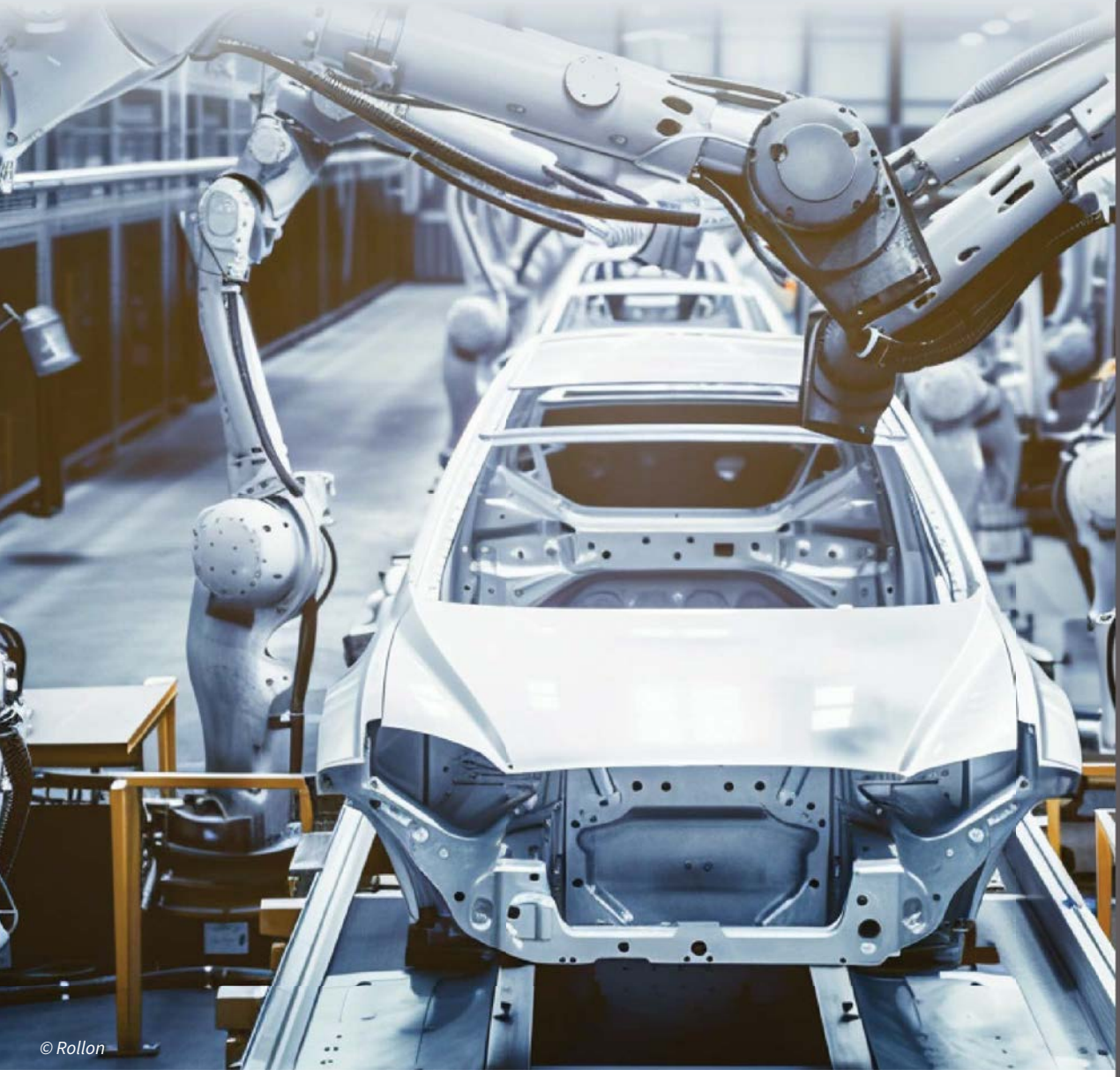
FEATURES:
Industry 4.0 + IIoT
Drives, motors + switchgear
Plant maintenance, test + measurement
(including Sensors + switches)



BMG in partnership with Rollon Linear motion systems to boost industrial performance

08/2025
ELECTRICITY+CONTROL
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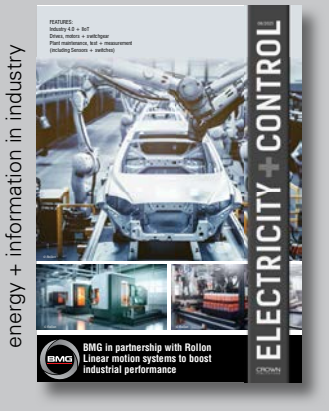

BMG – in partnership with Rollon – specialises in producing linear motion systems to deliver high-performance solutions for industrial machinery across diverse sectors.
(Read more on page 3.)

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Industry 4.0 – it's about transformation

This month, I thought I'd be a little provocative with my comment – simply because we feature Industry 4.0 and IIoT, technologies that are in place to make your plant management, control and monitoring that much more effective.

This technology drags your plant into the real-time world, essentially using the connectedness of the internet to optimise what you do, how you do it, how you analyse what you do and, in turn, how you increase your plant efficiency and reduce your costs.

All good common sense.

However, to my mind, these are components of a digital transformation strategy, and not part of any industrial revolution.

Most of what folk cluster in some mystical further industrial revolution are things that hark back decades – but seem to have come as a shock to some who now apparently sense a revolution in the making.

Revolutions are associated with sudden changes and developments and, quite frankly, with danger and mayhem! This is quite possibly why I waited for August to write this comment. Revolutions – especially of the industrial kind – generally move towards making the world a better place, but with significant collateral damage along the way.

Were the above facts about the various revolutions of our history not true, I rather suspect we would have found different ways of describing them.

Transformative processes, on the other hand, are methodical and engineered. Transformative processes are there to make things better. Transformative processes are put in place by collective thought and a belief in their benefit.

If we think back over how we used to run our plants, we will remember that we have moved on from those days of hard-wired (and by this, I mean copper wire!) loops and links, and little bulbs with shining lights and analogue needles on gauges. Sometimes we'd resort to folk in white coats wandering about with clipboards, writing down numbers, filing them. Although, to be fair, I am sure someone looked at them all at some stage.

Naturally, our ability to respond to plant conditions was much slower – and quite probably, we ignored many of the important parameters that defined plant efficiency. Furthermore, one wonders how often readings purportedly taken and written down were truly read – or were they simply repeated based on some human expectation of performance?

I digress. Any digitalisation and communications technologies we use in our industries should be put in place as part of a progressive strategy. This strategy will ensure the optimal performance of the plant and improved production.

This is how we ensure our competitiveness and progress on a local and international stage that is becoming increasingly competitive.

Transformation is about genuine improvement, thought, and benefit for all. Revolutions, although in some cases they have ended quite nicely, are not nice to live through… So let's begin to speak of Industry 4.0 and the IIoT as digitally transformative processes from now on.

If you treat them as a revolution, you may not have been following technology developments since the early 1990s.

Roll on the transformation!

Ian Jandrell

PrEng IntPE(SA), BSc(Eng) GDE PhD,
FSAAE FSAIEE SMIEEE

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Precision linear motion systems transform machine performance

BMG – in partnership with Rollon – specialises in the production and development of linear motion systems, delivering high-performance solutions for industrial machinery across diverse sectors in Southern Africa.

"As manufacturers face growing demands for productivity, uptime and cost-efficiency, linear motion technology plays an increasing role in the performance of industrial machinery. Rollon's engineered components – distributed and supported locally by BMG – offer measurable improvements in positioning accuracy, load handling and system durability," says Leon Koekemoer, BMG's Linearway & Ball Screw Product Specialist. "The critical function of linear motion components in modern industrial machinery cannot be over emphasised. Our partnership with Rollon ensures that manufacturers across Africa have access to world-class components that deliver the precision, reliability and performance required for competitive operations.

"These advanced linear motion products, which contribute to sustainable production, are supported by our team's technical expertise. Services include system design consultation, application-specific selection, installation assistance and condition-based maintenance planning. Our in-house engineering team ensures that every solution is tailored to specific operational requirements, from cleanroom environments to challenging outdoor mining installations."

Rollon's portfolio includes linear guides, telescopic rails, actuators and multi-axis systems, as well as ball screws and rotational units, engineered to function reliably in heavy-duty industrial operations. These robust components withstand high loads, continuous use and exposure to harsh environments, making them suitable for sectors such as automotive assembly, electronics manufacturing, packaging and materials handling.

Recent system advances have been designed to reduce energy loss, minimise lubrication needs and extend service intervals, lowering the total cost of ownership and enhancing environmental compliance. The incorporation of smart features for real-time diagnostics and predictive maintenance aligns these systems with Industry 4.0 initiatives.

In automated systems, linear guides provide smooth and precise motion that enhances the repeatability of robotic arms and CNC machinery. In packaging plants, telescopic rails and actuators enable efficient material movement and positioning, contributing to production speed and quality. Applications in machine tools benefit from the high rigidity and vibration resistance of Rollon guides, ensuring machining accuracy under dynamic conditions.

In the semiconductor and medical devices industries, where cleanliness and sub-micron precision are essential, customers rely on Rollon's specialist products designed for cleanroom compliance and low particle generation.

Similarly, in the aerospace sector, it is critical that linear systems operate with absolute reliability under extreme conditions. Rollon's quality-controlled manufacturing systems ensure consistent performance that meets these rigorous standards.

Rollon's robust systems are also used in heavy industries, including mining and metals processing. The components are designed to function efficiently under high temperatures, exposure to contamination and heavy mechanical stresses – conditions where conventional motion systems may fail.

Through BMG's partnership with Rollon, the team is able to supply and support advanced linear motion systems, to meet growing demand for precision in industrial automation, ensuring sustainable production.

For more information contact Leon Koekemoer at BMG.
Mobile: +27 82 445 3133 /Tel: +27 41 406 0300
Email: leonk@bmgworld.net
Visit: https://bmgworld.net/

BMG – in partnership with Rollon – specialises in producing linear motion systems to deliver high-performance solutions for industrial machinery across diverse sectors.

Sam Veng, Belden.

Building a data foundation for AI in manufacturing

In a recent Belden blog post, Sam Veng, Digital Automation Consultant, highlighted the importance of building a data foundation as essential to using AI in manufacturing. He outlined the steps to take to establish a unified and accessible data foundation. We share his guidelines here.


Connected, unified and accessible plant data unlocks actionable insights and more.

Talk of AI for manufacturing may be everywhere, but there's one big problem to overcome when putting the technology to work in the real world: Before AI can deliver on its potential, organisations must be able to unlock the data AI needs in order to generate meaningful, actionable insights and drive real efficiency gains.

Building a unified, accessible data foundation

This is the first step to scaling AI for manufacturing. It means:

- Bringing together data that's scattered across different systems and formats
- Breaking down silos between departments and technologies
- Ensuring data quality and consistency across all sources
- Labelling and organising it in a way that's useful for AI
- Enabling real-time access for faster, more responsive applications.

But these are not easy jobs in today's world, where the volume of enterprise data is exploding. Most plants can no longer claim 'data lakes'. Instead, they are dealing with 'data oceans'. The scale and complexity of information is overwhelming. Data is being created faster than ever before, and it is coming from more sources than organisations and their teams can manage. This data is also often scattered across different systems, trapped in silos and moving through networks that were not designed to support real-time analytics.

This fragmentation and complexity make building a data foundation for AI in manufacturing more difficult.

Steps to prepare your data for AI success

To deploy and scale AI for manufacturing, you must be able to identify, connect and prepare the right data. Here's how to make it happen.

- Determine what data matters: Assess your operations to decide which data sources have the greatest impact on efficiency, quality and business outcomes. That's the information you need if you want to optimise processes, drive informed decision-making and achieve measurable improvements in productivity, throughput and quality.
- Find and connect that data: Modern operations depend on seamless communication between people, devices and processes. But if you don't know where your data is coming from, or if it's managed independently in disconnected systems, then it's useless to you and your AI models. To address this, you must identify and connect valuable data from every corner of your plant, breaking down silos between systems and departments. For example, connecting information from production lines, quality control, maintenance logs and IoT sensors can enable real-time monitoring, predictive maintenance and process optimisation.
- Bring all your data together: Once you've identified and con-

nected key data, it's time to bring this information together, even though it's coming from a wide range of sources, relying on different protocols and existing across legacy and modern systems. By uniting disparate systems and breaking down technology silos, you can improve data flow across your organisation to power more accurate AI-driven insights.

- Clean and contextualise the data: Once the data is collected and unified, it needs to be clean, contextualised and structured in a way that AI models can use it to generate valuable insights that can be applied in the real world.
- Enrich the data: Make the data accessible in an easy-to-access dashboard so teams can use it to monitor operations, identify trends and make decisions.
- Complete connection solutions power real AI results: Of course, all this progress depends on having the right network infrastructure in place. A unified, secure and high-performance data backbone can handle the demands of today's applications and tomorrow's innovations.

Companies that want to get the most from their AI – and to unlock data's full value, as we have described above – need to invest in their data foundation. That means:

- Building strong connectivity and resilient network infrastructure
- Prioritising data quality, governance and security
- Creating workflows that make data accessible and actionable.

Belden's complete connection solutions address data issues at the source, delivering the resilient infrastructure required to make your data AI-ready.

The company helps customers find and connect their data, regardless of how many systems or devices are deployed, and bridge the gaps between old and new equipment to ensure seamless data flow. That enables them to turn unstructured information from various sources into a unified, structured format that AI models can use.

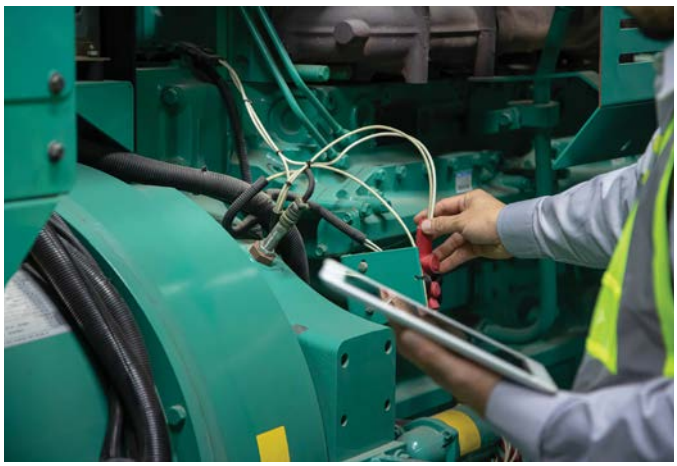
Belden makes sure the data is always connected, always available and always ready to inform decision-making. When the groundwork is solid, AI can deliver the business value expected, turning data chaos into clarity to unlock new possibilities: optimising operations, minimising downtime or improving quality.

