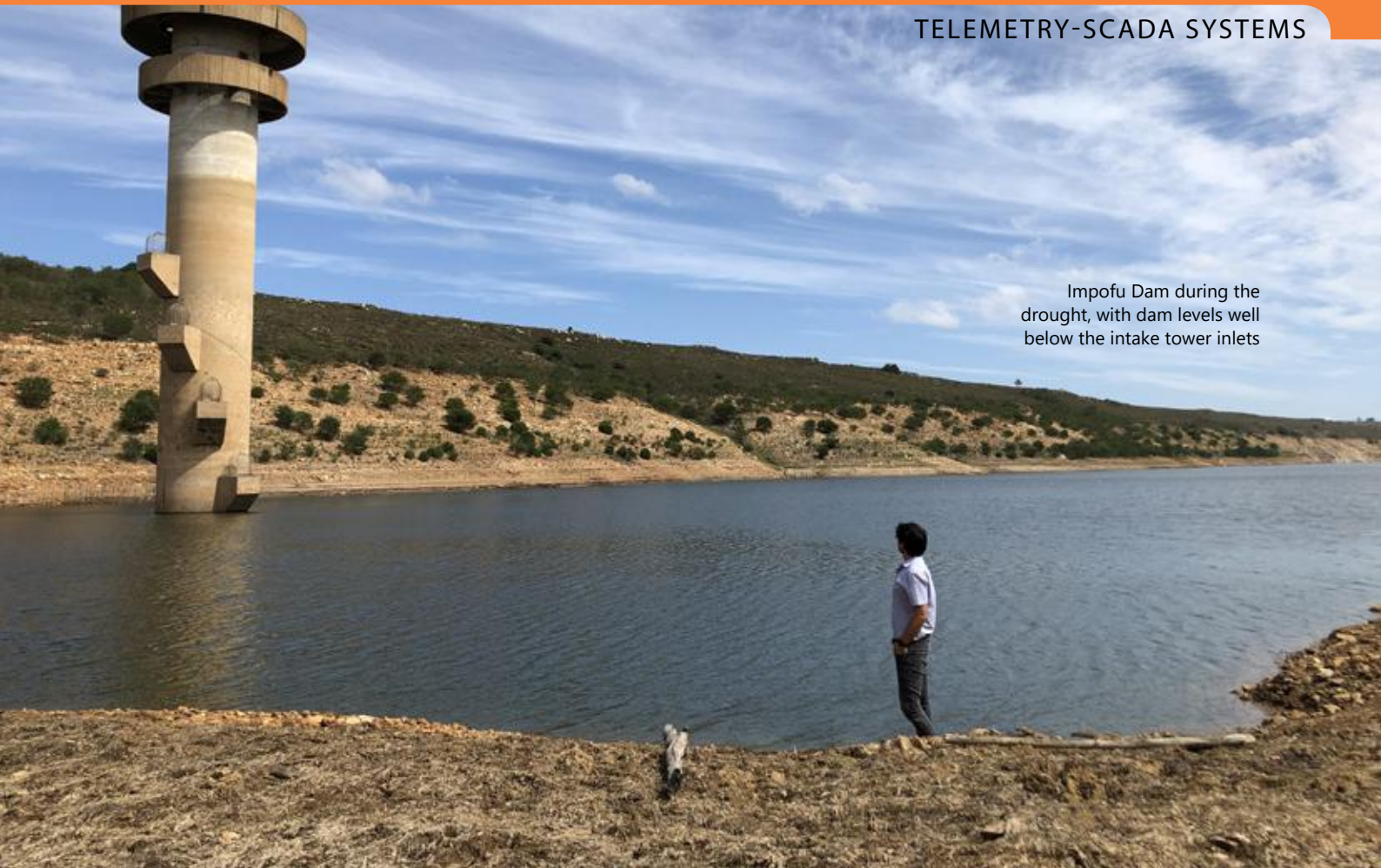
this challenging scenario called for a system that could remotely oversee and control the network while enabling fast, informed decisions and swift action,” explains Matthew Hills, Engineer, Nelson Mandela Bay Municipality (NMBM).

He adds that when reflecting on all of the NMBM's drought mitigation projects, it was the new

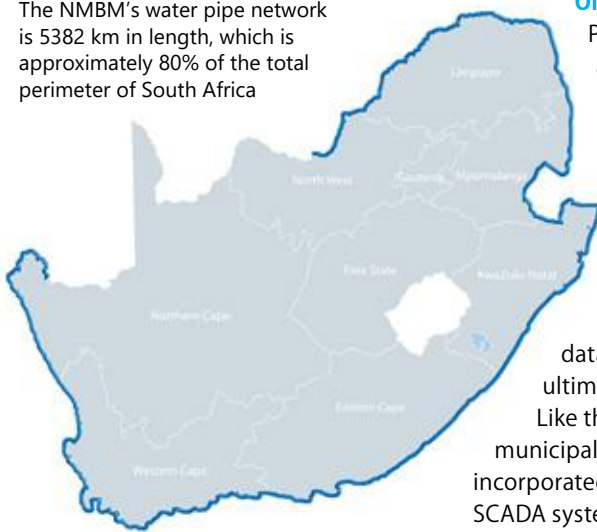
Telemetry-Supervisor Control and Data Acquisition (SCADA) system that made the most significant and positive impact. “The NMBM encompasses an area of 195 634 ha. We provide



Impofu Dam during the drought, with dam levels well below the intake tower inlets



The NMBM's water pipe network is 5382 km in length, which is approximately 80% of the total perimeter of South Africa



both bulk and distribution services and therefore have an vast and extensive water supply network. In fact, if our water pipes were laid end to end, they would be 5 382 km in length. That is equivalent to 80% of the total perimeter of South Africa's borders, both land and sea. Like most municipalities, we have limited human resources and do not have sufficient on-the-ground personnel to inspect and manage a network of this size effectively. Telemetry-SCADA systems are a creative engineering solution to overcome this complex challenge."

#### Old legacy system

Previously, the NMBM had a radio and microwave based system that was severely limited in terms of functionality, covered only a minor portion of the network, had communication that was notoriously unreliable, gave no confidence in the data it displayed, and was ultimately not very useful.

Like the NMBM, many other municipalities and water boards have incorporated some form of Telemetry-SCADA system, however, very few have become fully integrated into these entities for day-to-day operation and management of water supply systems valued at billions of rand.

Unlike the old system, the NMBM's new Telemetry-SCADA system has proven itself to be invaluable. "I immediately get a multitude of calls in those rare moments that the system is down, even if it is just a few minutes. Being able to remotely monitor and control the water supply system 24/7/265 has become essential to all staff within the water department."

"What I want other municipalities to take from this, is that implementing

a Telemetry-SCADA system in-house is completely doable. You don't need an army of specialised engineers or millions of rands in funding. You need someone to champion it, start small, and iterate. The NMBM is an example of this. Our system isn't theoretical – it's live, and it's working."

Hills explains that he documented his experience after the drought to share his approach to developing a Telemetry-SCADA system for a water department. He then went on to present a 12-step approach, practical and proven guide at the 2024 IMESA Conference in Cape Town so that others could follow to implement similar systems.

#### STEP 1: Operational technology (OT) is a separate system to your institutional information technology (IT)

A barrier to entry for many has been an organisational misunderstanding that a Telemetry-SCADA system is required to adhere to the institution's Information Technology (IT) policies. These policies are designed to protect an institution's network, including critical accounting and email systems, and therefore employ strong firewalls and an accompanying administrative process that is cumbersome to say the least. IT Departments within governmental

institutions are often short staffed and struggle to procure the most basic hardware and software. They don't always treat a Telemetry-SCADA system outage with the urgency it requires.

"The solution for the NMBM has been to classify its Telemetry-SCADA system as Operational Technology (OT), thereby exempting it from its IT Policy on the condition that the networks remain completely separated. OT includes the hardware and software used to detect or cause a change through the monitoring and/or control of equipment, devices, processes, and events (National Institute of Standards and Technology, 2024). A Telemetry-SCADA system meets that definition. This gives the water and sanitation department a sense of ownership and responsibility for the system," explains Hills.

**STEP 2: Packaging of data starts at the on-site Programmable Logic Controller (PLC) and linked devices**

A PLC is a rugged and industrial form of computer that acts as the brains of the electronics. It's the piece of equipment that reads information from sensors and devices, and then issues instructions and/or commands in return based on a set of programmed rules. By way of example, it's the intelligent box that tells a motor to turn off once the reading from the temperature sensor exceeds the maximum heat limit.

What information is stored within the memory of the PLC is the first building block of a Telemetry-SCADA system. Ideally an institution will issue a set of PLC function blocks, a technical name for lines of computer code, for each type of equipment used within its water infrastructure. This will ensure



Cellular networks were used for bi-directional communication and reliability

that the quantity and quality of data available will be easily integrated into upstream systems. It is here that information begins.

"Today, over 20 000 data points from pipelines, boreholes, pump stations, and treatment works are fed into the Telemetry-SCADA system every ten seconds," adds Hills.

**STEP 3: Build a network that allows full control of site connections**

All of the sites as well as head office must be linked to each other on a network so that they can communicate with one another. In technical terms, this is done by adding all sites to a Virtual Local Area Network (VLAN).

Instead of using a VPN service provider, which can prove complicated when it comes to sole-provider procurement, the NMBM has taken control of its OT network by purchasing a perpetual license for a gate manager. A gate manager is a device that enables the connection to and communication with multiple devices on a network.

The Secomea Gate Manager was selected as its locally stocked SiteManager devices automatically take care of network addresses changing and their user-friendly access portal for adding devices to the network. For sites

where the electricity grid is unavailable and thus need a battery based system is required, the Cloudworks Server package was selected as it was provided free of charge when purchasing their battery powered devices.

**STEP 4: Use the cellular network for bi-directional communication and reliability**

The NMBM's legacy telemetry system made use of an institutionally owned and operated radio and microwave communication system. Although the coverage was great, frequent vandalism and theft of tower equipment (and once even the whole tower structure itself) often led to extended network blackouts. Another major limitation was the limited bandwidth available, severely restricting the volume of communication traffic.

The chosen way forward was to migrate to the cellular network. Cellular network operators are highly motivated to keep their networks online as they earn revenue for the traffic hosted by their networks. The reliability and coverage of the cellular network was the primary motivator behind the migration. The secondary being that the high-speed bandwidth would allow the NMBM to work on PLCs remotely.

One of the disadvantages of the cellular network is that SIM cards normally have a dynamic Internet Protocol (IP) address. Every time it switches connection to a different cell tower, and sporadically even if it stays connected to just one cell tower, the IP address of the device changes. This makes it extremely difficult to "find" a PLC on the internet, as its "location keeps moving".

The alternative is to pay an exorbitant amount to a cellular provider to issue you with static IP SIM cards, thereby

Packaging of data starts at the on-site Programmable Logic Controller (PLC) and linked devices



fixing their address on the internet. Both the Secomea GateManager and Cloudworks Server were also chosen as they handle dynamic IPs automatically. In fact, they work independently of whichever SIM cards are in the device. This means that if the institution changes cellular service providers, switching device SIM cards will not require any additional setup.