About the author

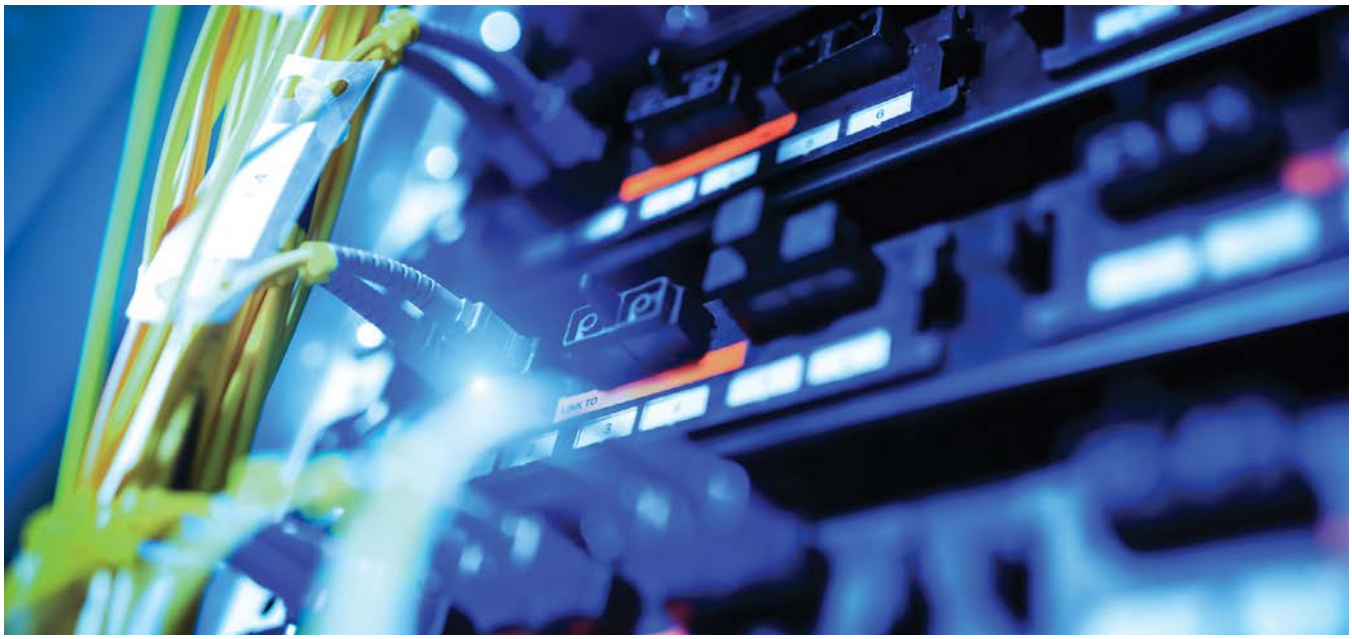
Digital Automation Consultant Sam Veng joined Belden in 2022 bringing with him over 10 years of experience in the industrial automation space. As a digital automation consultant, he visits customer sites to conduct workflow audits and identify opportunities for digital transformation. He also specialises in helping customers derive insights and performance opportunities from data through their digitisation solutions.

Acknowledgements to Belden and Sam Veng for permission to republish this post in Electricity + Control*.*

For more information visit: www.belden.com



By collating unstructured information from various sources into a unified, structured format, manufacturers can create a data foundation that AI models can use.



Belden solutions are agnostic and easily scalable.

Turning compliance into a competitive edge

The introduction of the National Data and Cloud Policy just over a year ago signalled a major step for South Africa in terms of digital transformation. Although on the surface it may seem to set yet another compliance hurdle, it represents a valuable opportunity for South Africa to drive digital leadership. This is the view of Digital Parks Africa.

By localising cloud data storage, processing and infrastructure, the policy significantly enhances data sovereignty, which in turn ensures that data is governed by local laws, enabling the country to protect sensitive information, support local innovation, and build a trusted, resilient digital economy.

A potential competitive advantage

Data sovereignty is increasingly becoming global best practice, as governments and industries worldwide recognise the need to keep data within their sovereign borders. Many countries have begun to introduce policies or frameworks that prioritise data sovereignty, as this principle is increasingly seen as the foundation for responsible and consistent data security.

One of the main reasons for this, beyond increasing concerns around cybersecurity and data privacy, is that data represents significant intellectual property in a digital world and protecting this is essential in maintaining a strategic competitive advantage. Cloud solutions represent the aggregation point for large datasets, and these form the basis for new technologies such as artificial intelligence. In order for SA to develop its leadership in this arena, these datasets must be maintained inside the country's geographic territory.

"Data sovereignty is critical for managing sensitive information; it is also important in protecting local intellectual property (IP). Cloud sovereignty contains data within sovereign borders, avoiding the possibility of a leaking bucket of IP. It means data and IP are controlled and managed within South African sovereign structures. This also helps the country to position itself as a digital leader by investing in local infrastructure and building a thriving digital ecosystem," says Eckart Zollner, Head of Business Development at Digital Parks Africa.

Tackling the complexities

While cloud first is seen as the preferred policy, it is often not a simple or straightforward goal to achieve. Migrating legacy systems to cloud environments is complex, especially for larger enterprises and governments.

Moving to the cloud involves the operational expense of paying for the service, and there can be a significant expense attached to the migration. A phased approach is generally preferred, but this tends to add layers of complexity that need to be carefully considered. In addition, any hidden, underestimated or unanticipated costs can quickly erode the benefits.

"Planning, understanding your equipment and ensuring that critical systems are always available is key in any migration. It's important to assess the landscape carefully, understand your own infrastructure, cloud cost structures, and what value and/or efficiencies you are looking to achieve. Operational realities like power consumption, whether you make use of the cloud, on-premises infrastructure or a hybrid solution, also need to be considered in terms of costs and long-term sustainability," says Wiaan Vermaak, Group Chief Commercial Officer at Digital Parks Africa.

A strategic advantage

South Africa's cloud sovereignty policy is in essence about compliance: it requires that data remains within the country, which means infrastructure needs to be hosted locally, and that will foster digital innovation from cloud providers. Global hyperscalers will be required to invest in the country to remain relevant, and it presents an opportunity for local industry to grow, innovate and facilitate greater competition, directly supporting job creation and skills development in South Africa. Keeping sensitive data and intellectual property within the country also safeguards innovation.

The National Data and Cloud Policy emphasises the need for interoperability and mandates that cloud providers build open,

South Africa's National Data and Cloud Policy promotes data sovereignty and opens opportunities for local players and innovators.

portable data structures. This prevents vendor lock-in and ensures customers can retain ownership of their data.

"This is an opportunity for innovation, allowing smaller or newer cloud providers to compete alongside the global giants. It is a catalyst to position South Africa to develop a robust, competitive cloud sector that supports local innovation, enables global integration, and protects national interests," says Vermaak.

Leveraging the opportunity

Businesses considering the use of cloud services need to study the National Data and Cloud Policy and research cloud capabilities from various providers, including local ones. It is important that they assess existing infrastructure, understand the costs involved, and define clear objectives for cloud migration, including expected business outcomes.

"You need to look at it pragmatically to understand whether a full migration, a hybrid approach, or remaining on-premises will be the best fit for your business, and whether a phased approach or a hybrid model will best meet your needs and better mitigate risk and manage the transition costs," Vermaak says.

Although the policy and compliance requirements do present challenges, they also create a foundation for growth, leadership and innovation. Sovereignty and interoperability offer real competitive advantages, protecting IP and enabling innovation.

"Digital Parks Africa is looking to develop itself as a digital leader in the region, and cloud sovereignty allows us to do that because our data remains contained. South African businesses that plan well can turn what could be seen as a compliance hurdle into an opportunity for sustainable growth and digital transformation," Zollner says.

For more information visit: https://dpa.host/

Advancing technology for safer mining

As demands for safety and productivity intensify across the mining sector, Booyco Electronics is advancing Proximity Detection Systems (PDS) and Collision Avoidance Systems (CAS) technology in underground and surface operations. With over 18 years' experience in mine safety, the South Africa-based company continues to lead the sector in developing intelligent, adaptable safety solutions that meet today's demanding operational and regulatory environments.

Whether in the confined high-risk zones of underground operations or the complex and dynamic settings of open pit mines, proximity detection and collision avoidance are essential safety measures. Anton Lourens, CEO of Booyco Electronics, says that although the hazards differ in these environments, the safety benchmark is the same: Zero Harm.

"In surface mining operations, poor visibility from dust, fog or low light and the movement of mixed fleets in large open areas create a particular set of safety challenges," says Lourens. "Underground, the risks are amplified in narrow tunnels with minimal escape space, making early warning and rapid intervention vital."

Booyco's PDS solutions are designed to be effective in these conditions, providing scalable, site-specific technologies that respond to real-world risks. "We have developed systems that work in both surface and underground mines, to support safety across the different environments," Lourens adds.

Integrated technology solutions

Booyco Electronics remains at the forefront of innovation, developing PDS solutions that integrate multiple technologies – such as RFID and GPS – into a single intelligent platform. The systems are designed to deliver high-accuracy detection, reduce false alarms and ensure operators receive only relevant alerts.

"False alarms are one of the biggest challenges to adoption," says Lourens. "Our systems are engineered to issue graded alerts based on severity to inform and warn operators."

Booyco Electronics' latest developments also support interoperability across mixed OEM fleets, a critical requirement as mines rely on a diverse range of equipment. "Our solutions are OEM-agnostic, which means a mine doesn't need to retrofit or replace existing machinery to achieve a unified PDS deployment," Lourens explains.

Data-driven decision making

A cornerstone of Booyco Electronics' ecosystem is its BEAMS (Booyco Electronics Asset Management System) software platform, which enables mines to harness operational data. By tracking near-misses, safety incidents and operator behaviour, BEAMS can identify high-risk areas and implement proactive safety measures before incidents occur.

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Prioritising Zero Harm, Booyco Electronics equips mines with intelligent proximity detection systems that minimise the risk of human-machine interaction.

Public exit: the swing to private cloud

Just a few years ago it seemed public cloud was the answer to everyone's needs. Adoption surged so quickly that, in itself and through its ripple effect, it created thousands of jobs and injected billions into the South African economy. However, Lee Syse, Director of Product & GTM at Routed, a local cloud platform provider and VMware specialist, notes that once the initial rush plateaued, many users realised there were quite a few gaps between the promise of public cloud and the lived reality.

Lee Syse Director of Product and Go-to-Market, Routed.

He points to cost creep, billing complexity, vendor lock-in and compliance exposure as just some of the issues that quickly arose.

Now, the pendulum is swinging back the other way. A Barclays CIO survey [1] revealed that 83% of enterprises plan to move workloads back from public cloud to private cloud environments, The Flexera 2025 State of the Cloud report [2] shows that more than a fifth (21%) of workloads have already been repatriated from public cloud to on-premises or private cloud environments.

On local shores, industry experts are also seeing a rise in customers who want to exit hyperscale environments, says Syse.

"This doesn't mean public cloud is unsound in some way. For certain workloads and use cases, it makes sense. But those reaching maturity in their cloud journey are now starting to understand when public cloud is no longer the right fit. For many South African enterprises, cloud repatriation is becoming a strategic move."

Public cloud pitfalls

According to industry research [3], around half of cloud buyers spent more than expected on cloud in 2023, and 59% predicted similar cost overruns for 2024.

This is usually the first and biggest complaint public cloud users have – and, often, they are shocked at their bills, Syse says. "Public cloud cost is often unpredictable, especially due to complex billing structures and metering, with variable usage-based pricing," he says. "It's so complex that it's created a whole new industry – consulting firms have opened up with a purpose of explaining and managing public cloud bills.

"Many users are caught unaware as they sign up for discount models that offer upfront savings but come with locked-in multi-year spend targets," he continues. "If businesses don't meet these targets, they face penalties or lose access to discounted rates, making costs higher. Some companies only realise the problem after their budgets has been spent.

"Many companies don't fully understand the commercial commitments they are making at contract stage. The value can be worth it if you understand how public cloud billing works, and you know what to expect," Syse adds.

That's the crux of almost every public cloud drawback – it requires some level of expertise to make the most of all those promised benefits that draw users in before they sign up. Without the necessary in-house know-how, companies often struggle with a range of issues, such as those outlined below.

- Management complexity: The vast number of features, services and configuration options offered by hyperscalers can be overwhelming to manage and require a deep understanding of cloud architectures.
- Security risks: The sheer scale of hyperscaler infrastructure creates a larger attack surface with more vulnerabilities and entry points for security threats. End-user misconfiguration can further expose these vulnerabilities.
- Compliance: As data crosses borders, compliance becomes more complicated, particularly regarding data sovereignty and privacy regulations.

The repatriation movement

Many companies are now considering cloud repatriation – returning workloads to private cloud or on-premises environments – as a cost and control recovery strategy.

Some view repatriation as a step backwards, but it's more often a sign of business maturity. When businesses make this shift, they regain control, stabilise costs, improve compliance and reduce risk. "Repatriation is a maturity move. It shows the business has done the numbers and realised what is sustainable in the long run. Repatriation doesn't mean cloud was the wrong choice – it simply means that a locally hosted cloud is a great alternative," says Syse.

For those looking to repatriate, a Virtual Private Cloud (VPC) is often the answer, as it strikes the right balance between the benefits of cloud provided by a hyperscaler and the predictability and control of on-premises infrastructure. A VPC offers all the cloud benefits such as predictable operations, disaster recovery options and backups, and enterprise-grade performance. But clients also benefit from

more predictable pricing, simpler contract terms and localised data hosting.

Syse warns that businesses planning to repatriate from a hyperscaler should do their homework to avoid falling into the same traps they faced with public cloud: "As well as bringing workloads home, repatriation is about making smarter long-term decisions. Businesses need providers that offer clarity, control and the ability to move at their pace without hidden risks or surprises."

Repatriation won't always be fast or easy, but for many, it's necessary. "Cloud does not offer one-size-fits-all, and migrations vary. Some clients can move in a day, for others, it may take months due to integration, scale or complexity," says Syse

"Whatever that journey looks like, businesses need to know that repatriation is not a step back, and it isn't the end of a cloud journey – it's the beginning of a more sustainable, mature and considered one."

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[3] https://www.theregister.com/2024/10/30/cloud_repatriation_about_specific_workloads/?utm_source=chatgpt.com

For more information visit: www.routed.co.za

Robust adapter for high-speed connectivity

The Edimax IEW-7811UTC, available locally from Vepac Electronics, is a dual-band 802.11ac USB adapter with a USB 2.0 connectivity that enables network connectivity with high speed rates of up to 433 Mbps (5 GHz) and 200 Mbps (2.4 GHz), allowing for greater Wi-Fi connection in harsh environments. With dedicated, robust, electronics and mechanical design, the components can fit into small housings. The IEW-7811UTC can operate within a wide temperature range, from -20°C to 75°C – for industrial and outdoor network deployment, and can withstand extremely hot and freezing conditions, delivering reliable performance. The product's high durability design provides for long-term usage.

The IEW-7811UTC covers security, quality and wide compatibility, providing seamless operation with Windows and Linux embedded systems, and inter-operation with existing Wi-Fi routers, AP and extenders, without replacements or additional purchases being required.

Instant upgrade to AC650 Wi-Fi 5

Users can simply plug the adapter into the USB interface of their device or computer and follow the installation guide. They can then immediately connect to the internet without cumbersome cable deployments or the need for future wire cable maintenance. The IEW-7811UTC wireless connection supports up to 433 Mbps in the 5.0 GHz band and up to 200 Mbps in the 2.4 GHz band.

The Edimax IEW-7811UTC adapter.

Secure and flexible dual-band options

Offering high level Wi-Fi security with WPA3-SAE (Personal), WPA2, WPA, WEP and 802.1x, the IEW-7811UTC supports selectable Wi-Fi bandwidths. This gives users the option of using the 5 GHz frequency band for more bandwidth and a less congested wireless network, than is available on the 2.4 GHz frequency band, which is generally crowded with applications and services.

Wide Wi-Fi compatibility

Compliant with 802.11a/b/g/n/ac standards, the IEW-7811UTC supports any existing Wi-Fi 5/4 routers, access points and range extenders. It supports Windows and Linux OS, offering users options for already embedded systems. Users can connect directly to a network in Wi-Fi available locations.

For more information visit: https://vepac.co.za/

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"In underground and surface mines, access to actionable data is becoming essential," Lourens says. "BEAMS transforms data into a strategic tool, helping mines optimise safety without compromising throughput."

Smarter, safer, more autonomous

The company's roadmap for 2025 and beyond reflects its commitment to the next evolution of mining safety. Current R&D efforts are focused on incorporating advanced AI for smarter risk analysis, enabling engineering control interventions such as automatic braking or speed control and expanding remote diagnostics through IoT-enabled connectivity.

"As we move towards Level 9 safety systems, where intervention is automated, the role of AI and machine learning becomes more important," Lourens notes.

Integration with autonomous and semi-autonomous vehicles is also a priority, to ensure Booyco Electronics' systems continue to safeguard human-machine interactions as mining moves towards automation.

Lourens adds that as digital transformation reshapes the mining industry, Booyco Electronics will play a central role in creating safer, more efficient working environments underground and on surface. "Our latest intelligent data-driven approach to proximity detection and collision avoidance is giving mines the tools they need to meet tightening safety regulations and reduce incidents," he says. "Safety doesn't need to come at the expense of productivity," Lourens concludes. "With the right technology and user adaptation, the two go hand in hand."

A South African success story in industrial engineering

Founded in South Africa and grown through its work at home, across the continent and abroad, Iritron this year celebrates its 25th year – an accomplishment which we report here in a tribute to the company and its achievements. Leigh Darroll, Editor of Electricity + Control***, spoke to Alwyn Rautenbach, CEO, about where Iritron began and what he sees as the key factors that have contributed to its success.***

Many readers will remember Y2K – when it was predicted that the transition from the 1990s into the 21st century would disrupt all computer-based systems around the world. Unless due steps were taken, computers would become dysfunctional, operating systems would collapse, and chaos would ensue. Rautenbach reminds us that, as it turned out, despite all the noise (and as was anticipated by some), nothing extraordinary happened. Time moved on. Computers and computerised systems still worked.

From his seasoned perspective, he suggests that such imagined phenomena are orchestrated to create new marketing directions, to create the space for new things to happen. And they did.

Iritron was formed in December 1999 by four individuals who, at the time, worked for a JSE-listed engineering company that provided broad engineering coverage – from electrical engineering to telecommunications, to utilities, defence, and industrial engineering. With the management changes happening when that company established an international base in Toronto, Canada, a core of individuals in the industrial engineering division chose to create a breakaway enterprise. Thus, Iritron began operating as an independently registered company, effectively, from 3 January 2000, coinciding with the hoo-hah surrounding Y2K.

It would focus on the design and engineering of electrical, control and instrumentation systems in the industrial arena. It handled design simulation and integration and, over time, developed its capabilities to provide turnkey systems integration. As industries evolved, and keeping pace with digital transformation, Iritron developed its own manufacturing execution system (MES). It also expanded its capabilities into manufacturing and assembling electrical control panels and motor control centres, bringing these skills in-house to overcome problems with long lead times and variable quality among external suppliers. So, Iritron grew to provide the full scope of electrical and instrumentation control systems.

Alwyn Rautenbach at Iritron's 25th year celebration.

Industry focus

Rautenbach says each of the four founding partners of the company had specialised in different industry sectors – and

A smart control centre supplied and installed by Iritron.

these became the focus industries for Iritron: mining and metals, food and beverages, utilities – energy, water and wastewater management, and automotive manufacturing.

However, he highlights one of Iritron's strengths is its adaptability, which, over the years, has opened up new fields of expertise and new markets for its services. "We are open to all opportunities where we believe we can add value," he says.

He highlights a number of other plus points that have helped Iritron grow.

Quality and compliance

The company recognised early that quality and compliance were critical in building its own capabilities and reinforcing its credibility in the field. From 2008 it began implementing relevant ISO standards as a foundation for its way of working. It achieved certification for ISO 9004 (Quality management system) in 2008 and subsequently obtained certifications for ISO 14001 (Environmental management system) and ISO 45001 (Occupational Health & Safety management system) in 2018. From this basis of systems and standards it has developed sound engineering principles which drive the culture of the company.

Vendor certifications

It also sought and formalised its certification as a vendor for leading systems engineering brands such as Siemens, Schneider Electric, Beckhoff, and Rockwell Automation. These confirm that Iritron applies best practice in using their control and automation technologies across the various industry sectors in which it works.

Internal training and mentorship

Rautenbach makes the point that skills qualifications and certification in the workforce are important too. Iritron maintains in-house upskilling training and mentorship programmes and all qualifying engineers are encouraged and assisted to register with ECSA.

The company facilitates cross-discipline exposure and learning for all staff, across electrical systems and software development for example, enabling them to understand how their skills can be integrated and applied in different projects.

He says mentorship and continuous learning are key to the company's culture: they add value to the company, enabling individuals and the company to grow. He cites examples of how general labourers, for instance, have become qualified technicians and electricians with in-house training or focused upskilling in manufacturing and assembly of systems or equipment.

Today, Iritron has a workforce of 120 to 140 permanent and contract staff.

Keeping up to date

Another factor that has supported Iritron's growth and its continuing success, is its recognition of the importance of staying up to date with technological innovations. Digitalisation is changing the way industries operate and opening up new possibilities to improve performance. Today, cloud and edge computing have become mainstream in industrial technology. Machine learning AI and big data are fast gaining momentum.

Through in-house simulations Iritron can explore how these technologies can be incorporated and adapted to particular projects, so it can optimise its control software and systems before implementing them.

In this regard, working with vendors and OEMs is also a priority in developing solutions for its customers. Additionally, it has learnt from colleagues by participating in industry organisations and various industry forums.

Opportunities to grow

Over the years, Iritron has grown organically and by acquisition. For example, the company acquired an F&B systems integration business when it needed support, complementing its existing in-house skills, and it owns Oculus control rooms, which is a 100% subsidiary of Iritron.

Rautenbach emphasises that it is essential to stay on top of your game. In his view, competition spurs performance and collaboration adds value.

All the factors outlined above have enabled Iritron to grow. Through its first 25 years, it has established a firm foundation of values, principles and systems on which it can build continuing success.

A long-term perspective

When the company celebrated its 25th anniversary at its head office in Pretoria earlier this year, Rautenbach said, "Iritron was conceived as a forever company." In this regard, he adds: "This means you have to have a long-term vision; you have to look beyond the short-term gains.

"A long-term view requires a strategic perspective, looking to sustainability. It means investing in skills, technology, building resilience.

"Based on the values, principles and systems by which it operates, Iritron has developed a strong company culture – and this is dynamic, it continues to evolve, driven fundamentally by what is good for the company and its long-term sustainability.

Today, Iritron assembles its electrical control panels and motor control centres in-house to ensure quality and on-time supply.

While it maintains its initial focus on engineering electrical, control and instrumentation systems, Iritron has expanded its capabilities into manufacturing and assembling electrical control panels and motor control centres.

This enables us to adapt, to weather change."

He emphasises that the company is essentially people centred. "It is the people that make the business. That's why it's so important for us to invest in our people, so they stay and grow with the company. This also supports leadership continuity – which is critical."

Rautenbach is the second CEO of the company, taking up the position when the first CEO, one of the original four founding partners, left. "Today we have a strong executive team of six people, and we have an effective organisational structure. We focus on delivering high-quality work, reliably and ethically. In this way, we build long-term relationships with our clients. Iritron is well known for this.

"In the work that we do, our clients are making substantial high-risk investments. They have to trust us. And we have to meet our commitments reliably and consistently."

Since it began operating in 2000, Iritron has worked on projects across Africa, the US, and the Middle East, and notably as the partner of choice for a Finnish company working in some of these locations. Rautenbach says the company's cross disciplinary skills – providing electrical, instrumentation and control systems for EPCMs, whether mechanical, civil or structural, helped it grow from its early work. He also notes that Iritron's first customer, a mining company, is still a customer: "Testimony to our customer service and commitment," he says.

Key people

He highlights several people who have been instrumental in building Iritron into the company it is today.

The four founding partners, alongside himself, included Francois Laubscher, now living in the USA, Jaapie Grant, now a customer, and Johan Pienaar, who was a partner until 29 February 2020.

Andre Roeloffze became a new shareholder in 2005. As the company's Compliance Executive, he is responsible for compliance, quality, and engineering accuracy. "We couldn't have found better," Rautenbach says. "He works in the back room and ensures all our work is delivered to spec and on time."

He adds too: "I must also pay tribute to my wife Annie. She has been the Financial Director of the company since its inception and still today, she manages the money. She worked full-time while raising a family and managing the household, as she continues to do.

"These are just some of the many people who have made a difference to me and to the company. I am now semi-retired. I keep a watch on things, making sure we continue to do things right."

For more information visit: www.iritron.co.za

Building Africa's digital connectivity – and why it matters

Africa's digital economy is scaling at an unprecedented pace. Teraco and NAPAfrica are building the interconnections that make it possible. From fast and reliable content delivery and access to global cloud on-ramps to co-location facilities, the continent's largest neutral data centre ecosystem is opening the way for Africa's next growth phase.

NAPAfrica recently surpassed five terabits per second of peak traffic, a milestone that consolidates South Africa's role as the continent's primary digital connection point. By keeping African traffic on African soil, the exchange slashes latency, trims transit costs, and unlocks richer user experiences – from streaming to mission-critical enterprise workloads.

NAPAfrica currently has 2 244 physically connected ports and a total connected capacity of 41.5 Tbps. This is in addition to offering direct access to more than 656 unique networks (ASNs) spanning 50 countries, and it is the first African Internet Exchange Point (IXP) to introduce 400 Gbps interconnects. Furthermore, it is 100% neutral; members pay zero port, cross-connect or membership fees – maximising value and advancing regional internet maturity.

An interconnection nexus

With more than 27 500 physical cross-connects, Teraco is Africa's most interconnected data centre hub and South Africa's only truly neutral co-location provider. It operates eight data centres across the country, including five in Johannesburg. Teraco recently completed significant expansions at several facilities to enhance its infrastructure and meet growing demand from clients.

In Johannesburg

- The Isando Campus (JB1/JB3/JB5): This hyper-connected campus, with a total critical IT load of 70 MW and 32 000 m^2 of white space, serves as a central hub for interconnection and co-location services.
- Bredell Campus (JB2/JB4): Located 10 km from Isando, the Bredell facility offers a total critical IT load of 64 MW and 26 300 m^2 of white space. It provides access to multiple fibre operators between the two campuses, enhancing connectivity options for clients.

In Cape Town

- CT1 (Rondebosch): This facility in the commercial centre of Rondebosch offers 2 500 m^2 of white space and 3 MW of critical IT load. It serves as a carrier-dense interconnection facility and hosts the NAPAfrica Internet Exchange Point (IXP) in Cape Town.
- CT2 (Brackenfell): Located 35 km from CT1, CT2 is undergoing a 30 MW expansion, which will support a total IT load of 50 MW and comprise 16 000 m^2 of white space. The facility is connected to CT1 via Teraco-owned fibre, facilitating seamless interconnection between the two sites.

In Durban

- DB1 (Riverhorse Valley): Teraco has recently completed an expansion at its Durban facility, doubling its existing capacity to 2 MW. With 1 600 m^2 of white space, this facility is located on Durban's north coast, offering secure co-location and interconnection services.

These data centres reflect Teraco's commitment to supporting digital transformation by providing scalable, secure, and interconnected infrastructure solutions to enterprises and cloud providers across the region.

Rendering of JB5 and JB7 on the Isando campus.

Attracting global content and cloud services providers

By hosting cache servers and cloud on-ramps and content edge nodes inside Teraco – such as Akamai, AWS, Cloudflare, Fortinet, Google, Meta, Microsoft, Mimecast, Netflix Open Connect, Tencent, and more – NAPAfrica delivers:

- Ultra-low latency for streaming, gaming, and SaaS
- Reduced international bandwidth costs for ISPs and enterprises
- Local data sovereignty and compliance advantages
- Compelling value for new peers to join the exchange.