#### STEP 5: Build redundancy into hardware infrastructure by including backup power generation

An Uninterrupted Power Supply (UPS) and backup power generation, usually in the form of solar or a generator is needed for servers at head office. It is expected that a Telemetry-SCADA system is operational 24/7/365 with an uptime exceeding 99%.

“What was overlooked initially was the need for backup power for our PLCs at each site. When a site experienced a loss of power supply, all too frequently during loadshedding, we would lose communication instantly and have no means of diagnosing the fault or issuing commands to equipment,” warns Hills.

Installing a backup battery system for PLCs is essential for understanding what is happening on site once the electricity grid goes out.

#### STEP 6: Elect for an open-source protocol

A major gripe with the NMBM’s legacy telemetry system was that the transmission of data in 1’s and 0’s from site to head office was in a language that the team could not understand, known as a closed protocol.

“This meant that we were “locked in” to a specific service provider and their proprietary equipment. Procurement in local government is complicated enough without having a sole service provider,” comments Hills.

Stipulating the use of an open protocol was a non-negotiable for the NMBM as the institution wanted to take back ownership of its communication network and pay zero royalties.

For the pull open protocol, whereby head office asks each site PLC for data at set intervals, MODBUS was selected and for the push open protocol, whereby the site PLC sends data when it deems it necessary for head office to know about, DNP3 was selected. Although DNP3



A user friendly system encourages operator usage

can significantly reduce the amount of unnecessary data on the network (think of a borehole level probe telling you a reading of 10.78 m every ten seconds for a whole month), it has proven complicated to implement at driver level and thus mainly MODBUS has been used to date with the aim of moving to DNP3 in the future.

#### STEP 7: Stipulate a tag naming convention so that information is logically stored

All the information being retrieved from site PLCs needs to be stored in a logical order.

“We developed a standard tag naming convention that designates a unique reference title to each piece of data. A maximum of twenty-nine characters in the following format was specified. This has made it simple to search through a large database when requesting some data, but also permitted the organised sorting and post processing of all information being retrieved,” adds Hills.

The NMBM’s tag naming convention is defined by the following standard:

UUUU\_VVVV\_WWW\_XXX##\_YYY##\_ZZZ  
where:

UUUU=Department

VVVV=Site

WWW=Process

XXX##\_=Work Unit

YYY##\_=Equipment

ZZZ=Signal

“This standardisation has made it simple to search through a large database when requesting some data, but also permitted the organised sorting and post processing of all information being retrieved,” he says.

#### STEP 8: Instil a consistent look-and-feel by developing standard icons, graphics, and colours

The NMBM has put a lot of time and effort into a from-the-ground-up redesign of the Graphical User Interface (GUI).

Complaints from users of the previous Telemetry-SCADA system often included that it was not “visually appealing” and that it “lacked a consistent look and feel” in terms of navigation and icons. Standardisation of the icons, graphics, and colours to follow a clear “situational awareness” display philosophy was thus developed. Situational awareness aims to only attract operator attention to sites requiring user action, a reservoir overflowing for example.

A template graphic form that separated the screen into four distinct areas created a consistent look and feel when navigating between different sites. Custom icons, in a vector file format, were created to represent each type of equipment within the water network. Even the colours used were standardised, with particular effort into choosing the graphic form background colour to be an off-white so as to minimise eye fatigue of the operators staring at it for extended

WTWK_COEG_FNW_PST02_TT#01_TMP						
DEPT	SITE	PROC	WORK		EQUIP	SIGNAL
UUUU	VVV	WWW	XXX	##	YYY	##
WTWK	COEG	FNW	PST	02	TT#	01
						ZZZ

Coegakop WTW Final Water Pumpset No. 2 Motor Drive-End Bearing Temperature

An example of a tag name for a temperature reading from a motor bearing.



Implementing a Telemetry-SCADA system to remotely oversee and control a water supply system can be done

periods of time, particularly at night. A dark-mode is further improving user comfort. By implementing consistent design standards, the system as a whole is easier to work on and the owner benefits by way of reduced maintenance costs.

#### **STEP 9: Develop a security matrix and define access and control permissions for groups of users**

“In hindsight, a security matrix that clearly defines the functionality and available control for specified user groups should have been the first step taken in this redevelopment of the Telemetry-SCADA system. One does not want a junior employee to be able to turn pumps on (plant control) or lower the free chlorine targets of a water treatment works (change setpoints). It further allows for a full audit trail of each users interaction with the Telemetry-SCADA system, essential for reviewing response times to alarmed events and actions taken.” states Hills.

#### **STEP 10: Allow for secure remote system access of mobile devices through a web hosted address**

The NMBM has a Water and Sanitation Operation Centre staffed 24/7/365 that takes responsibility for executing system alterations based on a set of Standard Operating Procedures (SOPs). The management of this fall within each division head, mainly the Water

Distribution and Plant Maintenance divisions. A need arose for these division heads, senior management, key stakeholders, and support staff to be able to securely access the Telemetry-SCADA system remotely from their mobile devices and laptops.

A Secure Mobile Gateway (SMG) server was thus hosted on-premise with an opensource certificate manager to ensure a secure and protected connection. Through this, one can use any web browser, like Google Chrome (Windows/Android) or Safari (iPhone), to access the Telemetry-SCADA system by navigating to a website through a URL. A username and password prompt ensures no unauthorised access.

#### **STEP 11: Feed data into asset management systems to encourage proactive maintenance**

The NMBM’s IT Department supported the development of the water OT system on condition that it remain isolated from the IT system. There has since been only one exception made to this rule; a single, highly secure point of access between the vast amount of information stored by the Telemetry-SCADA system on a Microsoft SQL database and the NMBM’s Water and Sanitation asset management system. Operators of the asset management system are able to send queries to the SQL database at predefined times for select data. This has tremendously improved the departments’ ability to timeously submit International Water Association (IWA) reports to the Department of Water and Sanitation (DWS), the standard water balance to evaluate the performance of water distribution systems. It has also improved on the planning of proactive maintenance based on quantifiable equipment health metrics.

#### **STEP 12: Integrate into non-revenue water and billing workstreams**

A recent investment into water conservation and water demand management by the NMBM has led to the establishment of numerous Greater Metered Areas (GMAs), District Metered Areas (DMAs), and Pressure Managed Areas (PMAs). The zones of supply connected to these meters can be measured and then compared to the total billed volumes within that same zone. This allows the NMBM to focus its efforts to reduce Non-Revenue Water (NRW) by targeting zones with the highest

disparity between the two figures. The Telemetry-SCADA system has automated these investigations, providing real-time and continuous data for analysis and actioning. Two secondary benefits have been the ability to collect data on nighttime flows and data on maximum pressures supplying each zone.

#### **Conclusion**

While many municipalities and water boards have been sold white elephants in the form of over-engineered, underutilised Telemetry-SCADA systems, the NMBM’s journey proves that success is entirely achievable.

Developed in-house, led by a champion, and built iteratively with end-users in mind, the Telemetry-SCADA system has become an essential backbone of the NMBM’s water supply system operations. It is living proof that with the right approach, a Telemetry-SCADA network can be one of the most powerful tools in a municipality’s arsenal – improving responsiveness, enhancing resilience, and ultimately delivering better water services to communities.

“In local government, we’re here to serve people,” Hills concludes. “If we can deliver water more efficiently, more reliably, and more sustainably – then we’re doing our job. And if I can share my learnings and help other cities do the same? Even better for all South Africans. We are willing to share our documentation and standards with other government entities provided that collaboration continues into the future, thereby ensuring that the partnership is mutually beneficial.”

A paper presented on above at the 2024 IMESA Conference in Cape Town won the award for Best Paper by an IMESA member. ●

### **SECRETS TO A SUCCESSFUL TELEMETRY-SCADA PROJECT**

- 1.** Select a “champion” to lead the project.
- 2.** Start small with pilot projects.
- 3.** Accept that it will be an iterative development process.
- 4.** Standardise and document everything!
- 5.** It is only as good as the time and effort put into it.

# GEARED MOTORS: built for tough water applications

Innomotics geared motors are designed to provide reliable performance, efficiency, and adaptability across industries, from manufacturing and mining to water treatment. Their focus on precision engineering ensures smooth operation, reduced energy use, and long service life.

**B**uilding on Siemens' legacy of 150 years of engineering excellence and innovation, Innomotics offers a portfolio of leading motors, drives, converters, programmable logic controllers, software and other engineered solutions.

## Local presence

Innomotics has established a strong and growing presence in South Africa, centred on its operations in Midrand, Johannesburg. The company recently opened an assembly centre, dedicated to producing and distributing geared motors and low-voltage motors. By assembling units locally, Innomotics is able to shorten lead times, improve product availability, and better serve industries that rely on dependable drive solutions.

The regional headquarters, also based in Johannesburg, employs specialists who provide electrical, automation, and digital solutions tailored to local industry needs.

## SG Geared Motors

The new Innomotics SG Geared Motors offer great flexibility due to a wide range of gear units. Suitable for horizontal and vertical applications the geared motors also have a compact design and are

engineered to cover a broad spectrum of torque requirements with precision, giving operators more choice and optimised performance for specific processes.

Gearboxes can be combined with a wider range of motors using the Totally Integrated Automation (TIA) Selection Tool. This digital platform makes it simple to configure a complete, all-in-one package, with every motor combination automatically validated for mechanical, geometric, and thermal compatibility. The result is a tailored solution that is not only reliable and efficient but also quick to order and deliver, streamlining the entire procurement process.

By blending durability, performance, and digital integration, Innomotics geared motors set a new benchmark for drive solutions in demanding environments. ●

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# INNOMOTICS

# JOHANNESBURG WATER

## *and water-efficient sanitation*

Aligning governance, technology and budgets is proving essential to deliver water-efficient sanitation that saves money while restoring dignity.

**S**peaking at a Bremen Overseas Research and Development Association (Borda) event, Dr Zakhele Khuzuwayo, manager: Innovation and Technology, Johannesburg Water, said the sector must “stop working in silos” and align across public, private and academic stakeholders.

### City of Johannesburg perspective

JW is a Municipal Owned Entity with CoJ as its sole shareholder. While technically separate, Khuzuwayo says the entities are “intrinsicly linked” — when JW succeeds, CoJ succeeds; when JW struggles, the city is seen to share those problems.

He further explains, “Johannesburg Water faces a tough balancing act: delivering services to a growing population with a constrained budget, while also providing free basic water and sanitation to indigent households. Our challenge is not just money, but how we manage it. Every rand saved through technology and innovation is a rand that can stretch further.”

### Sanitation pilot projects

This is where technology and innovation come into view, with piloting projects done over several years that pave the way forward. “We are past the pilot stage. Our focus now is embedding water-efficient sanitation solutions (WESS) into the mainstream budget and operations of the city. If a pilot is successful, you don’t stop there – innovation must be integrated into service delivery.”