Subsea cable systems such as 2Africa, Equiano, WACS, EASSy, ACE, Seacom, METISS, and SAT-3/SAFE have linked their South African coastal landing stations directly to Teraco. This global reach, combined with NAPAfrica's local fabric, enables networks from Southern, East, and West Africa to access international content without detouring through Europe.

Why it matters

- Economic growth – Faster, cheaper connectivity attracts foreign direct investment from tech giants and stimulates local innovation.
- Digital inclusivity – Free peering lowers barriers for emerging African ISPs, levelling the digital playing field.
- Future-ready bandwidth – 400 Gbps ports and multi-10 Tbps fabric headroom meet tomorrow's potential AI and Extended Reality (XR) demands.
- Sustainability – Keeping traffic local reduces carbon-intensive international backhaul and supports green energy initiatives at Teraco sites.

Looking ahead

As the adoption of mobile and broadband soars – fuelled by cloud, AI, streaming, and gaming – Teraco and NAPAfrica are doubling down on capacity, reach, and neutrality. They are looking to further expansions of facilities, more regional cache nodes to reduce last-mile distance, and new 400 Gbps participants, anticipating higher peak traffic records.

The world connects to Africa at Teraco, and Africa connects to the world through NAPAfrica. Organisations looking to advance their digital transformation are invited to join the exchange or visit one of the facilities to learn how seamless, scalable interconnection can drive a company's growth across Africa and beyond.

Complete mine hoist systems optimise productivity

ABB designs and produces complete mine hoists in-house – the mechanical equipment, brake systems, electrical control and drive systems. It supplies various types of mine hoists, from friction to single and double drum hoists, plus shaft interface equipment, for productive hoisting processes.

Because ABB designs the mechanical and electrical equipment for a mine hoist in-house, it optimises the productivity and safety in the complete system. Its advanced engineering is supported by a quality management system that covers all aspects, from design to commissioning.

The company also offers long-term service and support for its mine hoist systems. With a global and local presence, there is always a skilled ABB service engineer close at hand to ensure the equipment is well maintained for maximum productivity. With more than a century of experience and a long list of over 700 active installations worldwide, ABB's mine hoist systems provide proven, integrated technology, together with availability, reliability and safety.

Mike Davis, Global Product Manager for ABB's hoisting business says, "We often supply stage winders to mining contractors during shaft sinking projects. Contractors may purchase stage winders along with a kibble winder or bucket hoist. In some instances, they procure the stage winder and keep it in their fleet for future projects.

"If we engage with mine design teams early on, the kibble winder can be sized for permanent duty requirements, saving time and costs as the project moves forward.

"We can also handle mine electrification and major switchgear installations. These are managed by another expert team within ABB, with the hoisting team handling the hoists and the electrification specialists managing the switchgear and related systems," says Davis.

Jaco Truter, Technical Product Manager, Hoisting, at ABB, highlights that ABB's compact stage winders, particularly those using the regenerative ACS800 drives, are designed for efficient and precise winding applications. The stage is kept level either by synchronising drum movement or by feedback from a level transducer on the stage. This ensures precise guided movement through the shaft.

Multi drum winders are controlled using a central AC500 PLC and central safety circuit. This ensures closely synchronised starting and stopping of all drums. Each project is risk assessed to ensure the appropriate safety functions are included in the design.

ABB mine hoist solutions provide a low lifecycle cost, high reliability and system availability, short project execution time and a single source of supply for the complete system, including service and spare parts. The company also offers its globally recognised engineering resources to conduct feasibility studies and provide conceptual solutions for specific mine hoist systems. It has access to an extensive global network of hoist experts.

For more information visit: www.abb.com

The mechanical, electrical control and drive systems for ABB mine hoists are fully designed in-house.

The IFS PROFIsafe Gateway provides for easy network integration of up to 15 motor starters.

For easy network integration of motor starters

The IFS PROFIsafe Gateway from Phoenix Contact makes it easy to integrate network-compatible motor starters into PROFIsafe networks and use them in safety applications.

The IFS PROFIsafe Gateway can be used to integrate up to 15 motor starters intuitively into a network. The device allows safe switching of the enable inputs and saves I/Os in the control level. The economical solution for the interface level offers safe shutdown of motor starters through safe outputs and has a space-saving design, just 45 mm wide.

Additional advantages include the flexible extension options with further I/Os, as well as fast configuration, condition monitoring, and diagnostics via automation software and the clipx ENGINEER Device Parameterisation Tool. The Interface System (IFS) bus connection also saves network addresses.

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Driving efficiency and sustainability

A fully integrated turnkey drive solution

Jonathan McKey, National Sales and Marketing Manager at SEW-EURODRIVE.

SEW-EURODRIVE's TrueDNA package responds directly to challenges faced by industry when components from multiple suppliers are mixed in a drive solution. Performance inconsistencies, compatibility issues and support gaps often arise, compromising performance, efficiency and reliability.

Providing a complete power pack solution from a single original equipment manufacturer (OEM) comprising the highest quality components, SEW-EURODRIVE ensures all components work in harmony. It delivers optimum performance and streamlined support for extended warranties and peace of mind.

TrueDNA from SEW-EURODRIVE, a global leader in automation and drive technology, is a fully integrated turnkey drive solution designed for maximum flexibility, performance and efficiency. It is engineered to cover a wide range of power, torque and speed characteristics, so it can be easily adapted to drive different equipment across various heavy industries.

"A major advantage of the TrueDNA package is the significant reduction in lead times," says Jonathan McKey, National Sales and Marketing Manager at SEW-EURODRIVE. "Because most of the components are stocked items, customers can typically expect delivery within six to eight weeks from date of order. This is a notable improvement compared to lead times when using traditional sourcing processes. It means quicker access to the latest technological advances, enabling customers to start production, generate revenue and achieve savings on shorter timelines."

Each TrueDNA solution includes a base plate, gearbox, coupling and motor – all precisely matched to ensure seamless compatibility and optimum operational performance. Most customers opting for TrueDNA have selected the X.e series gearbox, known for its enhanced efficiency, durability and energy-saving features.

The drive train is pre-filled with the customer's lubrication of choice, although SEW-EURODRIVE recommends its latest advanced oil technology which offers extended lifetime, superior lubrication properties and improved efficiency in power transfer. With proper maintenance, customers can further reduce costs through extended oil-change intervals.

"For customers, choosing the TrueDNA package means they are acquiring cutting-edge drive technology and gaining additional value through extended warranties and complimentary maintenance training for end-user personnel," McKey notes. "We are committed to ensuring optimum long-term performance and supporting our customers' operational excellence."

With TrueDNA, SEW-EURODRIVE redefines industrial drive solutions – simplifying procurement, optimising performance and delivering a future-ready package built to meet the toughest demands of modern industry.

For more information visit: www.sew-eurodrive.co.za

TrueDNA offers a complete power pack solution from a single OEM, customised to meet the requirements of each application.

Motor control with certified PROFINET

igus has increased the flexibility of its D1 motor control with the integration of PROFINET / PROFIdrive. Designers use the D1 for electric linear drives, handling systems and robot axes. It is now possible to integrate the D1 seamlessly and quickly into higher-level control systems from major manufacturers such as Siemens, Beckhoff and Wago and other manufacturers using Siemens-certified PROFINET – without time-consuming and complicated adaptations. This extended connectivity enables higher performance and efficiency in automation processes.

As the industrial Ethernet standard for industrial automation, PROFINET makes real-time and reliable communication possible between control systems, machines and field devices such as sensors and actuators. "With the integration of PROFINET, communication between the D1 and these control systems is straightforward," says René Erdmann, Head of Business Unit drylin E Drive Technology at igus. "The extended connectivity eliminates the need for specialised software and in-depth technical knowledge. It is easy to embed into automation systems, shortens project times and reduces integration and maintenance costs." The D1 with PROFINET fieldbus is available immediately. Users of igus D1 motor control can also retrofit their older models with a free update.

Key benefits

Designers use the D1 motor control to operate stepper, dc and EC/BLDC motors of electric linear drives, handling systems and robot axes. "The D1 offers short cycle times, which ensure a fast response time of eight to 16 ms, depending on the application. This is especially advantageous in dynamic

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Automation solutions to support Eastern Cape industry

In another news statement, SEW-EURODRIVE reports that with the ongoing expansion of its facility in Gqeberha, it is strengthening its presence in the Eastern Cape. The region is well established as a hub for key industries, including automotive manufacturing, ports, agri-processing and renewable energy. From its Gqeberha base here, SEW-EURODRIVE delivers drive, automation and motion control solutions tailored to the needs of local industry and backed by responsive service and deep technical expertise.

Phillip Steyn, Gqeberha Branch Manager for SEW-EURODRIVE, says the investment in expanding the facility is a reflection of the company's long-term commitment to the Eastern Cape and the growing role the region is playing in South Africa's industrial landscape.

"The Eastern Cape has always been a strategic priority for us," says Steyn. "Our ongoing investment here is about being closer to our customers, understanding their operations and being in a position to respond swiftly with strategic solutions."

The new investment in a 2 400 m^2 facility will see a substantial upgrade from the previous 850 m^2 space, significantly increasing local capacity. The expanded operation will include purpose-built assembly stations, dedicated painting and dispatch areas, and a comprehensive service centre. Equipped with overhead cranes that can handle drive units of up to 10 tonnes, the facility will also feature a high-pressure cleaning system and advanced electronic testing infrastructure to support local refurbishments and ensure equipment is returned to service in peak condition.

Steyn notes that the expansion is already enabling faster turnaround times and enhanced support for customers. "We have moved from being a local service point to a fully-fledged regional hub," he says. "We're now able to hold more stock, assemble to order and carry out major repairs – all from Gqeberha."

Further investments planned for 2025 will include a dedicated experience centre, where customers can interact with the latest Generation C mechatronic drive solutions, conduct energy studies and test new programmes in real-world conditions. This is part of SEW-EURODRIVE's focus on providing intelligent energy-efficient solutions that support industrial performance and sustainability.

Phillip Steyn, Gqeberha Branch Manager, SEW-EURODRIVE.

The branch also supports major industrial projects across the Eastern Cape. These have included, for example, drive systems for fruit processing and packing plants and upgrades at the local Coega IDZ ports. The engineering team works closely with customers to develop application-specific solutions. It also provides strong aftermarket service through the company's network and global logistics reach.

"SEW-EURODRIVE's continued investment in the Gqeberha branch establishes a well-resourced facility that enables us to serve customers from a strong local base," says Steyn. "Our focus is on delivering efficiency, flexibility and innovation to power industrial success across the Eastern Cape."

For more information visit: www.sew-eurodrive.co.za

SEW-EURODRIVE's Generation C MOVI-C® electronics range offers advanced automation solutions.

Continued from page 16

applications," says Erdmann.

The intuitive operability via a web interface, where positions, speeds, accelerations and movement profiles can be set without additional software, is popular with designers. They also value the support of interfaces such as CANopen and Modbus TCP (gateway) to integrate the control system into existing automation environments. The D1 is suitable for a range of applications. With the AC1 speed control and AC3 positioning application classes, it can be used in various industry sectors, from automotive production and packaging lines to simple robotics. "With the PROFINET/PROFIdrive integration, which has been certified by Siemens, we offer design engineers a more flexible solution that increases the performance and efficiency of automation processes," says Erdmann.

The igus dryve experience provides more information on igus motor control systems and applications that have already been implemented, as well as tutorial videos of all functionalities and a guide for selecting the right motor control system. Igus also offers free sample programmes that reduce the integration time of the motor control systems, saving time and money.

The igus D1 motor control is now available with integrated PROFINET/ PROFIdrive.

Specialised electric motors for heavy duty applications

Hexagon Electrical has expanded its manufacturing and service capabilities to meet growing demand for customised, high-performance specialised electric motors for heavy engineering, hazardous industrial and mining applications.

The company, based in Brakpan, Gauteng, manufactures flameproof and non-flameproof equipment, combining mechanical precision, electrical expertise and design innovation to deliver robust, energy-efficient certified solutions, tailored to customer requirements.

"Our broad product portfolio comprises motors and transformers, enclosures and switchgear, ventilation fans, scrubber fans and auxiliary equipment, as well as a full range of flameproof equipment compliant with SANS 60079 standards," says David Dyce, CEO, Hexagon Electrical. "The range of specialised Hexagon motors includes dual kW and dual speed ac motors, slip ring motors and water-cooled flameproof motors. Also in our portfolio are flameproof or standard winch and traction motors, as well as standard or flameproof pad mount motors for heavy-duty mining applications."

Dyce highlights that all motors are offered with optional customisation in voltage, mounting, shaft configuration and thermal protection. The company also designs, supplies and services transformers, enclosures, ventilation equipment and auxiliary components for integrated system deployment.

Hexagon Electrical equipment is robust, engineered to ensure high performance and optimum safety in critical applications, including ventilation in hazardous areas, chemical processing, materials handling and in underground mining.

"With our in-house design, manufacturing and testing facilities, our highly skilled team offers a complete lifecycle service, including system design, motor rewinding, mechanical refurbishment, electrical testing and final certification," Dyce adds.

The company's recent investment in test infrastructure enables it to evaluate motors at full load up to 460 kW and 6.6 kV. Flameproof inspection is conducted by accredited inspectors and all products undergo mechanical and electrical assessments prior to final assembly. A dedicated vacuum pressure impregnation (VPI) system and dual varnishing process ensure quality, durability and performance in extreme operating environments.

The manufacturing facility is equipped with four production bays, each with dedicated lifting capabilities ranging from 5 to 25 tonnes. Machining, lamination punching, coil winding, and dynamic balancing are all undertaken in-house, using modern equipment, including a 460 kW Schenk dynamometer and high-voltage test systems.

The manufacturing process is supported by proprietary design software developed in collaboration with the University of Witwatersrand, enabling advanced simulation, stress verification and application-specific winding design.

The company's operations are underpinned by environmental and safety standards and are fully compliant with SABS, SA Flameproof Association, SEIFSA, MASC and ISO technical standards. Motors and control systems are assembled in accordance with SANS 10242 and inspected against client specifications prior to dispatch. Each unit is supplied with a full data book, including balancing certificates, electrical test reports, records of the repair history and traceable calibration records.

With his technical background and commitment to quality assurance, CEO David Dyce continues to drive the company's focus on performance, reliability and long-term customer support. As part of Montsi Investments, Hexagon maintains a strategic focus on industrial resilience, manufacturing new equipment and providing repair services to sectors where downtime and the risk of failure carry high operational costs.

Hexagon Electrical manufactures customised, high-performance specialised electric motors. Pictured here: winding of a flameproof water-cooled motor.

Barring a new copper bar rotor in the production workshop.

Monitoring infrastructure in remote environments

For power grids, water supply networks and many industrial facilities, managing infrastructure in remote locations is a significant challenge as it is almost impossible to maintain regular in-person oversight. The solution lies in remote monitoring, but it is important that any instrumentation used for this is right for the environment in which it is deployed. Gary Bradshaw, Director of Omniflex, outlines the requirements for monitoring equipment to be used in remote and harsh environments and shares the example of work done with South African electricity supply company, Eskom.

Remote locations present particular challenges for monitoring equipment for several reasons. First, the equipment is often exposed to harsh environments: high heat levels, moisture, dust and electrical storms, all of which can damage electrical equipment. This is made worse where maintenance capabilities are limited, and getting a technician to site to check the equipment is logistically challenging because of the locations, time and costs involved.

Furthermore, there is often no access to mains electricity in these environments, so systems typically run on batteries or, where possible, solar power. This means energy management must be considered to maintain system availability, and replacement batteries should be stocked so batteries can be replaced before outages cause downtime.

Maxiflex pole-mounted RTUs are interfaced to a central control room, to enable remote monitoring and resets when necessary.

Maintaining reliable data links and system connectivity is especially challenging. Cellular network signals are often unavailable in remote locations and accessing them using traditional wired infrastructure is generally impractical due to the prohibitive installation costs. The only viable options in these scenarios are radio and satellite.

Underlying all these obstacles is a broader challenge of system longevity. Many industrial monitoring products come with a built-in obsolescence cycle that forces system replacements every decade, sometimes sooner.

For installations in remote and dangerous locations, this is not always practical as sending engineers out to replace equipment on a regular basis raises the same cost and risk challenges as in-person monitoring and maintenance. For these installations, remote monitoring equipment should ideally maintain full serviceability and compatibility for decades, to minimise the need to dispatch engineers and technicians to the site.

Pole-mounted RTUs for Eskom

In the early 1990s, South African electricity utiliity Eskom was struggling to cope with the challenges of managing remote installations, such as 11 kV and 22 kV distribution lines running through some of the country's most remote terrain. During storms, lightning strikes and falling tree branches regularly tripped the lines auto-reclosers and sectionalisers, causing service outages.

Restoring service required engineers to travel long distances, often at night and in treacherous conditions, to investigate faults and manually reset devices. Fault reporting was often delayed too, as many of the regions had poor telecommunications infrastructure.

To overcome these challenges, Eskom engaged Omniflex to provide it with remote monitoring instrumentation that could be used to monitor installations from a centralised control room 24/7. Omniflex provided a solution in the form of pole-mounted Maxiflex remote terminal units (RTUs).

Maxiflex is a modular product that can be configured to suit a wide range of applications, and its hot-swappable I/O modules enable maintenance without powering down the system, minimising any associated downtime.

The Maxiflex pole-mounted RTUs were mounted directly on power line poles alongside switching devices and interfaced to a control centre over unlicensed radio bands for secure 24/7 monitoring. This solution allowed operators to receive real-time fault alerts and enabled them to isolate line sections or reset devices remotely, without dispatching engineers.

The Eskom project was one of the first projects where the Maxiflex product was deployed and, since then, it has been used across critical infrastructure applications worldwide. These range from radiation monitoring at most UK nuclear sites to utility metering, real-time sequence of events monitoring and alarm annunciation projects in industries including nuclear, petrochemical, and oil and gas.

For more information visit: www.omniflex.com

Integrated services from one provider

As businesses face growing pressures locally and internationally, costs are under constant scrutiny. For mining companies, as for many others, the focus is on streamlining operations without sacrificing output. Mamiki Matlawa, ACTOM Group Business Development Executive notes that despite this, many organisations still depend on a fragmented network of service providers, each with its own contracts, processes, and communication protocols to meet their equipment, staffing, and maintenance needs.

Mamiki Matlawa, ACTOM.

While working with multiple service providers might seem like a good way to access flexibility and specialist expertise, it often leads to duplicated efforts, increased costs, ineffective communication, and frustrating delays. A more practical approach can be to use an integrated services provider. This simplifies operations by reducing friction, cutting costs, and improving service quality and uptime through one central point of management.

Hidden costs in managing multiple providers

When services are handled by different vendors, industrial operations face the challenge of keeping everyone on the same page. Meetings are repeated, data is siloed, and communication becomes a constant back-and-forth between various teams. This results in an unnecessarily heavy administrative burden, where every vendor must be managed, vetted for compliance, and evaluated for performance.

Response times are slower when emergencies such as critical equipment failure arise, as responsibility is dispersed across multiple parties and projects may stall while teams wait for updates, clarification, or coordination. In some cases, simple repairs may involve several service provider touchpoints and redundant site visits, dragging out timelines and driving up costs.

Integration enables simplification

A provider of integrated services brings together essential functions such as equipment supply, maintenance, safety audits, and staffing under one contract with a unified management structure. This streamlined setup delivers immediate benefits, and in high-pressure situations like unexpected equipment failures, the value of having a single, reliable point of contact becomes especially clear. Instead of scrambling to coordinate multiple service providers, companies can rely on a cohesive team that already understands their infrastructure, protocols, and priorities. This can significantly reduce the time to resolve the problem and mitigate operational risks.

An integrated approach also reduces the administrative burden as fewer contracts, invoices, and points of contact mean less paperwork and more time for strategic tasks. Such an approach further enhances quality control, as instead of managing multiple suppliers with varying standards, companies can work with one provider to ensure consistency across the board. Additionally, it gives the service provider the visibility to spot opportunities for synergy and efficiency that might be missed when services are split across different vendors. For example, maintenance schedules can be aligned with staffing and equipment supply, minimising downtime, and maximising output.

Cost savings and quick wins

When services are handled under a single umbrella, cost savings follow. This is because where service volumes are consolidated, companies can increase their bargaining power. Instead of negotiating separately with each provider, the company can unlock value through economies of scale with reduced rates, rebates, or more favourable contractual terms.

With fewer vendors to manage, they can also reduce the number of audits, training sessions, onboarding processes, and compliance checks required, which cuts down on time and costs. The hours once spent coordinating multiple supplier relationships can instead be redirected to core business tasks. And quality management can be better streamlined, with the ability to audit one provider's systems across multiple services, rather than assessing each supplier individually.

Safety, uptime, and lifecycle management

An integrated approach also makes it easier to tailor services to strategic goals. Whether that's improving safety, increasing equipment uptime, or supporting sustainability targets, there is greater alignment and clearer accountability across teams when one provider is responsible for multiple facets of the operation. Regular safety audits and quality assessments can be centralised to ensure consistency and reduce audit fatigue.

The most compelling advantage of service integration lies in lifecycle value. When one provider manages an asset from cradle to grave, covering procurement to maintenance and repair, they are better positioned to optimise its performance over time. Additionally, there is no need to re-onboard new vendors at every stage or renegotiate terms with each new requirement, as everything is managed through one trusted partner with a big-picture view of the company's operations.

In this way, the total cost of ownership can be reduced, which helps companies plan and manage their assets more efficiently,

minimising unplanned downtime and extending the useful life of critical infrastructure.

A strategic investment

As industrial operations evolve, the need for seamless service delivery and tighter cost control will likely become more pronounced. Integration provides a scalable solution that helps companies meet today's operational demands and position themselves to meet future challenges with agility and confidence.

With the simplification of their service provider portfolio, companies can move faster, respond better, and produce more, with less friction. Choosing the right partner is key, however, and factors like local availability, strong logistics, technical capabilities, and a proven track record will all factor into the decision. The goal would be to build a strategic relationship that supports the full scope of service demands – from emergency response to long-term efficiency and performance improvements.

Especially in competitive, high-stakes industries like mining, reducing complexity can create a powerful advantage. Integration might be the right forward-thinking strategy to cut costs, improve uptime, and build operational efficiencies.

For more information visit: www.actom.co.za

Differential pressure measurement made simple

Differential pressure sensors from Vega employ a metallic measuring cell at their core. This provides several significant advantages. The sensors are particularly suitable for applications that require the management of high static pressures and detection of extremely small pressure differences. Their compact design allows for efficient integration into complex systems, and their robust construction ensures consistently high accuracy in measurements. This makes the sensors a reliable choice for environments where precision is paramount, and the slightest pressure variations must be captured and monitored.

A notable characteristic in this category, as in the CSB and CSS variants for example, is the use of chemical seals. Chemical seals are designed to enable universal application across different scenarios involving large pressure differences and high static pressures. They typically incorporate an integrated overload diaphragm, which enhances operational reliability by protecting the sensor from damage due to unexpected pressure surges. This feature is especially valuable in industrial settings where process conditions can vary unpredictably and equipment durability is essential for continuous operation.

The VEGADIF 85 is an exemplary model of a differential pressure sensor: suitable for universal application, providing high operational dependability and integrated overload protection, ensuring consistent performance in the harshest conditions, and safeguarding both the measuring cell and the integrity of the readings produced.

Electronic differential pressure measurement, on the other hand, has introduced a new level of versatility and ease of use in modern process industries. These systems typically employ two pressure transmitters – often from the VEGABAR PRO series – which are combined to form a comprehensive measurement system. One of the primary advantages of electronic differential pressure systems is their immunity to environmental factors, such as fluctuations in ambient temperature, which can otherwise compromise measurement accuracy. Additionally, electronic systems offer considerable flexibility, allowing for the use of various sensor configurations and measuring cells tailored to specific applications.

The installation, assembly, and ongoing maintenance of electronic differential pressure measurement systems are straightforward, minimising operational downtime and reducing overall lifecycle costs. In practical terms, the systems can be used for applications such as monitoring pressure overlays in vessels, where sensors from the VEGABAR 80 series are seamlessly combined. The modularity of the series means users can address challenges such as large temperature differences, vacuum conditions, abrasive media and the need for cost-efficient solutions with minimal installation complexity.

Whether you are using conventional or electronic differential pressure sensors, VEGA's modern industrial measurement solutions offer a comprehensive suite of options designed to deliver precision, adaptability and reliability across a range of demanding applications.

For more information visit: www.vega.com/en-za

Left: The VEGABAR series of electronic differential pressure measurement sensors. Right: VEGABAR electronic differential pressure measurement sensors here provide steam and condensate process pressure measurement in a paper mill.

The hazards of fuel adulteration in machine maintenance

Fuel adulteration remains one of the most insidious threats to industrial machinery, safety, and environmental compliance across multiple sectors. Craig FitzGerald, Chief Executive Officer of ISO-Reliability Partners, points out that this issue is widespread and, as well as undermining mechanical performance and operational safety, it raises significant legal and financial risks.

ISO Reliability Partners warns that fuel adulteration remains one of the most prevalent hidden threats to industrial machinery.

"Adulterated fuel is not just a matter of poor performance; it is a danger to equipment integrity, worker safety, and environmental sustainability," says FitzGerald. "The problem is far more prevalent than many realise, and the consequences are escalating."

Quality concerns

Central to the issue is the adulteration of diesel with substances such as illuminating paraffin (IP), used transformer oil, and gear oils. These agents significantly degrade fuel quality. "IP, for instance, reduces diesel's lubricity, which is essential for the protection of high-pressure fuel injection systems. Without proper lubrication, operations will see elevated costs, premature wear and mechanical failure," says FitzGerald.

In addition, adulteration alters the fuel's viscosity and density, directly affecting combustion efficiency and engine output. This results in increased maintenance frequency, unexpected breakdowns, and markedly higher operational costs over time.

"We are seeing cases where seemingly minor dilution leads to major engine damage, simply because the physical and chemical properties of the fuel are no longer within operational parameters," adds FitzGerald.

Safety risks and invisible hazards

The safety implications extend beyond engine wear. Used transformer oil, a common adulterant, often contains polychlorinated biphenyls (PCBs), a class of highly toxic chemicals strictly regulated under the Basel Convention.

"The combustion of PCBs in engines produces extremely harmful by-products, including hydrogen chloride and dioxins, many of which are carcinogenic and mutagenic," FitzGerald notes. "When you are running equipment using adulterated fuel, you are creating chemical hazards that affect machine operators and the broader environment."

Mechanical reliability is also compromised. Poor fuel quality can cause diesel engines to fail under load, potentially creating hazardous conditions, particularly in heavy industrial or transport environments.

Environmental and economic fallout

As well the harm it does to equipment and people, adulterated fuel undermines environmental protection and public finances. "The practice leads to the illegal disposal of hazardous industrial oils and long-term soil, air, and groundwater contamination," says FitzGerald. "It is a form of environmental abuse hiding in plain sight."

Moreover, the economic consequences are serious. FitzGerald highlights that losses to the South African fiscus from fuel adulteration and associated tax evasion are estimated to exceed R3.6 billion annually. "These are funds that could otherwise support environmental enforcement, infrastructure, and community development," he says.

Proactive industrial measures

FitzGerald advocates a combination of advanced technology and sound procurement practices to combat adulteration. Real-time sensor technology like the Yateks® Africa FuelTrust system allows for real-time on-site detection of critical fuel parameters, including density, viscosity, and dielectric constant, which flags contaminants such as paraffin and PCBs as well as moisture content and temperature. The sensors are particularly suitable for continuous monitoring in high-volume operations.

In addition to technological solutions, regular fuel sampling, laboratory testing, and comparative analysis against EN590 standards remain essential. "Even when using unbranded or 'white site' fuel suppliers, it is critical to analyse lubricity and chemical composition to avoid surprises," FitzGerald says.

Accountability from suppliers

ISO-Reliability Partners advises industries to tighten their fuel procurement standards. FitzGerald recommends demanding written certification of compliance with EN590 or similar recognised standards, batch test results for viscosity, density and sulphur, and contractual audit rights. "Fuel suppliers must be held accountable." He advises industry to choose branded suppliers with traceability and a reputation to lose, as they are statistically less likely to be involved in adulteration.