Dr Zakhele Khuzuwayo, manager: Innovation and Technology, Johannesburg Watermanager: Innovation and Technology, Johannesburg Water



Khuzuwayo emphasises that leadership and governance are just as critical as technical solutions. Illegal connections, informal settlements, and non-revenue water remain major challenges, and these cannot be solved by engineers alone. “We need the right people in the room – finance officials, municipal leaders, regulators – to make decisions that stick. Engineers can design, but only leadership can align governance, budgets and service delivery.”

Something Dr Khuzumayo points out is that whenever technical workshops

and events are taking place, high-level decision makers are absent from the room. JW makes a point of sending senior management to these events because the decision-making power lies with them. “If the problem lies with municipalities, and we want to address all 257 of them, why are only two or three showing up? Water-efficient sanitation solutions (WESS) will die if only two or three municipalities take it seriously.”

### WESS

Water-efficient sanitation solutions are a huge priority for JW and CoJ, but it has laboured under a different name before. “When the technology came to focus as Non-Sewered Sanitation (NSS), we had a lot of explaining to do, and we lost a lot of ground, because this transformative tech was packaged badly. When we refer to WESS, it’s simple to grasp, and I do believe we lost a lot of mileage to NSS because people understand ‘water’ and ‘efficient’.”

Alternative sanitation and WESS are usually treated as separate from water operations, and Dr Khuzuwayo says, “By separating these, we make innovation seem like a separate thing, but the point of innovation is to aid in the day-to-day. We must, as a starting point, integrate innovation into the daily delivery.” He explains that this creates a separate market for newer technologies, where there is already money and funding for daily delivery. “If we improve our sanitation through innovation, we need to include innovation in our normal budget.” ●

A successful pilot project in Slovoville has been operational since November 2021



# WASTEWATER MONITORING SAFEGUARDS WATER QUALITY AND INDUSTRY COMPLIANCE

With stricter environmental regulations and mounting pressure to protect aquatic life, accurate wastewater monitoring has become a priority for both municipalities and industries. Hach, a global leader in water analysis, is helping South African sectors meet these demands with innovative testing solutions and trusted local support.



**C**OD testing measures chemical oxygen demand, which is the amount of oxygen required to chemically break down organic and inorganic matter in water. It shows how much pollution (especially organic waste) is present in wastewater.

“COD has traditionally been a critical parameter in municipal water and wastewater treatment, but it is now attracting greater focus from industrial treatment plants,” says Kagiso Ramoadi, regional sales manager at Hach. He notes that nitrates, ammonia, pH, conductivity, and turbidity are also essential indicators for effluent monitoring.

To meet these needs, Hach provides a full spectrum of testing options. Portable meters allow technicians to measure parameters like ammonia and nitrates in the field, while bench-top equipment is geared toward laboratories conducting accredited analyses. For larger facilities such as municipal plants and production sites, online monitoring systems enable continuous oversight before effluent is discharged. Traditional test kits remain an option for cost-sensitive users. “While they may not offer the same level of precision as advanced bench-top instruments or continuous online analysers, test kits serve as an important first line of monitoring,

giving operators a rapid indication of water quality,” states Ramoadi.

#### A history in wastewater testing

“Hach has been a pioneer in accurate COD testing. We have decades of experience in testing effluent. And that knowledge translates into reliable, tailored solutions for every sector. Our global footprint ensures access to expertise across regions. Our brand is trusted because we don’t just sell equipment – we provide ongoing support,” he adds.

That support extends from Hach’s South African office in North Riding, which has operated for more than 30 years. The facility includes a technical workshop to repair and refurbish instruments, backed by a network of channel partners across the country and neighbouring states. Clients benefit from free training, regular webinars, and the guidance of sales engineers who ensure that equipment specifications match real-world needs. “Our clients have technical backup from the moment they enquire about a product to decades after the sale is concluded and they are looking to upgrade,” states Ramoadi.

“Water is something that affects us every day, and Hach is playing a pivotal role in protecting the quality and quantity



Kagiso Ramoadi, regional sales manager, Hach

of water. We are a well-known, well-respected brand that is dedicated to making water analysis better – faster, simpler, greener and more informative – so you get it right the first time, every time,” concludes Ramoadi. ●

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# NEW RESILIENCE

## *in water storage*



The Rhino Tank is steel bolted and finished with Fusion Bonded Epoxy (FBE) coating, making it highly durable

**A**quadam, a steel tank and water storage solutions company, has taken these needs into account and produced the Rhino Tank. This tank is durable, efficient, and built with the long term in mind.

The Rhino Tank is a bolted steel tank enhanced with a Fusion Bonded Epoxy (FBE) coating. This coating is thermally bonded to the steel surface, creating a seamless, corrosion-resistant barrier that significantly extends the tank's lifespan. The result is a product that exceeds industry standards for durability and performance.

### **Built for harsh environments**

The African market demands durability, and the Rhino Tank is manufactured to withstand extreme conditions. Between the high heat of mining operations and the corrosive atmosphere of industrial zones, the Rhino Tank maintains its structural integrity and performance. Its impact-resistant design ensures that it can endure on-site handling and accidental damage without compromising its functionality.

This resilience makes the tank primed for use in sectors such as mining, agriculture, and manufacturing, where water storage systems are exposed to harsh chemicals, fluctuating

temperatures, and mechanical stress. The Rhino Tank's FBE coating provides chemical resistance, making it suitable for storing not just potable water, but also effluent and other industrial liquids.

### **Efficiency in installation and operation**

Unlike welded tanks that require extensive on-site labour and equipment, the Rhino Tank's bolted panel design allows for rapid assembly with minimal disruption. This modularity not only reduces installation time but also enables easier transportation and relocation, an invaluable benefit for remote or temporary sites.

Moreover, the tank's low lifecycle cost is a major advantage for budget-conscious projects. Its long design life, combined with minimal maintenance requirements, translates into significant savings over time. For municipalities, NGOs, and private enterprises alike, the Rhino Tank offers a compelling case for sustainable infrastructure investment.

### **Customisation and aesthetic integration**

Recognising that functionality should not come at the expense of aesthetics, Aquadam offers the Rhino Tank in a

In a world increasingly defined by the need for sustainable infrastructure and resilient systems, water storage has emerged as a critical component of industrial, agricultural, and municipal planning.

variety of colour options, including green, desert sand, blue, red, and brown, at no additional cost. This allows the tank to blend seamlessly into its surroundings, whether in urban, rural, or industrial settings.

In addition, Aquadam provides a comprehensive range of optional accessories, such as:

- Roofing systems
- Access ladders and staircases
- Rest and working platforms
- Walkways and safety railings

These enhancements not only improve usability and safety but also allow clients to tailor the tank to their specific operational needs.

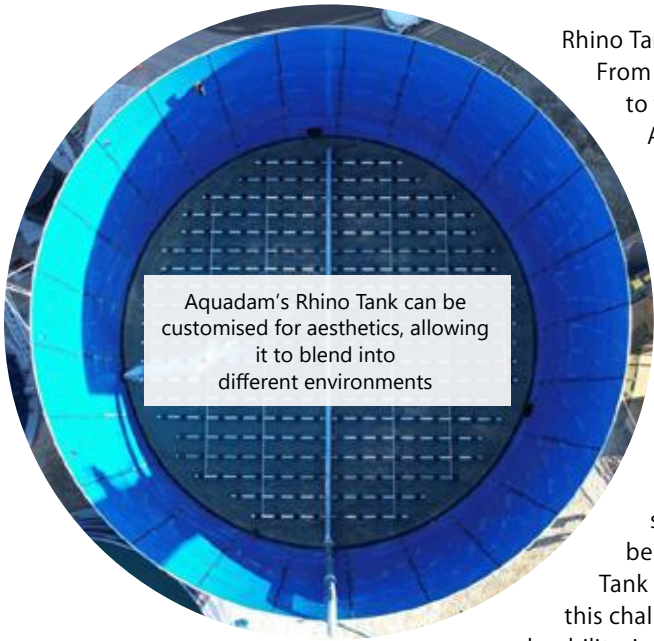
### **Sustainability and environmental stewardship**

In an era defined by environmental considerations, the Rhino Tank is free from volatile organic compounds and offers long service life, reducing the need for frequent replacements and minimising waste.

Furthermore, by enabling efficient water storage and management, the Rhino Tank supports broader sustainability goals such as rainwater harvesting, drought resilience, and water conservation. For communities facing water scarcity, the Rhino Tank can be a lifeline, providing reliable access to clean water in times of need.

### **Applications across industries**

Its adaptability ensures that whether the need is for a 50 000 litre tank on a farm or a 12-million-litre tank in a mining operation, the Rhino Tank



Aquadam's Rhino Tank can be customised for aesthetics, allowing it to blend into different environments

Rhino Tank installation is a success. From initial consultation to final commissioning, Aquadam works closely with clients to deliver tailored solutions that meet both technical and budgetary requirements. As global water challenges intensify, the need for robust, efficient, and sustainable storage solutions has never been greater. The Rhino Tank by Aquadam rises to this challenge with unmatched durability, innovative design, and proven performance.

delivers consistent performance and reliability.

Aquadam's commitment to quality assurance, technical support, and after-sales service ensures that every

Whether you're managing a large-scale industrial operation or planning a community water project, the Rhino Tank offers peace of mind and long-term value. ●

THE R.H.I.N.O. ADVANTAGE

Aquadam's R.H.I.N.O branding is an acronym that highlights the features of the tank itself.

**Robust:** Engineered with high-grade mild steel and precision-fabricated panels

**High-Integrity:** Designed with rigorous quality assurance protocols

**Innovative:** Incorporates advanced coating technologies and modular construction

**Nano-Overcoat:** Features a nano-level epoxy coating for superior protection

**Optimised:** Built for long-term performance and cost-efficiency

This holistic approach to design ensures that every Rhino Tank delivers maximum return on investment through reduced maintenance, longer service life, and lower total cost of ownership.

# RHINO TANK



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Built for **Generations.**

Rhino Tank is the new standard in wastewater containment, engineered with fusion-bonded epoxy coated steel for superior corrosion resistance, structural strength, and long-term reliability.

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# Oil water separator

## DESIGN AND SIZING DEMYSTIFIED

Many still view oil water separators as simple concrete boxes, but evolving regulations and technology demand far more precision. Proper classification, correct sizing, and awareness of site-specific risks are essential. Without this, operators risk non-compliance, flooding, or costly retrofits.

A new design mindset is urgently required.  
By Justin Kretzmar, sales engineer, Rocla

**T**he design and specification of oil/water separators often falls into a 'no man's land' wherein there is a vast lack of understanding and appreciation towards different type and size systems along with the intricacies of incorporating these into specific site requirements. Indeed, while some sites might be similar, no two sites are alike and what might have been the solution on one project cannot be blindly applied to another.

On new design-and-build projects, design of the oil separator is usually included in the engineering scope and addressed accordingly and correctly, typically after consultation with suppliers in the industry to discuss and confirm product specification, design and availability. However, retro-fit installations fall through this net and are driven by either the property owner, tenant or a small contractor, looking to "do the right thing" where we are asked to "quote on an oil separator" without any thought or indication as to the type and size required. Unfortunately this is often followed by "just your smallest and cheapest unit will be fine."