He also emphasises the value of contractual protections: "Include clauses that enforce penalties for non-compliance, allow

immediate termination if adulteration is detected, and mandate traceable sourcing. This creates a legal and ethical deterrent," FitzGerald suggests.

Furthermore, when adulterated fuel causes equipment failure, industries have strong legal recourse, provided evidence supports the claim. "If damage can be forensically linked to contaminated fuel, and a supplier is found to have breached contract or acted negligently, litigation is a viable route," he says.

South Africa's National Environmental Management Act regulates substances like PCBs, and the Consumer Protection Act supports claims of defective or misrepresented fuel. "Service-level agreements are key here," says FitzGerald. "They provide the foundation for enforcing quality expectations and pursuing legal remedy."

He also notes that government oversight is catching up. The Department of Mineral Resources and Energy has confirmed over 70 failed fuel samples in a recent inspection, which bolsters industry claims and highlights the regulatory awareness of the issue.

A call to industry

As South Africa's industrial sector grapples with economic pressures and environmental challenges, ensuring fuel integrity is fundamental. "With the right tools, contracts, and vigilance, industries can protect their machinery, personnel, and the environment," says FitzGerald.

"ISO-Reliability Partners is committed to helping clients implement these safeguards effectively. In industries where fuel adulteration continues to threaten operational stability, awareness, action, and accountability must work together," he says.

For more information visit: www.iso-reliability.com

A dynamic compressed air control system

CompAir has launched Ecoplant, a dynamic, compressed air management solution that adjusts compressor parameters in real time, offering up to 30% reductions in energy costs and CO_2 emissions.

Generating compressed air can be very energy-intensive and many conventional control systems are not designed to adapt to fluctuations in air demand in real time. As a result, up to 50% of compressed air can be wasted, through inappropriate use and artificial demand, combined with failure to detect pressure drops or leaks.

Ecoplant is different. Using dynamic, AI-based control rather than static control, the system monitors key metrics throughout the network. It then adjusts compressor setpoints accordingly and selects the optimal operating configuration.

Ecopplant also allows for easy identification of air leaks, which can then be isolated for repair. Health insights can predict and warn of potential issues before they occur, helping to prevent costly downtime.

Remote, cloud-based monitoring

The cloud-based management solution combines intuitive predictive maintenance, generated by the algorithm and SaaS proactive analytics and controls. This enables operators to monitor issues from anywhere in the world.

Immediate maintenance alerts and one-click monitoring mean teams can respond quickly, helping to prevent downtime and supporting cost savings through sustained production efficiency.

Customised dashboard and reporting

By monitoring the compressed air system dynamically, operators can make better decisions based on better data. In addition, Ecoplant is customisable to the needs of each site in monitoring its compressed air system, including monitoring energy consumption and operation.

Unlimited historical data is also readily available. Trends such as periods of inactivity or lower demand can be tracked for the whole system or for individual processes or compressors. Simple comparisons between different periods can be performed within seconds, all helping maintenance teams to identify inefficiencies over time and take remedial action.

Commenting on the launch, Andrea Milia, Business Development Manager at CompAir said: "Over 70 per cent of manufacturing facilities use compressed air systems, which typically represent between 10 and 30 per cent of the site's average annual electricity costs. Together with variable equipment efficiencies, costly maintenance and poor air quality, generating compressed air can be costly.

"With its dynamic control managed by machine learning, Ecoplant offers a new approach for operators to monitor and manage their compressed air system remotely, helping save maintenance costs and avoid equipment downtime."

An annual value calculator is available on the CompAir website to help operators calculate potential compressed air system savings if they install Ecoplant in their facility.

The monitoring and control solution manages compressed air systems dynamically, increasing efficiencies and delivering substantial energy savings.

Earth leakage protection is critical

The installation of earth leakage protection devices with all electrical installations is mandatory in South Africa for a reason. When something goes wrong on site, it is the installer who is held accountable, not the manufacturer, supplier, or wholesaler. Lives, liability, and professional reputations all hang on a single point of potential failure: the device you choose to install.

Dr Andrew Dickson, CBi-electric: low voltage.

"Get it wrong, and you're risking far more than a technical fault," says Dr Andrew Dickson, Engineering Executive at CBi-electric: low voltage. "You're putting human lives and your career on the line."

When current takes an unintended path

Earth leakage protection devices (ELPDs) monitor the flow of current in a circuit and trip when they detect even a slight imbalance – the signal that current is leaking to ground instead of returning via the neutral conductor. Sometimes, this is through a person's body. "It doesn't take a large current to do serious harm," warns Dickson. "Occupational health and safety guidelines indicate that currents over 30 milliamps (mA) can be fatal. That's why our devices are designed to trip between 23 and 27 mA. A few milliamps, and a few milliseconds, can make the difference between life and death."

The human body responds to electrical current at different levels in different ways:

- 1 mA: Tingling, but easy to ignore
- 5 mA: Unpleasant shock
- 10-20 mA: Loss of muscle control, limited ability to let go
- 30+ mA: Breathing is disrupted; heart rhythm affected
- 50+ mA: Burns, unconsciousness, or death.

This is why the safety threshold is 30 mA, and why devices must be accurate and reliable in tripping below that point.

Legal compliance

South African law requires that all earth leakage devices meet the National Regulator for Compulsory Specifications' (NRCS) VC 8035 specification which sets safety and performance standards. "If you install a device that does not comply with this specification, you carry the legal liability," Dickson cautions.

To ensure compliance and reliability, he recommends:

- Confirming SABS or equivalent certification
- Checking that the trip level is 30 mA or less
- Avoiding unbranded or generic products that may fail testing.

Nuisance tripping should not be ignored

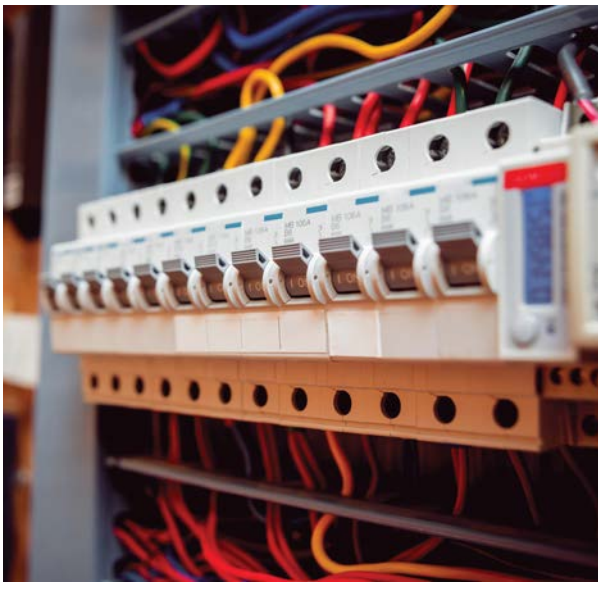
Unexpected trips are often brushed off as a nuisance, but Dickson points out that they can signal bigger issues. "You might be dealing with high cumulative leakage, poor wiring, contaminated terminals, overloaded circuits, or equipment generating unwanted current loss."

He emphasises that proper fault-finding, including measuring leakage levels and tracking variation across appliances, is essential. "Ignoring these symptoms could mean missing the early warning signs of system failure or risk of injury.

"The installer is responsible for installing effective ELPDs," says Dickson. "He or she needs to know exactly what they are installing and ensure it meets the relevant legal and technical standards. Certification, compliance, and correct specifications are fundamental."

CBi-electric: low voltage manufactures high-quality NRCS-compliant ELPDs that are tested for local conditions, for residential, commercial and industrial applications. Its products are designed to protect people, including electrical installers and technicians.

For more information visit: https://cbi-lowvoltage.co.za/



ELPDs monitor the flow of current in a circuit and trip when they detect even a slight imbalance.

Koeberg Unit 1 return to service delayed

In a mid-July update on the planned maintenance of Unit 1 at the Koeberg Nuclear Power Station in the Western Cape, Eskom announced the unit's return to service, initially scheduled for July 2025, has been delayed. The unit is now scheduled to be back online by end of August 2025.

Koeberg Unit 1 is currently offline for the second phase of its long-term operation maintenance programme. The revised timeline for the maintenance programme is based on thorough inspections being conducted throughout the process to ensure the highest quality standards are met and the power station continues to operate safely and reliably.

During scheduled detailed eddy current inspections – a non-destructive testing method used to detect cracks, corrosion, or wear in the metal tubes of steam generators – defects were identified on four tubes, among several thousand tubes inspected, across two of the newly installed generators.

Eskom immediately carried out an advanced automated process to address the four tube defects, supported by specialised international teams working alongside local experts. These critical repairs have now been successfully completed to uphold the highest safety and quality standards.

Importantly, the major maintenance activities – which included the legally required 10-year Integrated Leak Rate Test (ILRT), where the reactor building was pressurised over 72 hours and its leak rate and structural integrity were monitored – were successfully completed. The ILRT confirmed the robustness and leak-tightness of Unit 1's containment structure, reinforcing its safety in line with international standards.

"Our top priority is always the safety of our employees, the public and the environment. Carrying out these additional inspections and repairs to world-class standards, we are investing in the long-term reliability of Koeberg and South Africa's energy future," said Bheki Nxumalo, Eskom's Group Executive for Generation.

"The planned maintenance under way on Unit 1 will help deliver decades of affordable, low-carbon baseload power, demonstrating how nuclear energy can support economic growth and environmental sustainability. Through our commitment to high-quality maintenance and with the expertise of the Koeberg team and their exceptional skills, we are ensuring nuclear power remains a valuable part of the country's energy mix," said Nxumalo.

Power generation milestones in 2025

In parallel, Eskom has made significant progress on other generation projects this year, with two of them already adding 1 600 MW to the grid.

- On 23 March 2025, the new 800 MW Kusile Unit 6 was successfully synchronised to the national grid and will be in commercial operation by September 2025.
- From February 2025 to the end of May 2025, the 800 MW Kusile Units 1, 2 and 3 were safely reconnected to the repaired west stack and are now operating with their flue gas desulphurisation (FGD) systems. This follows the temporary authorisation granted by the Department of Forestry, Fisheries and the Environment (DFFE) to operate without the FGD system under strict conditions until 31 March 2025, after the 2022 structural failure.
- On 6 July 2025, the 800 MW Medupi Unit 4, which had been on a long-term outage since August 2021, was returned to service.

Koeberg, located on the west coast, is South Africa's only nuclear power station.

These milestones reflect Eskom's commitment to improving generation capacity and securing electricity supply.

Eskom's Winter Outlook

Eskom says the revised return date for Koeberg Unit 1 will not increase the risk of load shedding. The Winter Outlook released on 5 May 2025, which covers the period until 31 August 2025, remains valid. Importantly, the planned return of 2 500 MW this winter does not rely on Unit 1.

The outlook shows that load shedding will not be required if unplanned outages remain below 13 000 MW. Even if outages rise to 15 000 MW, load shedding would be limited to a maximum of 21 days over the 153-day winter period, capped at Stage 2. Since 15 May 2025, no load shedding has been implemented, and only 26 hours of load shedding have been recorded for the financial year to date (1 April to 10 July 2025).

Once all maintenance work is complete on Koeberg Unit 1, the unit's reactor core will be refuelled, tested and synchronised back to the national grid.

To protect supply, planned outages at Koeberg are carefully staggered every 16 to 18 months so that both units are not offline at the same time. Together, Koeberg Units 1 and 2 provide around 1 860 MW – about 5% of the country's electricity needs.

Unit 2 remains fully operational, generating up to 946 MW, with a year-to-date Energy Availability Factor (EAF) of 99.38% as of the end of June 2025.

In the statement Eskom said the national power system remains stable, with a month-to-date EAF of 62%. As the winter season continues, Eskom encourages all customers to adopt energy-efficient practices.

For more information visit: www.eskom.co.za

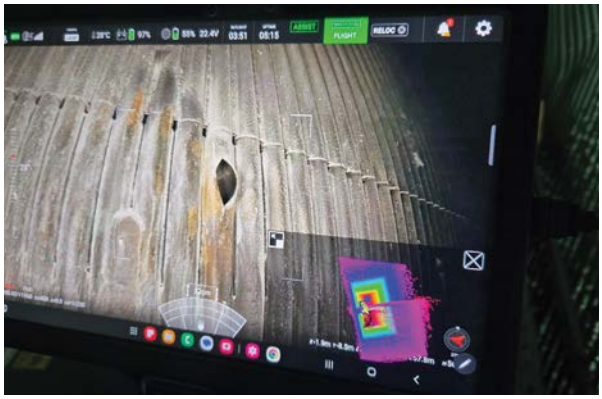
Drone technology cuts maintenance and repair costs

Steinmüller Africa has expanded its intelligent engineering services with the addition of the Elios 3 caged inspection drone to its fleet, enhancing inspection capabilities and reducing costs for coal-fired power stations, for instance, by reducing the need for human inspection services.

"The drone is designed for inspections in dangerous, cluttered, and confined spaces. It's a safer, more accurate way to gather information in hazardous areas," says Carel van Aswegen, Group QC/NDT Manager at Steinmüller Africa.

"Using this drone enables us to cut downtime for inspections – in some cases by as much as 50% – as a result of the accessibility and the accurate data it provides," says van Aswegen. "We can inspect damage in boilers once they cool down to around 50°C, without waiting for permits required for human entry or installing scaffolding and sky climbers. The drone also locates damages with greater accuracy."

The Elios 3 is the first indoor mapping and inspection drone that can transform asset data into digital insights. Its carbon fibre protective cage (18.9" wide by 13.8" high) provides 360-degree collision tolerance, allowing it to navigate tight, complex environments without risk of damage. The drone's advanced stabilisation system ensures smooth, stable flight even in turbulent conditions; this is crucial for capturing high-quality visual and thermal data.



Equipped with LiDAR and advanced stabilisation, Elios 3 captures reliable 3D data in complex environments.

Equipped with a 4 K camera, flight control sensors, inertial measurement unit (IMU), magnetometer, barometer, thermal imaging sensor, three computer vision cameras, time-of-flight (ToF) distance sensor, and LiDAR technology, the Elios 3 delivers high-resolution imagery and enables precise 3D mapping, even underground. This allows for the creation of accurate digital twins of inspected assets, with intuitive reporting on a 3D model and real-time situational awareness built into the piloting app.