In South Africa, many engineers and municipalities still view oil water separators as old concrete box, gravity-fed systems. Until recently, some municipalities even issued 1970s hand-drawn sketches as standard designs, with



no reference to site-specific sizing or modern requirements. Technology has advanced, and with rising contaminant volumes from industry, all stakeholders must adapt and raise their standards.

### Standards and bylaws

SANS 50858-1-2002 [Part 1: Principles of product design, performance and testing, marking and quality control] defines CLASS II separators as having a "Maximum permissible content of residual oil" of 100 ppm whilst the newer CLASS I separators are restricted to a maximum of only 5 ppm contamination passing through the system. This code allows a bit of relaxation when physically testing separator systems by stating that "No individual sample shall have a higher value than 10 mg/ℓ for CLASS I or 120 mg/ℓ for CLASS II".

### SIZING FORMULAE

Before finalising flow rate, six key factors must be addressed:

- 1. Application** – Workshop, wash-bay, parking runoff. Municipal bylaws and SANS 50858-2-2003 provide guidance on which CLASS is permitted and where discharge can go.
- 2. Spill risk** – Every separator has a maximum oil storage capacity. A small unit may handle daily traces but fail catastrophically during a major spill, such as a ruptured transformer releasing 2 000 ℓ of oil. Closure devices will shut outlets when capacity is reached, risking flooding. In high-risk areas, upstream bunding or flow-restricted closure valves are recommended.
- 3. Indoor vs outdoor** – Stormwater can create far higher flows than actual wastewater, overwhelming the system. For example, two pressure cleaners might produce <2 ℓ/s, but a 1:20 year storm could exceed 10 ℓ/s.
- 4. Stormwater catchments** – Designers must not ignore stormwater from other site areas. "Clean" water should be diverted away, preventing unnecessary upsizing of separators.
- 5. What can be separated** – These systems treat light liquids below 0.95 SG (petrol, diesel, mineral oils). Emulsified oils, fats, grease, or solids need specialised treatment.
- 6. Flow rate formula** –
 
$$NS = (Qr + fx \times Qs) fd$$
  - NS = nominal size (ℓ/s)
  - Qr = stormwater flow rate (ℓ/s)
  - Qs = wastewater flow (ℓ/s)
  - fx = impediment factor (e.g. 2 for industrial effluent)
  - fd = density factor for the liquid

Municipal bylaws, however, typically allow up to 10 ppm separation which is a factor of 10x lower than the expected separation achieved from a CLASS II system. So, even though TABLE B.1 of ANNEX B of SANS 50858-2-2003 [Part 2: Selection of nominal size, installation, operation and maintenance] provides for configurations that include CLASS II separators with TABLE B.2 stipulating which type separator can discharge from what type installation and into what type municipal network, public sewer or stormwater, both regulations and bylaws must be cross referenced with the stricter requirement being addressed.

As per same TABLE B.2, in some instances and due to their vastly superior filtration capacities, discharge from a CLASS I separator can be fed directly into stormwater networks whilst CLASS II separators, when acceptable for use, may only discharge to the public sewer network.

Once the design team have established which CLASS separator is relevant, based on available discharge network Vs contaminant and if CLASS II will suffice then the unit can be sized based on flow rate, required retention time and resulting overall volume. For a full retention system, ie one where the collection of silt and oil are combined into the same unit, available storage volumes of each of these must also be considered in the calculations.

In comparison, CLASS I separators are easier to size as the suppliers list the flow rate capacity (ℓ/s) of each unit. All other calculations have already been taken into account such that the designer simply needs to scroll down the list to find the relevant system and spec accordingly.

**fd = density factor for the liquid**

For liquids  $>0.85$  SG, CLASS II units must be oversized compared with CLASS I. For example, a calculation producing 6 ℓ/s might require 12 ℓ/s in CLASS II but only 9 ℓ/s in CLASS I. This often makes CLASS I smaller and cheaper overall.

**Example:** A workshop and wash-bay using three cleaners ( $<1$  ℓ/s each) plus a 400 m<sup>2</sup> outdoor area subject to 50 mm/hr rainfall. With effluent density 0.85–0.9, the design results in  $\sim 12$  ℓ/s capacity required.

**Accordingly, you will often find that the CLASS I separators can be smaller than the CLASS II unit for the same site.**

ROCLA's new range ESK-Z Lamella Oil Separators from ecol Unicon can treat 100 ℓ/s flow by means of 2 x 50 ℓ/s systems each requiring an oil separation tank of only 1500 mm internal diameter x 2.7 m deep. So, at the outset, when a CLASS II unit might be deemed the most cost effective option, on closer investigation, the better CLASS I system might work out cheaper overall due to space, materials and labour savings.



Additionally, CLASS II separators have minimum requirements for surface area ( $A_{min}$ ), total volume ( $V_{min}$ ) and light liquid storage volume ( $V_{1 min}$ ), all defined as a ratio to NS (overall volume).

Generally to treat waste water (trade effluent) from industrial processes, vehicle washing, cleansing of oil covered parts or other sources, e.g. petrol station forecourts take note that we apply a factor of 2 for ( $f_x$ ) to what is considered contaminated flow – so flow directly from the operation as opposed to storm-water which is not subject to this loading factor.

• **So to summarise this into an example:**

Let's consider an operation that has an undercover and enclosed workshop alongside same layout wash-bay. Coupled to this and directly in front of these two work stations is a "holding area" where vehicles can be washed/worked on. It is assumed that

there will be a division of stormwater flow between this holding area and the balance of the site with separate catchpit channels / slopes collecting the "clean" rainwater from elsewhere, discharging it accordingly and the potentially contaminated stormwater from the vehicle holding area.

The washbay will have 2 x high pressure water cleaners and the workshop, one. These same cleaners will be used to wash the outside holding area as and when required. So the worst case scenario here would be that both the washbays are

operational together with the workshop hosing down their space, all during a rain-storm.

The water jets will be assumed to be less than 1 ℓ/s each such that all three must be considered at 4 ℓ/s in total. As per the formula, this contaminated flow must be subject to a safety factor of 2, resulting in 8 ℓ/s for this part of the site.

Let's not get into specifics for the storm-water but using a rainfall event of 50mm/hour or 139 mm/s.ha and an outdoor holding area of 400 m<sup>2</sup> give us 6 ℓ/s stormwater flow to be considered.

We will assume light liquid density between 0.85 and 0.9 with loading factor 1.5 for CLASS I separator (or 2 for a CLASS II separator).

Accordingly we get  $(6 + (2 \times 4)) \times 1.5 = 21 \ell/s$ . but if we issue instruction that the washbay and workshop are not to operate cleaning during a rainstorm then we can split this into 9 ℓ/s or 12 ℓ/s and hence design for the higher being 12 ℓ/s.



### Additional equipment

SANS 50858 also requires the inclusion of a grit/silt chamber placed upstream of the filter unit to remove as much floatables and solids as possible and avoid these entering the oil separator chamber and impeding the operation.

The code has a very simple design guide for three different sizes of these grit tanks, rated at 100\*Ns, 200\*Ns or 300\*Ns depending on the type installation (Ns being the flow rate in  $\ell/s$ ). Typically a site where small concentrations of silt and sand are to be expected, the smaller unit will suffice. But washbays for muddy mine vehicles would require the largest unit. So by example, an oil separator sized at 3  $\ell/s$  would have either 300  $\ell$ , 600  $\ell$  or 900  $\ell$  overall size grit chamber.

Additional optional equipment can include:

- High pressure shut off valve to close the inlet of the separation chamber
- Automatic draw off [ADD] devices sit inside and at the top of the oil chamber, opening and closing via a complex system of floats, constantly draining the accumulated oil from the surface, through the tank wall and into a separate chamber that will only consist of separated oil.
- Oil and grit depth sensors are also relatively freely available in the market to warn of a system reaching maximum levels of either.

Once a system has been installed, commissioned and operational, the end use must make contact with an oil recycler who will then visit the site periodically and monitor/measure grit, sludge and oil levels and then make recommendation as to when the system should be maintained.

Maintenance would include shutting an upstream valve, draining the grit, sludge and oil, then draining the remaining water. The filter media will be removed and cleaned and the system filled with clean water and flushed with this water also removed by the recycler. The filter will be replaced, the tanks filled with clean water and the valve opened to allow free flow of effluent. The recycler will then continue to monitor and eventually recommend a routine relevant to the site. ●





## **CORROSION PROTECTION OF THE TRANSFER TUNNEL, DELIVERY TUNNEL, MUELA HYDROPOWER STATION, & STATION BYPASS TUNNEL STEEL LININGS**

During inspections of the Transfer and Delivery Tunnels between September and November 2019, it was established that the internal corrosion protection lining in all sections of the tunnels that are steel lined was wearing off and if left for too long, there was a risk that steel tunnel sections would corrode. The specialists advised that the tunnel could safely be operated for a period of around five (5) years (Say October 2019 to October 2024). Safe operation of the system significantly beyond the 5 years could not be guaranteed.

As a result of this, LHDA understood that the entire system would need to be taken out of service for an extended period for major refurbishment of the steel tunnel sections in order to protect one of Lesotho's major assets for future generations and hence why the 2024 – 2025 Tunnels Outage was actioned.

Corrocoat SA (Pty) Ltd, partnering with LHDA, undertook extensive corrosion protection refurbishment, maintenance and repair works in the steel tunnels, requiring a complete shutdown of the entire Water System as well as at Muela Power Station to undertake the critical corrosion protection refurbishment work.

### **Contact:**

Johannesburg: +27 (0) 11 845 4247 – [Corrojhb@corrocoat.co.za](mailto:Corrojhb@corrocoat.co.za)

Durban: +27 (0) 31 465 2024 – [enquiries@corrocoat.co.za](mailto:enquiries@corrocoat.co.za)

Cape Town: +27 (0) 21 951 6911 – [capetown@corrocoat.co.za](mailto:capetown@corrocoat.co.za)





- Corrocoat Zip-E a nano glass-flake solvent-free epoxy to 1000 microns in a single coat.
- Circa 20 000 Sqm of steel liners up to (3,4m in diameter) to be refurbished over 6 discrete project sites throughout the tunnel system (the furthest site being 2 hours' drive away over the mountains to Katse Dam).
- 3 months to complete critical path.
- Water supplies 80% of Gauteng's water in South Africa – (largest economic hub in South Africa) – Critical and high-profile project for both Lesotho and South Africa so that SA does not run out of water.
- System supplies 780 million cubic metres of water per annum to South Africa plus generates hydro-electric power for the Kingdom of Lesotho.
- 100% 3rd Party QC Inspection required.
- Almost 300 people involved in the project with over 200 people being Lesotho people (Basotho).
- Much infrastructure to be left in Lesotho on completion of the project such as accommodation camps, electrical switch gear etc.