The Elios 3 also features advanced flight path detection, enabling it to navigate complex, GPS-denied environments autonomously and with precision. Real-time data transmission enables inspectors to monitor live feeds and make quick, informed decisions, and the drone's modular payload capabilities offer additional flexibility.

Steinmüller Africa has also used the drone for post-incident investigations. Van Aswegen cites the case where a client recently experienced an explosion on site. "We quickly mobilised the drone to assess the damage for safe entry, providing the team with exact locations and live footage of the surroundings, enabling faster, more targeted care," he explains.

Beyond benefitting current clients, the Elios 3 opens new opportunities for Steinmüller Africa. "The drone can be used almost anywhere that would be unsafe, impractical, or financially unviable for a person to go," van Aswegen adds. It can be used, for instance, in coal storage tank facilities, grain silos, underground mines, manufacturing plants, warehouses, boilers, tunnels, cell phone towers, railway ransport tankers, and on bridges.

Steinmüller Africa began using Elios drones in 2017, becoming the first company in South Africa to acquire the technology from Swiss manufacturer Flyability.

Vibration monitoring in three axes with IO-Link

Machine vibrations are important indicators in assessing a machine's condition. Damage to rolling element bearings and other machine components can be detected at an early stage before costly machine downtime occurs. ifm's new and smart IO-Link vibration sensor allows customers to adopt a simple and scalable condition monitoring approach using a single device.

The VVB30x condition monitoring sensor continuously detects vibrations in three dimensions. From the measured values recorded, the sensor calculates proven indicators to evaluate the machine's condition: information on fatigue (v-RMS), mechanical friction (a-RMS), impacts (a-Peak) and bearing wear (Crest factor). As an additional wear indicator, the surface temperature is also transmitted.

The sensor offers a range of other smart functions. In the Basic condition monitoring version, the sensor can continuously analyse and, if required, reliably communicate any unbalance developing in the machine. The sensor also calculates the machine operating hours based on the machine-related vibration level, which is another auxiliary variable in modern maintenance. The DataScience condition monitoring version of the device includes a smart bearing demodulation process for reliable and continuous bearing analysis, known as BearingScout.

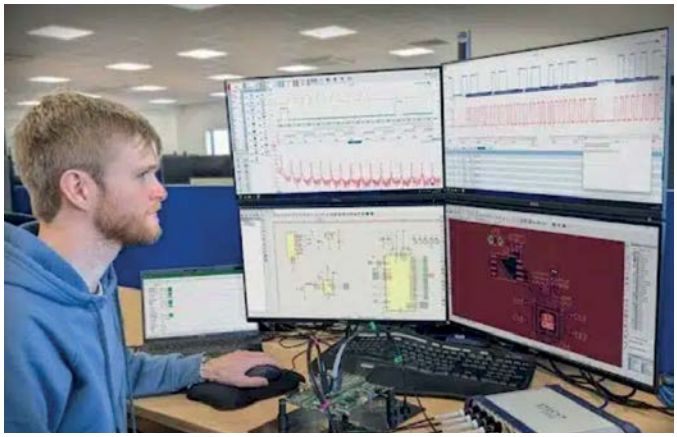
The new vibration sensor uses IO-Link for data transmission, device diagnostics and parameter setting. This enables users to implement vibration monitoring and analysis in a SCADA system from any manufacturer using standard fieldbus protocols. Optionally, this can be done simultaneously via a standardised MQTT or HTTPS interface in any IT system. With the moneo IIoT platform, ifm electronic offers smart additional functions for root cause failure analysis, making it easy to implement IT-based condition monitoring.

Configuration is also easy via IO-Link. In agreement with the respective machine category according to ISO 20816-3, predefined limit value profiles are stored directly in the device and can be adapted to the respective target application using the corresponding system command. In the event of a limit value being exceeded, a detailed root cause analysis can be done, even without moneo, with the integrated BLOB ring memory. Up to 12 seconds of raw data can be made available automatically if required. In addition, the sensor has an internal characteristic value history that provides an overview of the last nine days.

With condition monitoring, damage to pumps, fans, geared motors, vacuum pumps and many other rotating machines can be detected at an early stage. This means maintenance work can be planned cost-effectively and in line with requirements, maximising machine availability. Where vibrations in machines have an impact on the quality, condition monitoring also helps to improve the production process.

For more information visit: www.ifm.com

The benefits of using PC-based USB oscilloscopes



Left: PicoTech's PicoScope 7. Right: With adequate lab space, time and frequency domains and serial decoders can be viewed at the same time, keeping design data in sight so you know what to test.

For decades, traditional benchtop oscilloscopes have been a cornerstone of electrical and electronics engineering, offering reliability, precision, and familiarity. However, as technology evolves, so do the tools we rely on. The PC-based USB oscilloscope introduces an advanced, adaptable alternative that's redefining test and measurement. Pico Technology, represented locally by Comtest, here sets out why USB oscilloscopes, like PicoScopes, are becoming the preferred option of engineers around the globe.

One interface for every scope

Switching between different test equipment can disrupt workflows and drain productivity, especially when engineers have to relearn unfamiliar software for each device. The PicoScope 7 software provides a single, unified interface for all Pico real-time oscilloscopes – from 10 MHz to 3 GHz. This allows teams to work smarter, not harder. From entry-level models to high-performance solutions, the same intuitive platform adapts as the user's needs change and grow.

As projects become more complex, engineers need tools that evolve without adding unnecessary friction. With the PicoScope 7 software, labs can stay agile and ready to tackle any challenge. It offers several advantages.

- Streamlined training: One training session equips your team to operate every scope in the line-up, reducing on-boarding time for new hires.
- Seamless upgrades: Scaling to higher bandwidth models is easy – no steep learning curve or downtime.
- Consistent workflow: Familiarity with the interface means faster setup, easier analysis, and uniform reporting, every time.

Test anywhere, anytime

Not all testing happens in the lab. A traditional benchtop oscilloscope is fundamentally quite big because of the built-in screen. For engineers on the go, bulky benchtop oscilloscopes can be impractical and difficult to transport.

The PicoScope offers a portable solution, designed for mobility. Compact enough to fit in a laptop bag, PicoScopes make it easy to take the power of the lab to the field. Many models are USB-powered, which means a mains supply is not needed. So PicoScopes can be used for testing even in remote locations.

Capture what matters

When debugging equipment or systems, usually, every millisecond counts. Yet many oscilloscopes waste valuable record length in capturing dead time between events, making analysis inefficient and frustrating. PicoScope's deep memory and waveform buffer overcome this obstacle.

The scopes are designed with memory segmentation in mind, ensuring every captured waveform focuses on what matters. By slicing captured memory, PicoScopes maximise efficiency and enable frame-to-frame analysis. This means test teams can focus on key events with advanced triggers without wasting record length on irrelevant data. It supports faster analysis to isolate issues quickly for troubleshooting. And the onboard Hardware Acceleration Engine maintains performance even when dealing with thousands of saved waveforms.

PicoScope empowers engineers to capture events smartly. Whether chasing intermittent faults or isolating key signals, segmentation ensures the scope functions efficiently to provide precision, performance, and results.

Decode without limits

Another advantage is that, with PicoScope 7 software, PicoScopes are equipped with all serial protocol decoding options, included as standard. For engineers working with I^2C, Modbus, CANXL, 10BASE-T1S or another protocol, PicoScope 7 covers most options. And new options are added continually. This simplifies signal decoding and system debugging.

The power of PCs

When every second counts, waiting for compute-heavy operations on an oscilloscope can stall workflow. With PicoScopes, users can leverage the power of a PC for faster and more efficient analysis. The oscilloscope and PC work together, turning compute-intensive tasks into seamless operations. Whether validating designs in the lab or testing performance in production, PicoScope won't slow things down.

Further advantages include the option of automating test sequences using the PicoScope 7 software; simplified collaboration across teams, locally and globally, because all test data is stored on PC; and a lower total cost of ownership, because PicoScopes deliver long-term reliability and value.

PC-based USB oscilloscopes are redefining the field of electronic measurement. Compact, cost-effective and high performing, they combine the reliability of traditional scopes with the power and versatility of modern technology. PicoScopes offer a smarter, more efficient way to work.

For more information visit: www.comtest.co.za

Cybersecurity and AI

Ryan Boyes, Governance, Risk, and Compliance Officer at Galix

Artificial Intelligence (AI) is reshaping information security, presenting unprecedented opportunities and significant new threats. While AI-driven solutions can enhance threat detection, automate responses, and improve compliance with stringent regulations like the Protection of Personal Information Act (POPIA), and the General Data Protection Regulation (GDPR), they also introduce vulnerabilities that could be exploited by cybercriminals. The challenge for businesses is clear: how can you leverage AI effectively while mitigating the risks it inherently brings?

AI as a force for good

AI's capabilities in cybersecurity are extensive. Machine learning algorithms can analyse immense datasets, identifying patterns and anomalies that might indicate a security breach. This allows organisations to detect threats faster than they can using traditional methods, reducing response times and limiting damage. AI also enhances compliance efforts by streamlining data classification, access control, and audit processes, enabling businesses to meet evolving regulatory frameworks.

Beyond detection and compliance, AI plays a role in automating routine security tasks, freeing up security teams to focus on higher-level threat management. The ability of AI-powered security tools to adapt and learn from previous attacks means businesses can build a proactive rather than reactive security posture.

The other side of the coin

The same technology that enhances security can introduce new vulnerabilities. Cybercriminals are leveraging AI to launch increasingly sophisticated attacks, such as AI-generated phishing emails that mimic human communication with unnerving accuracy. Deepfake technology can be used to bypass traditional identity verification methods, and AI-powered malware can evolve to evade detection. Attackers are also using AI to analyse network defences and tailor their attacks accordingly, making them more difficult to anticipate and counter.

For example, AI-driven phishing attacks are becoming increasingly difficult to detect. They can analyse an organisation's communication style, crafting personalised messages that may trick even the most vigilant employees into revealing sensitive information. Similarly, AI-enhanced malware can continuously evolve to evade signature-based detection methods, making traditional cybersecurity approaches less effective.

Another concern is the risk of over-reliance on AI-driven security measures. The automation of security processes can sometimes lead to complacency, with businesses assuming their AI tools are infallible. The reality is that AI is not perfect – it can make mistakes, and it can be manipulated, and its effectiveness depends on the quality of the data on which it is trained. Blind trust in AI without human oversight can create a false sense of security, leading to vulnerabilities being overlooked.

Call in the experts

The knowledge and skills of security compliance officers and third-party cybersecurity experts are essential. Their role goes beyond ensuring regulatory compliance; they act as a check against AI's potential weaknesses in cybersecurity systems. By conducting thorough audits, fine-tuning AI-driven security systems, and continuously assessing emerging risks, these professionals help organisations build resilient security frameworks.

Ryan Boyes, Galix.

Security leaders should prioritise a hybrid approach that combines AI's analytical power with human intuition and expertise. While AI can process vast amounts of data and detect anomalies, human oversight is needed to interpret nuanced threats, assess context, and make informed strategic decisions. Regular security audits, penetration testing, and ongoing staff training are essential to staying ahead of AI-powered threats.

Moreover, businesses need to recognise that AI is only as good as the data on which it is trained. Biased or incomplete datasets can result in AI misidentifying threats or generating false positives, leading to ineffective security measures. Human intervention is required to fine-tune AI models and ensure they are accurate and adaptable. Additionally, the ethical implications of AI-driven cybersecurity solutions need to be carefully managed to prevent misuse or unintended consequences.

Gaps in compliance

With regulations like POPIA, GDPR, and others imposing stricter security and privacy mandates, businesses need to ensure that AI-driven solutions do not inadvertently lead to compliance breaches. AI's ability to process extensive data makes it a powerful tool for security, but without proper governance, this can also be a liability.

For example, AI models used in security may store or process sensitive personal data in a way that violates data protection laws. Additionally, AI-generated security insights might introduce biases that result in discriminatory or legally questionable decisions. Organisations must take a proactive approach to AI governance, ensuring that AI-driven security measures align with legal and ethical requirements.

Balancing AI's promise with proactive defence

Businesses need to approach AI-driven security with a balanced strategy, leveraging its strengths and remaining vigilant against its vulnerabilities. By integrating AI with robust governance frameworks, human oversight, and expert-led security strategies, organisations can harness the power of AI without falling prey to its risks. The key to securing the future lies in using AI not as a replacement for human expertise, but as a tool that enhances and strengthens security measures in the evolving threat landscape.

For more information visit: www.galix.com

Gearing the grid for EV adoption

Dr Patrick Narbel, Co-founder and Chief Technology Officer at GoSolr highlights that in South Africa, the intersection of energy and mobility sectors is driving transformation. Electric vehicles are becoming more accessible, and CleanTechnica [1] reported that local EV sales grew by 35% from 2023 to 2024. Yet, this exciting growth faces a familiar obstacle: the country's fragile, overburdened national electricity grid.

Can our electricity system support the all-electric future? It will need help. As well as the clear need to expand capacity, it requires a complete rethinking. South Africa's National Development Plan 2030 aims to have an energy sector that promotes economic growth, job creation, and environmental sustainability through a diversified energy mix. In this light, solar energy presents one alternative in the energy mix and is fast becoming central to the country's energy transformation strategy. Increasingly, it is emerging as a viable solution to South Africa's energy future.

Dr Patrick Narbel, GoSolr.

The grid is under strain

The country's national grid is under extraordinary pressure and the energy crisis is well documented. Decades of underinvestment, reliance on coal, deep-seated corruption, and maintenance backlogs have left the nation vulnerable to widespread load shedding, load reduction, unexpected power outages and system inefficiencies. This has had a ripple effect across industries, with energy insecurity becoming a significant barrier to economic competitiveness.

Globally, EV sales are expected to exceed 20 million this year. This figure is up 35% year-on-year, according to the 2025 edition of the IEA's annual *Global EV Outlook* [2], and is being fuelled by government incentives, manufacturing innovation, and falling battery prices. Locally, the potential is equally promising, with the government's draft Electric Vehicles White Paper providing a foundation for EV industrialisation and infrastructure development. It outlines investment goals and policy frameworks designed to position South Africa as an EV manufacturing hub. However, it also acknowledges the risk of further grid instability without new approaches to energy generation and distribution.