# INNOVATIVE FILTER MONITORING

## in drinking water supplies

Access to clean drinking water is fundamental to public health and the overall well-being of communities. With ongoing advancements in technology, approaches to monitoring and preserving water quality have become increasingly sophisticated



**T**oday's filtration systems depend on highly accurate, intelligent monitoring tools to ensure that every drop consistently meets the most stringent standards for safety and quality.

The monitoring process starts by drawing raw water from a natural source, such as a river, and directing it into a dedicated holding tank. Next, the water flows through a drum filter, which efficiently removes suspended solids and larger impurities. At this stage, electronic differential pressure measurement plays an important role, continuously tracking the level of filter contamination. Once the detected contamination surpasses the preset limit, the system automatically triggers a cleaning cycle, maintaining optimal water quality and ensuring seamless operation.

VEGA, a manufacturer of water monitoring sensors, designs its equipment to uphold the highest standards of purity and safety, protecting public health throughout the process. The systems are built with carefully selected materials that meet stringent international standards, including FDA and *EU Regulation 1935/2004*, along with relevant local certifications.

From the outset, installation efficiency is a central consideration. By utilising two seamlessly interconnected sensors with just a single cable connection, the system minimises technical complexity, shortens installation times, and significantly reduces associated costs. This streamlined approach not only eases the burden on installation teams but also translates to lower operational expenses for municipalities and utilities.

The design further prioritises operational simplicity and ease of maintenance. Multivariable sensors, such as advanced differential pressure probes, integrate multiple measurement capabilities into a single device, reducing the need for additional hardware and simplifying system architecture. This consolidation enhances the user experience, enabling operators to access comprehensive water quality data through intuitive interfaces and minimising opportunities for error.

Routine maintenance and troubleshooting are facilitated by features such as robust self-diagnostics, clear status indicators, and remote parameter adjustment capabilities. These innovations empower technical personnel to address issues quickly and

efficiently, maximising system uptime and ensuring continuous monitoring of water quality.

Through these advancements, modern filter monitoring systems not only meet but exceed the evolving expectations of water safety and operational efficiency, supporting the reliable delivery of clean drinking water to communities everywhere.

The VEGABAR 82 is an electronic differential pressure measuring instrument that is built for long-term stability and reliability. Its moisture-proof measuring cell stands up to challenging environments, while an integrated temperature sensor eliminates the need for separate temperature monitoring devices. The ceramic CERTEC® measuring cell offers substantial resistance to abrasive particles, further enhancing operational durability.

To optimise sensor power supply and diagnostics, the VEGATRENN 141 separator is employed. It provides immediate on-site status feedback via LED indicators and allows for easy parameter adjustments using HART sockets. This ensures that maintenance and troubleshooting are both efficient and straightforward. ●



Integrated systems like VEGABAR 82 and VEGATRENN 141 offer communities reliable, cost-effective, and user-friendly solutions that support the ongoing delivery of clean, safe water.



# From coal to clean water: ARNOT'S NEW LEGACY

The Olifants River catchment is vital to South Africa's water supplies.  
*Image courtesy of Creative Commons*

Seriti Resources, in partnership with Nafasi Water Technologies, is launching a project to finance, build and operate a water treatment project at the Arnot Closed Colliery near Middelburg, Mpumalanga. This initiative reflects Seriti's commitment to responsible water management, environmental stewardship, and compliance with regulatory requirements.

**T**he Olifants River catchment is one of South Africa's most important water systems, supporting communities, agriculture, industry, and biodiversity across multiple provinces. By discharging clean, treated water into the environment, this project will help restore downstream water quality, enhance water security for users, and contribute to the ecological health of the catchment, ultimately ensuring more sustainable use of this critical shared resource.

Mining activities at Arnot ceased in 1992, yet the site continues to produce mine-impacted water. Existing onsite measures such as evaporation and pumping are no longer sustainable or cost-effective, and storage capacity has been exhausted.

The new facility will treat the water to the required quality standards and discharge clean, compliant water into Bosmanspruit, part of the Olifants River catchment, in line with Seriti's Water Use License.

Delivered through a Build-Own-Operate-Maintain (BOOM) model, the project encompasses the complete lifecycle from design and construction through to long-term operation and eventual decommissioning. All waste will be responsibly disposed of at approved off-site facilities.

Mike Teke, group chief executive officer of Seriti Resources, says, "At Seriti, we

recognise that our responsibility as a mining company extends far beyond the life of our operations. The Arnot water treatment project is a clear demonstration of how we can honour our mine closure obligations while making a meaningful contribution to the environment and communities around us. Clean and secure water systems are vital for South Africa's future, and through this partnership with Nafasi Water, we are taking tangible steps to protect one of the country's most critical catchment areas. This is about ensuring that the legacy of Arnot Colliery is not only about powering the nation in the past, but also about safeguarding natural resources for generations to come."

Suzie Nkambule, chief executive officer of Nafasi Water, adds, "Through this collaboration, we can leverage our specialist expertise in mine water treatment to deliver a solution that brings both environmental and community benefits. By applying innovative treatment processes and maintaining the highest operational standards, we can ensure that clean, compliant water is returned to the environment, supporting the restoration and protection of this vital catchment area."

During its operational life, Arnot Colliery played a central role in South Africa's energy supply, powering homes,

industries, and economic growth. Now, in its post-mining phase, it will become an equally important asset for the region by contributing to the improvement of water security and quality for the same communities it once served with energy.

This long-term solution will address mine closure obligations, reduce environmental risk, and help protect critical local water systems within the Olifants River catchment. ●



Mike Teke, group chief executive officer of Seriti Resources



Suzie Nkambule, chief executive officer of Nafasi Water

# TAILINGS STANDARDS HIGHLIGHT *the value of water stewardship in mines*

Maintaining compliance with the Global Industry Standard on Tailings Management (GISTM) will require a keener focus on water stewardship, according to Lindsay Shand, partner and principal environmental geologist at SRK Consulting South Africa.

**T**he GISTM requires more effective engagement and collaboration between mines and their stakeholders, an approach that also aligns closely with the principles of water stewardship. “The GISTM approach to responsible tailings management includes an appreciation that a mine’s water footprint and its tailings storage facilities (TSFs) have impacts well beyond the mine’s licence area,” said Shand. “The standard calls for engagement with stakeholders in the broader water catchment area, or basin.”

## Mitigate risk

She highlighted that mines will often develop their water management plans (WMPs) with a limited focus on the area within the mine’s boundaries. However, this is only a partial step towards achieving the real goal of these plans, which is to mitigate operational risk and the potential impact on adjacent landowners and downstream water users, as well as to protect the environment.

“A water stewardship approach broadens a mine’s appreciation of factors outside of its immediate site boundary, extending to its zone of influence, which needs to be considered when managing water responsibly,” she explains. “The approach emphasises proactive and ongoing collaboration among water users within a catchment, ensuring that their operations and plans are more holistic and sustainable.”

Franciska Lake, partner and principal environmental scientist at SRK Consulting SA, pointed out that – from an operational perspective – the management of water and TSFs on mines is intricately linked, as water from the TSFs is usually captured and reused in the mining operations.

Lake highlighted that the GISTM requires mines to take a comprehensive approach to managing TSFs, whether in terms of engineering, water management or stakeholder engagement. “A mine’s water balance usually includes inputs and outputs from the TSF, and the way a mine manages this balance can have an impact on water

quality and quantity for downstream users,” she explains.

## Knowledge base and monitoring

According to Kavandren Moodley, principal environmental scientist at SRK Consulting SA, water management is intricately linked to several key principles of the GISTM.

“GISTM’s Principle 3, which mandates the integration of all elements of the tailings-related knowledge base, has direct implications for water management,” says Moodley. “This knowledge base must encompass not only technical data but also social, environmental and local economic factors, many of which influence – or are influenced by – water use.”

He notes that technology and monitoring – key aspects of GISTM’s Principle 5 – are particularly pertinent to managing water-related risks.

“Real-time water quality monitoring, for instance, enables earlier detection of anomalies on TSFs, significantly enhancing risk mitigation,” he said. “The principles of water stewardship are deeply ingrained throughout the GISTM and are pivotal in identifying and mitigating risks.”

A water stewardship approach helps mines to proactively address risks such as contamination, seepage, and water imbalance, contributing to sustainable outcomes for both the facility and surrounding ecosystems.

## Cumulative impacts

The GISTM has also informed other important industry frameworks, such as the 2023 International Council on Mining and Metals’ (ICMM) Water Stewardship Maturity Framework. This emphasises that mines understand cumulative impacts related to water management, according to SRK Consulting SA senior environmental scientist Giulia Barr.

“Beyond the mine itself, water management needs to consider the broader hydrogeological basin and the potential impacts of climate change,” says Barr. “This means that a mine’s WMP will look at how

they affect other users, and how other sites in the catchment might affect the mine.”

The ICMM and Alliance for Water Stewardship (AWS) standard require that the key stakeholders within a catchment are identified, and information on water usage patterns is gathered.

## Engagement and collaboration

“This opens the door to engagement and possible collaboration in applying best practice principles to meet key water stewardship outcomes,” she says. “These include good water governance; sustainable water balance; good water quality status; important water-related areas such as aquifer recharge zones, springs and wetlands; and safe water, sanitation and hygiene for all.”

Shand adds that water stewardship principles enhance the knowledge base required by the GISTM, through information on downstream users and the potential short-term and long-term consequences of TSF failure.

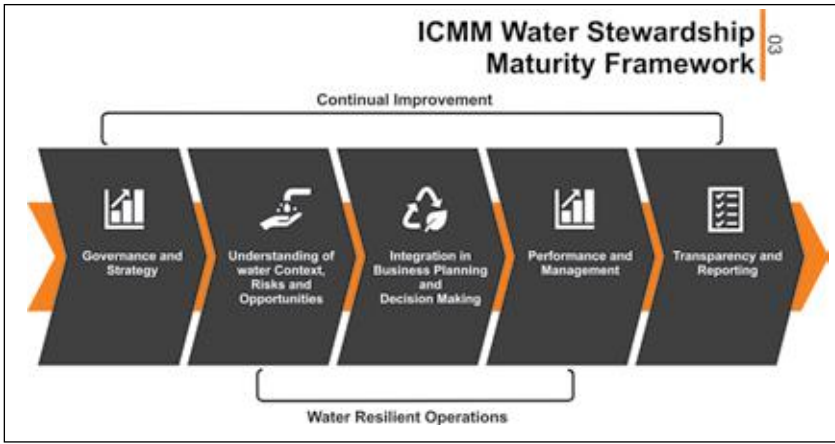
“Depending on the nature and chemistry of tailings, the consequences of failure can be more accurately assessed with more data from downstream stakeholders,” she says. “This might include the impact of land and water contamination into the future – even beyond the immediate recovery from a TSF incident.”

## Managing water and risk in the DRC

With many mines in the Democratic Republic of Congo sharing watercourses, there is a growing risk of water contamination, according to Wouter Jordaan, partner and principal environmental scientist at South Africa — also a director of SRK Congo.”

Strategies to mitigate this risk will be more effective if mines collaborate to responsibly manage water resources within their shared catchments.

“Most mines only focus on water in terms of their own internal water monitoring plans,” he explains. “The cumulative impacts of mining are therefore often



not well understood, especially in the downstream environment, where the apportionment of liability and responsibility becomes blurred.”

This can lead to impacts being unmitigated, while those mines or final water users in the downstream catchment must deal with the results. To avoid this outcome, the GISTM and water stewardship principles play a vital role in a country like the DRC, where there are many mining-related sources of potential contamination.

“Many communities are reliant on the mining industry, settling close to the mining area, and there may also be cultivation of land along the downstream watercourses,”

says Jordaan. “They are all vulnerable from a water supply and quality perspective.”

Communities are also vulnerable to TSF failures, which could contaminate large areas of water and soil, on which people rely on for their livelihoods.

“The GISTM facilitates the identification of these vulnerable groups or communities, providing strict criteria for safeguarding their rights,” he explains. “Taking a wider approach to water management can also further protect these groups against water-related impacts.”

He notes that SRK has the expertise to assist mines in applying both GISTM and water stewardship standards.

- 1** Lindsay Shand, partner and principal environmental geologist, SRK Consulting SA
- 2** Kavandren Moodley, principal environmental scientist, SRK Consulting SA
- 3** Giulia Barr, senior environmental scientist, SRK Consulting South Africa
- 4** Franciska Lake, partner, and principal environmental scientist at SRK Consulting SA

“This combined approach strengthens our DRC mining clients' efforts to maintain their social licence to operate, while being proactive in their risk identification and management measures,” he concludes. ●



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# CLEARING THE AIR ON MUNICIPAL ODOUR CONTROL

Over the past three decades, bio-trickling odour control has become a proven, reliable solution at wastewater plants. However, despite the technology's proven track record, there are still many misconceptions or misnomers about bio-trickling filters in the industry that warrants clarification.

**By Annejan Visser, professional engineer (chemical), Zutari**



A poor understanding of the differences between biological odour control technologies often results in choosing an unsuitable solution for the application. This may result in potentially higher operating cost or disappointing odour removal performance, that leads to biotechnology being labelled as not suitable for municipal odour treatment. The aim of this article is to explain the fundamentals of biological odour control, the elaboration of the various odour control technologies available in the market, and to clear some of the common myths around bio-trickling filters for its suitability to treat municipal odours.

## Definition of biological odour control technologies

Broadly speaking, biological odour

control technology could be divided into three categories:

- 1) Biofilters,
- 2) Bio-scrubbers, and
- 3) Bio-trickling filters

A biofilter uses either organic media (such as wood chips) or inorganic mineral type media (such as lava rock) onto which the bacteria adhere. Biofilters are well suited for applications that require primarily reduced organic sulphur compounds (ROSC) removal when hydrogen sulphide ( $H_2S$ ) concentrations are low (less than 5 ppmv  $H_2S$ ). High  $H_2S$  concentrations lead to acidification of the media, thus shortening the media life and resulting in less than optimum odour removal performance. Biofilter media requires replacement, and the replacement frequency depends on the  $H_2S$  concentration in the air to be treated.

Because bio-trickling filters and bio-scrubbers appear similar, they are often

confused, leading to misunderstandings about their effectiveness and suitability for treating specific odorous airstreams.

Bio-scrubbers typically use random media that provide a surface for microorganisms to attach and form a biofilm, which then biologically degrades the odorous compounds. Bio-scrubbers normally use polyurethane foam (also known as PUF media). Cube media is often referred to as random media, since the PUF media cubes are randomly oriented in the reactor vessel. Bio-scrubbers rely on continuous recirculation of the process water through the reactor by using a pump that recirculates the water from the reactor base to the top of the media. The biological oxidation of the odorous compounds is performed by the bacteria on the media surface as well as the bacteria that is in the recirculated water.

Bio-trickling filter filters use mostly structured synthetic media or expanded clay media as the base on which a microbial biofilm develops to biologically degrade the odorous compounds in the air. Certain manufacturers have developed proprietary bio-trickling filter media that focusses on high specific surface area, media surface chemistry and mass transfer optimisation, to improve the removal efficiency of various odour compounds. The structured media is typically formed as a module of dimensions like the inside dimension of the reactor vessel and is installed in the reactor at the manufacturing facility.

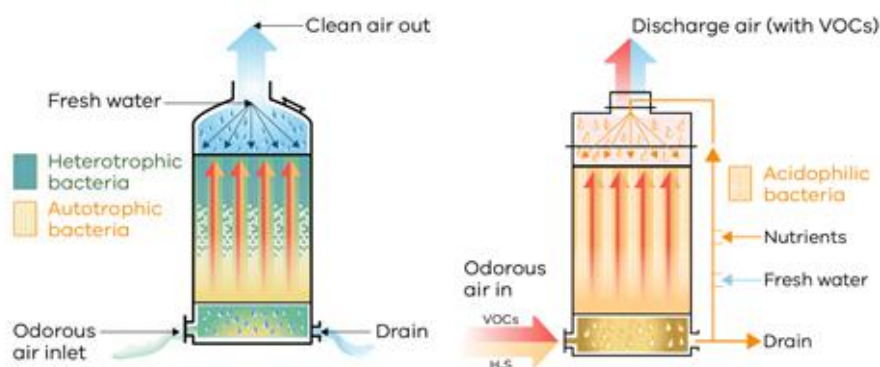


Figure 1 illustrates the operating principles of bio-trickling filters (left) and bio-scrubbers (right) Credit: Environmental Protection Authority, Victoria

This allows for better quality control and results in higher odour removal efficiency. Bio-trickling filters also use “once through” irrigation of the water from the top of the reactor and the process water then exits the reactor at the bottom drain.

Bio-trickling filter technology is considered more advanced compared to bio-scrubbers in its ability to remove municipal odours other than  $H_2S$ , which is essential for satisfactory odour treatment. The following section provides further explanation of the differences between bio-trickling filters and bio-scrubbers as it pertains to its operation and the microbiology involved in removing odours.

#### Operational differences between bio-trickling filters and bio-scrubbers

Water is essential for the operation of both bio-trickling filters and bio-scrubbers, since it keeps the biofilm moist and active, and enhances the mass transfer of odorous molecules from the air to the bacteria. Water also removes

the by-products of biological oxidation of odorous compounds, in particular sulphuric acid ( $H_2SO_4$ ) that is formed during the biological oxidation of  $H_2S$  to  $H_2SO_4$  by autotrophic bacteria. The pH of the drain water from either the bio-trickling filter or bio-scrubber is normally controlled at a pH of 2.

Bio-scrubbers recirculate the process water in the reactor using a recirculation pump, which is recirculated from either a reservoir in the bottom of the reactor or a separate recirculation sump. This adds to the complexity and maintenance for the system, as well as increasing its energy use. The recirculated water also forms a “thicker” water layer on the media surface due to constant recirculation, which may inhibit mass transfer of the odorous compounds to the bacteria and thus then reduce the odour removal performance of bio-scrubbers.

Bio-trickling filters operate in a “once through” manner whereby the irrigation water enters the media pack at the top and “trickles” down to the

bottom media layers after which the liquid is removed directly via drain at the reactor bottom. Bio-trickling filters do not recirculate water. Due to the “once through” irrigation method, neutral pH water enters the top media pack and trickles through the packing media while absorbing  $H_2SO_4$  and other by-products of bacterial oxidation from the reactor. This irrigation method also results in a “thinner” water film on the media surface, which improves the mass transfer of pollutants from the air to the bacteria, which is especially important for pollutants with low water solubility.

#### Understanding the microbiology associated with municipal odour removal

Municipal odours mostly consist of a mixture of  $H_2S$ , ammonia ( $NH_3$ ) and ROSC. ROSC includes compounds such as mercaptans, dimethyl sulphide, dimethyl disulfide and carbon disulfide. All these compounds have very low odour detection threshold concentrations and thus must be treated

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to very low concentrations to avoid any odour nuisance concerns.

In bio-trickling filters and bio-scrubbers, H<sub>2</sub>S is removed by autotrophic bacteria. Autotrophic bacteria obtain its carbon for microbial cell synthesis from the carbon dioxide (CO<sub>2</sub>) in the air. These bacteria can grow under both acidic and neutral pH conditions.

In bio-trickling filters, ROSC is removed by heterotrophic bacteria that grow optimally under neutral pH conditions. Heterotrophic bacteria obtain the carbon for microbial cell synthesis from the carbon in the ROSC molecules.

A unique difference between bio-trickling filters and bio-scrubbers is that bio-trickling filters allows the growth of both autotrophic bacteria and heterotrophic bacteria, and thus bio-trickling filters can remove both H<sub>2</sub>S and ROSC in a single reactor vessel. Bio-scrubbers on the other hand, allows the growth of autotrophic bacteria only and thus removes H<sub>2</sub>S only.

The ability of bio-trickling filters to allow for both autotrophic and heterotrophic bacteria to grow in a

single reactor vessel allows for treatment of a broad range of odour compounds in municipal airstreams.

### Common myths associated with bio-trickling filters

Although bio-trickling filter technology has been widely studied over the past decades, several misconceptions still exist and biasedly influence the technology selection as it pertains to municipal odour control. Here are some of the most common myths:

- *“Bio-trickling filters are only suitable for hydrogen sulphide removal.”* As explained herein, bio-trickling filters are suitable to be used for treatment of a wide spectrum of municipal odour applications, i.e. from headworks with H<sub>2</sub>S and low ROSC concentrations to sludge treatment with higher NH<sub>3</sub> and ROSC concentrations. Bio-trickling filters’ ability to host both autotrophic and heterotrophic bacteria allows it to handle a mix of organic and inorganic odours in a single reactor vessel, thus reducing its footprint requirements and eliminate the need for secondary polishing.
- *“Biotrickling filters require carbon polishing to remove ROSC compounds to meet stringent air quality standards.”* While true for bio-scrubbers, bio-trickling filters can achieve sufficiently low outlet odour concentrations that meet most odour treatment requirements without the use of carbon polishing. The combination of a diverse microflora, i.e. autotrophic and heterotrophic bacteria in the same reactor, along with favourable mass transfer conditions are sufficient to meet stringent air quality targets. Bio-scrubbers, on the other hand, almost always require a second stage carbon polishing or biofilter to achieve acceptable odour removal.
- *“Bio-trickling filter units use more water than bio-scrubbers which make them less suitable for water scarce applications.”* Water use requirements for both bio-trickling filter and bio-scrubber systems use the same when operated at the same drain pH conditions. Both technologies require low water usage.
- *“Bio-scrubbers that use random PUF media provide the same level of H<sub>2</sub>S treatment performance as bio-*

*trickling filters that use structured synthetic media for a given empty bed residence time (EBRT).”* False. Structured media generally supports better gas flow, more uniform irrigation, and improved mass transfer. This means a bio-trickling filter with structured media can achieve the same removal efficiency in a much shorter empty bed residence time (EBRT) compared to one using random media - often at a third (33%) of the EBRT than a comparable bio-scrubber.

### Bio-trickling filters – a practical choice for municipal odour control

In the author’s experience, a well-designed bio-trickling filter offers an adaptable, dependable and sustainable solution for municipal odour control and management. It can be applied effectively to almost any stage of a wastewater treatment works - from the initial headworks to sludge handling areas - as well as in pumping stations and sections of the sewer network where odour complaints are present.

Because bio-trickling filters use biological processes rather than chemicals or adsorbents, bio-trickling filters have a low carbon footprint, very low operating costs, and require fewer consumable inputs compared to many conventional alternatives including bio-scrubbers. Furthermore, bio-trickling filters are easy to operate, thus require minimal operator attention.

Due to the latest development in bio-trickling filter technology, it offers a compact design requirement minimal footprint, thus making it suitable to replace existing odour control systems especially at footprint constrained sites. The technology does not produce secondary waste stream that require specialized disposal, which is an important factor sustainable plant operation.

For municipalities aiming to balance odour treatment performance, cost, and environmental responsibility, bio-trickling filters warrants serious consideration. While they are not a one-size-fits-all solution - no odour control technology is - with the right design, media selection and operation, bio-trickling filters can deliver long-term, sustained high-efficiency performance. ●



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**CLOSING THE GAP:**

**HOW THEMBISILE HANI IS TACKLING ITS WATER SHORTFALL**



Thembisile Hani Local Municipality in Mpumalanga faces a major water shortfall, but through disciplined funding, infrastructure projects, and community engagement, it is steadily improving supply, sanitation, and compliance – showing how municipalities can make real progress towards achieving Sustainable Development Goal 6 (SDG 6).



Dumisani Mahlangu, a municipal manager for Thembisile Hani

**T**HLM is home to 310 458 people in 110 563 households. While 75% have access to water, only 28% have sanitation.

With demand at 99 Mℓ/day and supply at just 42 Mℓ/day, the 56.8 Mℓ/day shortfall highlights the urgent need for improved service delivery.

Dumisani Mahlangu, a municipal manager for Thembisile Hani, says, “Most of our focus as a municipality is on water. Water infrastructure, water sources, and ensuring the local population understands what we are doing.” For Mahlangu SDG 6 is not an ideal but, “a goal that pushes us in the right direction and something to measure ourselves against.”

**Current state of water in THLM**

The current state of water in THLM is still behind SDG 6, but the municipality has made significant strides, and the path forward is promising and tangible.

The municipality has historically had no access to its own water sources, instead

relying on agreements with Rand Water and a cross-boundary scheme with the City of Tshwane, Mahlangu says, “Due to our shortfall we are one of the municipalities that implement water rationing, which is of course not the best and not sustainable. We maintain careful contact with the communities and ensure that everyone understands the rationing times and decisions.”

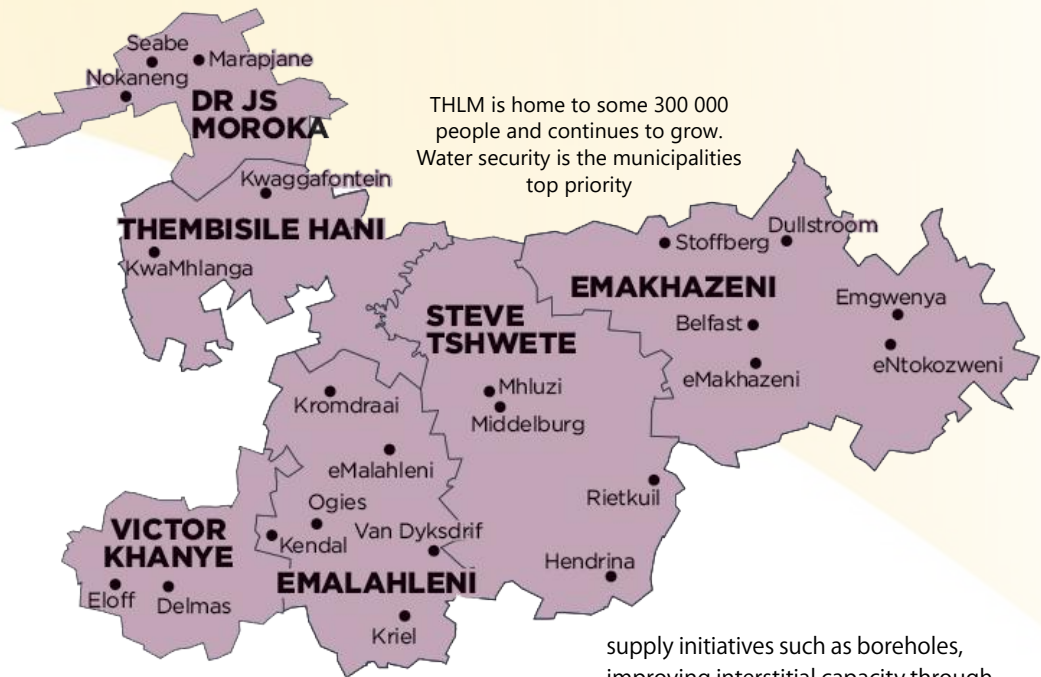
To grow their supply, and get tighter control of it, the municipality is working on a few infrastructure projects and agreements that will bolster supply and begin the process of creating a water surplus:

- Loskop Scheme: Construction of pump stations and pipelines that can facilitate the abstraction of 20 Mℓ/day from the Loskop Dam. This will then feed into various other water supply schemes planned by the municipality.
- City of Tshwane shortfall: The municipality has a cross-boundary agreement with the City of Tshwane, but

there have been several issues plaguing this agreement. The matter has gone to the South African Human Rights Commission and is currently under mediation to gain at least 7 Mℓ/day from the contractual 16.6 Mℓ/day.

- Moloto Groundwater: Moloto is a village

Part of THLM seen from above



under THLM and is under the current water rationing. The village can be supplied with 2 Mℓ/day of groundwater to aid the supply there.

- Borehole: Various villages (including farm areas) are prime candidates for boreholes, adding 4 Mℓ/day to the current supply.
- Rand Water additional bulk: There is a planned long-term increase in water supplied from Rand Water, adding 30 Mℓ/day to the supply,
- Water demand management: A reduction of water losses from 34% to below 20% which will add an additional 5.53 Mℓ/day into the system.

“The plan is that these projects and agreements will add 68.53 Mℓ/day to the supply, creating a surplus of 11.73 Mℓ/day for the municipality, which will end rationing,” says Mahlangu. While supply is the top concern, it will feed into other objectives such as the proposed sanitation strategies:

- Construction of Alternative Sanitation Systems.
- Refurbishment of the KwaMhlanga Oxidation Ponds.
- Construction of the Luthuli Wastewater Treatment Works (WWTW) which will add 20 Mℓ/day to the KwaMhlanga Sanitation Scheme.
- Upgrading the Tweefontein WWTW from 1.5 to 4.5 Mℓ/Day.

### Finance and funding

Municipalities face scrutiny over finances, failures, and unfulfilled infrastructure

and funding promises, all of which fuel public concern. The THLM is an example of how ringfencing finance, and applying accountability, transparency, and planning to critical issues can work, and work well for South African municipalities facing large challenges.

Mahlangu explains, “From 2015–2025, THLM received R3.1 billion in Municipal Infrastructure Grants, allocating R1.87 billion (60%) to water. Starting at 90% in 2015, the budget tapered annually, keeping water funding high while still supporting other infrastructure. THLM also received R542 526 000 from 2017 to 2025 through the Water Services Grant, all of which was used to augment the tapering water budget.”

Due to their work, the municipality qualifies for further grants, which displays the willingness of the National Government to fund municipalities who are achieving their goals. Mahlangu adds, “We are one of the municipalities that do not owe any entities for the services, we pay service providers within 6 days on average and have fostered good relationships with our stakeholders to ensure we are always bettering our services.”

This funding has had a tangible impact on key performance metrics:

**Blue Drop:** in 2013 THLM scored 67% on Blue Drop compliance, and in 2023 improved this score to 75%. This was done by obtaining a water use license to speed up approval for key water

supply initiatives such as boreholes, improving interstitial capacity through staff recruitment and training in line with regulation 3630, extensive community engagement on proper water usage and conservation, as well as adding and refurbishing infrastructure.

**Green Drop:** scoring 26% on the Green Drop in 2013 the municipality conducted preventive maintenance and adopted a preventive maintenance programme, expanded effluent and sludge monitoring to meet Green Drop compliance, improve financial planning and resource allocation, adopt water demand management in line with national standards, as well repairing flow meters and improve data collection. This led to a score of 46% in 2023, while the municipality expects a much-improved score following the latest audit that was conducted by the Department of Water and Sanitation (DWS).

**No Drop:** The municipality scored 43% in No Drop compliance and is addressing this through minimising non-revenue water, meter maintenance and replacement programmes, and conducting water balance checks.

The DWS’s Water Indaba 2025 was a call to action. Municipalities were grouped according to their performance and issues, ordered from ‘best’ to ‘worst’ performing. These municipal forums were made to discuss problems and plot action plans for each municipality regarding their water service delivery. THLM has implemented 11 out of 20 interventions that came from these discussions thus far, and Mahlangu says, “we will continue to implement the various plans and interventions as per DWS guidance.” ●

# DEVELOPMENT FINANCE *and bankability* IN WATER

As South Africa's largest development finance institution, the Industrial Development Corporation (IDC) showcases how funding can unlock opportunities while also revealing persistent hurdles in water and sanitation investment.

“E stablished in 1940, the IDC has operated sustainably for 85 years. The only cash injection we have ever received from the government was at inception,” states Thabo Kabini, senior water specialist at the IDC.

The institution operates across sectors like mining, manufacturing, agriculture, energy and infrastructure. Kabini stresses that water is a common thread across all of them. “Water cuts across every SBU. Whether you are in mining, agro-processing, or even film production, without water you cannot function. We invest in bulk infrastructure such as dams, tunnels, pump stations and reservoirs, as well as alternative water sources like desalination, wastewater reuse and rainwater harvesting.”

He highlights the IDC's involvement in major national projects, including the Lesotho Highlands Water Project and the Mokolo Crocodile project. The organisation also supports wastewater treatment, rehabilitation of ageing infrastructure, and industrial water efficiency initiatives.

### Finance challenges

Many projects fail to secure funding because they are not bankable. The IDC

has identified three recurring issues:

- **Project preparation:** Many municipal and water board proposals lack feasibility studies, designs or a coherent business case.
- **Governance and corruption:** Due diligence and media checks frequently expose governance failures that undermine confidence.
- **Tariffs:** Water tariffs in many municipalities are not cost-reflective, making projects financially unsustainable. The collapse of Sedibeng Water and other boards was partly attributed to this problem.

### Closing the gap

To address these gaps, the IDC funds project preparation, covering pre-feasibility, feasibility and design studies. “We can finance up to 49% of project development costs, but we closely monitor how that money is spent.”

The IDC also provides a wide range of funding instruments, from senior and junior debt to equity in strategic projects, guarantees and working capital. “In the private sector, many contractors only realise they need funding after receiving appointment letters. We step in with instruments like working capital and guarantees to ensure projects continue,” Kabini explains.

Developmental impact remains the guiding criterion for IDC's funding



Thabo Kabini, senior water specialist at the IDC

decisions. “Job creation, local content, regional development, transformation and support for black industrialists are critical. We even adjust the cost of funding to reward ownership by women and youth,” Kabini says.

For Kabini, the IDC's role extends beyond financing. “We don't just fund projects and walk away. We hold the client's hand through implementation and beyond, sharing lessons from past projects to help them succeed,” he notes.

Reflecting on the IDC's long track record, Kabini recalls success stories such as Ouma Rusks, which the IDC supported decades ago, and which still thrives today. “These examples show the lasting impact of IDC's work. We are constantly seeking new sectors and new ways of doing things, because our responsibility is to drive the economy forward,” he concludes. ●

# WATER MAFIAS

## *how they work & how to **stop** them*

South Africa's water networks face escalating sabotage by criminal syndicates known as 'water mafias'. By destroying infrastructure and exploiting tanker contracts, they profit from people's desperation while deepening inequality. What began as vandalism has become a crisis of governance, corruption and violence, threatening the nation's water security and human rights.

**By Duncan Nortier**

**F**or the South African Human Rights Commission (SAHRC), an institution that safeguards the country against human rights abuses and threats, the rise of organised crime centred around critical infrastructure goes beyond "operational challenges." Dr Henk Boshoff, SAHRC commissioner, says, "This has become a crisis of governance, a crisis of ethics and a crisis of enforcement of laws. If left unchecked, the trajectory could create a full-tier system: clean water for the wealthy without interruption, and hazardous, overpriced tanker water, often unsafe, for the poor."

The SAHRC released a policy document that covers water sabotage and how to address this systematic attack on essential infrastructure.

The document states that there are three distinct patterns associated with water infrastructure sabotage, outlining each with a corresponding case study.

**1) Property damage:** The Tsojane bulk pipeline in the Chris Hani Municipality in Butterworth, Eastern Cape, was attacked on multiple occasions in August 2023. This caused major leaks and recurring water outages affecting 40 villages. In a similar case, parts of eThekweni in KwaZulu-Natal were left without water for eight days in September 2023 following incidents of vandalism. Investigation into these incidents showed an underlying pattern, and the SAHRC notes that in some places, like the Free State, this pattern is even more evident as bulk infrastructure is destroyed days after repair.

**2) Bodily harm and murder:** The SAHRC has collected reports that show physical violence as a means of vandalism. Between 2022 and 2023, eight water service employees were murdered in the eThekweni municipality. Municipal officials





The scale of water infrastructure means that incorporating community voices and listening to people on the ground in a necessity

## The more the tankers are needed, the more sabotage is done to create demand. The link between the municipality and the tankers is built on corruption

and security officers were held at gunpoint and tortured during a copper cable heist in 2024. Employees have compared working in eThekweni to working in a warzone, with another employee killed while attending to a reservoir in December 2024. In October 2024, ten attackers held four security guards hostage at gunpoint at the Temba Wastewater Treatment Plant in Tshwane. The attackers vandalised the plant.

### 3) Organised crime and corruption:

These attacks and sabotages are not randomised or opportunistic. They form part of a larger pattern of organised crime that seeks to take advantage of and weaken the state for financial gain. In times of water supply disruption, municipalities use tankers as a measure to provide water to affected residents. SAHRC notes that this is the exploited mechanism utilised by the 'water mafia' or 'water tanker mafia'. These mafias induce water crises, and provide information to other crime networks to create a necessary climate for water tankers, owned by the criminal networks, to exploit people in need of water. It is alleged that these water tanker mafias work with corrupt municipal officials. This has led to an entire sub-water economy costing the fiscus billions of funds that could be directed elsewhere. The City of Tshwane spends R98 million a year on tankers. Gauteng spent R2.3 billion on water tankers between 2018 and 2023.

These water mafias also abstract from rivers and dams, bypassing all protocol, leading to serious health risks. The Hammanskraal cholera outbreak was linked to the water quality of these tankers.

Commissioner Boshoff explains that the emergence of these mafias is linked to ailing infrastructure and unstable municipal governance. "Municipalities and water service authorities lack the necessary skills, coupled with decaying infrastructure, high water losses, bad

fiscal management, and an existential debt crisis. This is the backdrop on which these mafias are active, taking advantage of the problems already facing South Africa."

### Inside man

Dr Ferriar Adam, executive director of WaterCAN, a network of citizen science activists, explains, "Sabotage is a symptom of corruption, and while we focus on public sector corruption, it is necessary to link the private sector's corruption to get a broader picture." While municipal and local governments are the institutions that enable the sabotage, it is private companies and individuals that benefit.

Dr Adams explains that the private sector water tankers are contracted by municipalities, and this creates a vested interest in sabotage. The more the tankers are needed, the more sabotage is done to create demand. The link between the municipality and the tankers is built on corruption.

The scale of the problem is difficult to note, but Dr Adam suggests a link between euphemistically named 'Municipal Business Forums' and the growing crime around water infrastructure.

This link between public and private sectors through corruption is known, but Dr Adam says, "We need to look at what's happening on the ground to truly understand the problem. These mafias are gaining from exploiting the most vulnerable people in society. On a grassroots level, I've heard stories about people using their SASSA grants for water, and these people are scared to report the issue for fear that the tankers will disappear, leaving them without any water." On a wider scale, 45% of government clinics do not have clean water, and 26 of schools do not have clean water. Dr Adam notes that in some cases, 'water' is on stationery lists. The mafia problem is often quantified in rands spent, but Dr Adam points out that the real cost is humanity and hope. "People are unable to celebrate

## These mafias induce water crises, and provide information to other crime networks to create a necessary climate for water tankers, owned by the criminal networks

birthdays, get married, enjoy leisure time, because there is no water or the money they have goes toward the water mafia. There is an infrastructure cost, but there is also a social cost."

Adding to actually quantifying the scale and impact, Professor Tracey-Lynn Field, professor of Law at Wits School of Law and lead investigator for the South African Water Justice Tracker, says, "Since 2022, we have embarked on the South African Water Justice Tracker project alongside the SAHRC, which maps indicators towards realising the right to water for all in South Africa." She says that a lot of data is focused on large metros, but this tracker allows for data collection in rural and smaller areas in South Africa. The project is large, and water theft is only a part of the data collected, but this data illuminates the scale and real impacts of this rise in organised crime.

"We engaged with all nine provinces, and what we saw was that those attending these engagements were not just politicians but the technical people working and managing the water infrastructure. This gave us valuable insight into the real on-the-ground scenarios and concerns from a practical level," says Prof Field. The data gathered from speaking to the technical operators shows that there are three distinct problems, only one of which is the water mafia. "When we speak of sabotage, we must also include theft of electrical infrastructure, and the theft and vandalism of water service infrastructure like borehole pumps and illegal connections." These issues only compound and worsen the ongoing water woes in South Africa and further prop up the conditions that lead to the water mafia.

She recalls some extreme examples of water mafia practices to expand on the scale and tactics, "In Merafong, a Limpopo municipality, illegal miners known as zama-zamas stripped a water treatment works and created their own supply network." The data and dialogue gathered also

showed that 90% of all vandalism arises from coalitions within the municipality.

The data gathered through the Water Justice Tracker pinpoints exact drivers behind some of the crimes, which include poverty and drug addiction; these systemic issues give organised crime desperate hands to work with. In electrical cable theft cases, the driver is the scrap metal trade coupled with these systematic issues, which give people in poverty access to money.

### How to take on a mafia

Dr Adam suggests transparency as the first step in solving the problem. If all transactions, stakeholders, and connections are made visible, the margin for being able to commit a crime without oversight decreases substantially. Adding accountability to transparency is a key focus, too. She says, "This is a serious crime, we need to see people held accountable from both spaces government and the private sector. We cannot allow those who are found guilty to shift around. If a business is found guilty in Gauteng, then it can't win contracts anywhere else. We need to give people their hope back by being active citizens. People on the ground are most affected but are often forgotten; it is they who face the issues who know what is going on, and involving the community will go a long way."

A feature of South Africa's water infrastructure is that it is vast, as Prof Field notes, Rand Water alone has a pipeline network of 3000 plus kilometres. This dispersed network makes for a difficult task to tackle. Here, Prof Field concurs with Dr Adams and says, "The sheer size of the network means we have to rely on communities to be eyes and ears on the ground." She also adds that due to the underlying systemic issues, poverty and drug addiction, there should be broader social reform that directly addresses the cause of crime.



Tankers meant to provide relief during times of water supply interruptions have become the industry of choice for enterprising criminals



The most vulnerable people in society are those most affected by the criminal attack on water infrastructure



Ageing infrastructure is a contributor to the environment that enables crime to take the place of the normal water supply

**What the law has to say**

Dr Johandri Wright, a postdoctoral researcher, speaks to how the law can address these criminal undertakings, “If we look at the definition of terrorism as defined under the Protection of Constitutional Democracy Against Terrorist Activities Act 33 of 2004, the organised criminal element of these attacks, the water mafias that sabotage the infrastructure could be called terrorists.” She does clarify that this is not the smaller opportunistic crimes but the specific organised criminal element who have infiltrated the government, tortured and murdered people in pursuit of profit. Dr Wright does explain that using this act must be done in good faith, because of South Africa’s pre-1994 history of misusing the terrorist act. “For South Africa, this legislation is complex and time-consuming, and the vague, broad nature of the act makes it difficult to convict under this act,” says Prof Field.

Using the Terror Act also means that South Africa would have to report to the United Nations, which could affect the standing of South Africa economically and discourage investment, but Dr Wright explains that using the act to classify some of these crimes as acts of terror could deter criminals due to the severity of the punishment.

Another avenue is using the Criminal Matters Amendment Act 18 of 2015, which Dr Wright explains is “The criminalising of tampering with, damaging, or destruction of vital systems that deliver basic services like water and sanitation. This is a good narrow definition, which means less for



Dr Henk Boshoff, SAHRC commissioner



Dr Ferrial Adam, executive director of WaterCAN

Professor Tracey-Lynn Field, professor of Law at Wits School of Law and lead investigator for the South African Water Justice Tracker



Dr Johandri Wright, a postdoctoral researcher



the defences to argue against, and it specifically targets this offence and carries a 30-year imprisonment or R100 million fine.” This act means you can prosecute companies involved, targeting the private sector part of the equation.

There is also the upcoming Critical Infrastructure Protection Act, where certain infrastructure, like property and equipment, is designated as critical for

the functioning of society, and any unlawful damage to the infrastructure carries heavy penalties that outweigh normal vandalism charges. Dr Wright notes that many of the country’s water works are not listed.

Dr Wright does say, “The issue with the legal response now is that it is reactive and does not prevent the crime.” ●

**Employees have compared working in eThekweni to working in a warzone, with another employee killed while attending to a reservoir in December 2024**

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