EVs obviously need electricity. Experiences from other countries show that users tend to charge their vehicles at home and work, reserving the use of fast charging stations for long-distance travel. At home, a user will be able to charge a vehicle from a standard plug, which will take 6 to 10 hours to charge the vehicle from empty to full, depending on the model. A user can install a dedicated EV charger that will typically draw 3.7 kW, or upgrade to 11 kW, which would significantly reduce the time it takes to fully charge a car (but would be equivalent to running 11 swimming pool pumps at the same time).

Imagine 100 000 EVs being plugged in at the evening peak – 100 000 x 11 kW, or 1.1 GW added to the evening peak. For Eskom, this would mean ramping up power plants faster (far from ideal) and dealing with higher peaks. Existing substations would also come under added strain.

Although this scenario is possible, it doesn't have to play out that way. Not all EVs will charge at the same time. (Just as we don't fill up with petrol every day.) Plus, while EVs are relatively new in South Africa, the technology is mature and incorporates built-in flexibility.

The real need is a full battery before the next trip and not immediately upon arriving home. Most vehicles are parked for over 20 hours a day, offering ample time to shift charging to off-peak hours when the national grid capacity is underused. This shift would help to flatten peak demand. And by boosting off-peak usage, we can make better use of existing infrastructure and spread fixed costs over more kilowatt-hours, potentially reducing the unit cost of electricity.

Smart tariffs are key to encouraging such behaviour. Time-of-use pricing with higher rates during peak hours and lower rates off-peak could nudge EV owners to charge their vehicles when it's most efficient and affordable.

What about solar?

Rather than relying on South Africa's predominantly coal-fired electricity, clean electrons from renewable sources like solar PV provide an alternative.

International experience shows that EV owners are more likely to invest in solar installations. If an EV is charged at a workplace equipped with solar PV, energy consumption is aligned with solar generation, maximising the use of clean power when it's most abundant. That's a clear win. At home, excess solar energy can be stored in the EV's battery to be used at night or during the next day's commute.

A tech-savvy thinker might go a step further – imagining a world where EVs help stabilise the grid, discharging power during peaks or when there's a local shortfall. But to make this a reality, regulatory changes are needed to allow EVs to operate as part of the energy ecosystem. Smart, flexible tariffs are also key, enabling behaviours that reduce system-wide costs, while ensuring vulnerable users aren't unfairly affected (for example, by keeping time-of-use tariffs optional).

Of course, challenges will remain, especially in rural areas where local infrastructure may struggle to handle increased demand. But the potential is clear: with the right incentives, planning, and upgrades, EVs can be part of the solution, not the problem.

The National Association of Automobile Manufacturers of South Africa reports that new energy vehicle sales, including hybrids, plug-in hybrids, and fully electric vehicles, represented only 1.45% of total vehicle sales in 2023, a long way from the global average of more than

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Empowering the next generation of energy professionals

The images highlight speakers and participants in the programme presented during Mr Ngubane's visit to the IEPA.

June proved to be an eventful month for the Institute of Energy Professionals Africa (IEPA), driving momentum and marking some notable milestones. The institute was involved in several events that are shaping the future of energy skills development across South Africa and beyond.

On 18 June, the IEPA was honoured to welcome Mr Mabuza Ngubane, Chief Director for SETA Coordination at the Department of Higher Education and Training (DHET), for a site visit at its premises in Benoni. It spotlighted the institute's growing role in developing the skills needed for South Africa's low-carbon energy-efficient economy.

This high-level visit, hosted by Yolanda de Lange, Executive Director of the IEPA, and Mpho Mookapele, CEO of the Energy and Water Sector Education and Training Authority (EWSETA), offered Ngubane an opportunity to review the impact of EWSETA-funded training programmes delivered by IEPA, all aligned with the national vision for a just energy transition.

From classroom to real-world application, the stories shared by students and facilitators brought the value of practical, inclusive, and outcome-driven training to life. Their experiences reaffirmed the strength of public-private partnerships and the importance of enabling access to green skills through innovation, collaboration, and mentorship.

Highlights of the visit

The site visit shared a programme of addresses, presentations, and learners' testimonials that confirmed the transformative power of technical training in the energy space.

Ngubane applauded the IEPA's contribution to tackling South Africa's triple challenges of unemployment, poverty, and inequality. He emphasised that TVET colleges and centres like the IEPA are "critical levers of change", producing not just certified individuals, but competent professionals who can operate at national and international levels. Citing lessons from the recent Africa Green Hydrogen Summit, he reinforced the importance of investing in people alongside infrastructure to ensure sustainable development in the energy sector.

"The unique programmes offered here at the IEPA must produce students who solve local challenges and compete globally," Ngubane said.

Mpho Mookapele highlighted the importance of skills development as a national imperative, underscoring the success of the IEPA-EWSETA collaboration. She called for continued alignment between training providers and the demands of a fast-evolving energy sector.

"When partnerships prioritise outcomes, we see young people stepping confidently into the future of work," Mookapele said.

Robyn Vilakazi, Executive: Skills Delivery and Quality Assurance at EWSETA, welcomed the delegation and provided an overview of the day. She emphasised that the growing momentum in energy training requires high standards and shared responsibility for equipping youth with meaningful, sustainable opportunities.

The visit included some inspiring reflections from current learners and IEPA alumni who shared a small part of their stories.

Vutivi Vinolia Shivambu, a Mechanical Engineering graduate and IEPA Assessment Manager, completed her skills programme in 2019-2020 as a step towards her international certification as a Certified Energy Auditor (CEA®) and a Certified Energy Manager (CEM®) by the Association of Energy Engineers®. She demonstrated energy auditing tools – from ultrasonic leak detectors to lux meters – and explained their relevance in Energy Performance Certificate (EPC) compliance.

Phetahunddi Beauty Tau, a graduate of the EPC Practitioner Skills Programme under the UNDP/EWSETA Mpumalanga Programme, shared how the experience opened new doors for her in the energy sector. Having completed her training at Nkangala TVET College, she looks forward to expanding her skills in energy auditing and helping companies align with compliance and energy goals.

"My future is exciting. I've opened doors in energy and I'm just getting started," she said.

Tonic Khodani Nemathithi, who completed the Energy Efficiency / Audit Technician (EET) Programme, emphasised the value of social and professional workplace skills. Under the mentorship of Mr Albert Williams and Mr Louis Lagrange, Tonic learned the importance of discipline, communication, and continuous learning. Now employed at Energy Cost Savers, he aims to inspire youth in Venda, Limpopo – where he originates from – to embrace sustainable energy and clean communities.

"The journey doesn't end here. I want to inspire others back home and keep learning every day," said Tonic Nemathithi.

Agenda Khoza, now a lecturer at Resolution Circle at the University of Johannesburg on the EPC Practitioner Programme, spoke of her transformation from student to educator. She recently participated in a Training of Trainers programme with the IEPA's Skills Development Manager, Vera Maditsi, and now mentors others entering the energy space.

"As lecturers, we have a mandate to continue the teaching. We're not just teaching — we're building careers." Agenda Khoza said.

Also in attendance was Vijayen Naidoo, CEO at the Quality Council for Trades and Occupations (QCTO). Sharing learnings from a recent ILO Youth Development Workshop hosted in Italy and supported by GIZ, he acknowledged the success of IEPA's pilot training model. "Skills programmes are a miracle in this country. They may be a risk, but it's a risk that is paying off," Naidoo said.

Faith Mkhacwa, General Manager: Energy Efficiency at the South African Energy Development Institute (SANEDI), the implementing agency for Energy Efficiency Programme of the Ministry of Electricity and Energy (DEE), delivered a moving reflection on her early days in energy and the influence of Albert Williams, the same lecturer and mentor with whom Tonic Nemathithi learnt. Faith Mkhacwa praised Williams for his enduring commitment to youth empowerment and lifelong learning. "His passion rubbed off on us – and now we pass it on. That's what real mentorship does." Mkhacwa said.

Powering the future through collaboration

This high-level visit at the IEPA reflected the collective commitment of government, SETAs, TVET colleges, and training providers to bridge the energy skills gap and unlock opportunities for learning, employment, and enterprise. Through programmes like those delivered at the IEPA – and with the support of key development partners such as GIZ South Africa [1], SECO [2], and UNDP South Africa [3] – the sector is charting a future rooted in capacity building, employability, and resilience.

At the IEPA, we believe skills development is more than policy – it is the engine driving transformation, economic growth, and a just transition for South Africa and the continent.

Notes

[1] GIZ South Africa: the German Institute for Development Cooperation in South Africa.
[2] SECO: the State Secretariat for Economic Affairs, Switzerland, which handles Economic Cooperation and Development. (Going forward, the Swiss Agency for Development and Cooperation (SDC) will continue to cover the area of vocational education and training, previously handled by SECO.)
[3] UNDP South Africa: United Nations Development Programme South Africa

For more information visit: www.iepa.org.za

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20% for fully electric vehicles. This slower uptake locally has been attributed to high upfront costs, import duties, sparse charging infrastructure, and anxiety about how far they can range.

Yet, the tide is turning, and the complementarity with solar energy means that we can look forward to the future. Long seen as a supplementary power option, solar is quickly becoming essential to infrastructure, especially in rural and remote areas of South Africa, where extending the national grid is impractical. The country has some of the highest solar irradiance in the world and, paired with declines in battery costs, solar can be combined with energy storage to offer a resilient, clean, and decentralised power source to keep EVs running even when the grid is unable to. Furthermore, EVs and solar can be part of the solution in making the current infrastructure more resilient.

This evolution in solar technology is being driven by necessity, leading to innovation, and presents an opportunity for South Africans looking to reduce their reliance on the grid and Eskom. By adopting solar-powered EV charging solutions, we can lower our energy and transportation costs, gain independence from relying on fossil fuels, build resilience against power outages, and contribute to a cleaner, more sustainable environment. In areas with recurring power outages (from cable theft, load shedding, load reduction or a combination), some consumers and businesses have already installed rooftop solar and home energy management systems.

The intersection between EVs and solar energy is undeniable – and unfolding in real time. By positioning solar as an enabler of electric mobility, South Africa can better navigate its energy future, accelerate EV adoption, and build a more resilient grid that advances the country's goals.

References:

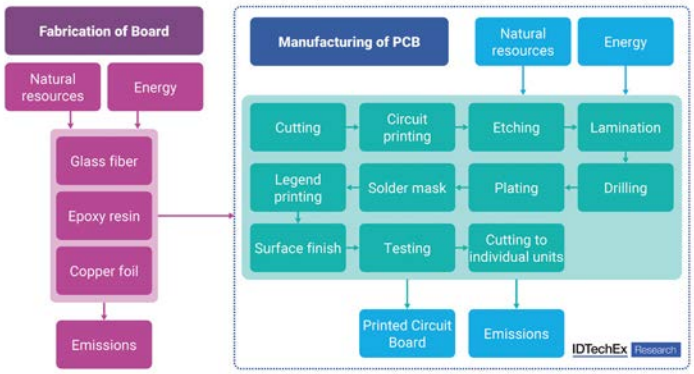
[1] https://cleantechnica.com/2025/01/28/the-volvo-ex30-leads-the-way-in-south-africa-as-bev-sales-go-up-35-in-2024/
[2] https://www.iea.org/reports/global-ev-outlook-2025

In South Africa, solar energy can serve as an enabler of electric mobility – and, in parallel, contribute to a more resilient grid.

For more information visit: www.gosolr.co.za/

Towards sustainability in electronics manufacturing

Thomas Bithell, Technology Analyst at IDTechEx



The diagram shows conventional PCB manufacturing steps, containing multiple sources of waste and harmful emissions. [Source: IDTechEx]

Conventional printed circuit board (PCB) manufacturing is wasteful, harmful to the environment and energy intensive. This can be mitigated with the use of new recyclable materials and technologies which have the potential to revolutionise electronics manufacturing.

During research interviews for its report titled *Sustainable Electronics and Semiconductor Manufacturing 2025-2035: Players, Markets, Forecasts*, IDTechEx found that recent research and testing developments have resulted in many of these materials approaching full-scale commercial readiness, while cost and performance remain a barrier for others.

New substrates

FR4 remains the dominant substrate of choice for PCBs, a glass-reinforced epoxy resin laminate. It is lightweight, strong, and cheap. However, it is also non-recyclable and can contain toxic halogenated flame retardants, which can be released into the atmosphere at end of life through incineration. This makes the use of alternative substrates desirable; these could be bio-based, biodegradable or recyclable.

One promising new material is JIVA's Soluboard®, a biodegradable substrate made from the natural fibres flax and jute. It dissolves in 90°C water, allowing component recycling and precious metal recovery at end of life. The substrate is currently being tested by companies such as Microsoft, Infineon, and Jaguar, who also see it as a method to combat rising global e-waste levels.

Polylactic acid is another sustainable material with opportunities for flexible PCBs. The chemical can be sourced from organic industrial waste and is also biodegradable. Conventional flexible PCBs are made from the plastic polyimide, with sustainably sourced alternatives yet to be found. Polylactic acid could be the solution, currently in the protype scale validation phase, demonstrated by companies and research institutes such as VTT. It can withstand temperatures of up to 140°C, which is lower than that of polyimide and FR4, but compatible with manufacturing processes such as silver ink sintering.

Sustainable soldering

Mayerhofer Electronik was the first to demonstrate the use of second-life tin for soldering in its electronics manufacturing processes. 180 000 tonnes of primary tin are used in electronics globally, primarily sourced from mines in China, Indonesia and Myanmar, causing significant environmental damage. The quality of recycled tin is the same as primary tin, confirmed by X-ray diffraction. It is produced by smelting waste metal and metal oxide. Only around 30% of tin is currently recycled worldwide so there is significant potential for a push towards a circular economy in soldering processes.

Strong regulatory drivers are expected to encourage increased metal recycling, with secondary copper another possibility with potential for implementation into electronics. The strongest regulation to date is seen in Germany. Its National Circular Economy Strategy (NKWS), introduced in 2024, aims to halve per capita raw material consumption by 2045. It also aims to double the share of recycled materials across all industries and reduce municipal waste by 10%. Apple has committed to using secondary tin in all products by 2035. There is scope for more companies to follow suit or implement use of secondary tin sooner.

Recovering copper waste and chemical etchants

Copper is used wastefully in PCBs. A flat sheet of copper is applied to the substrate, before holes are drilled and a circuit pattern produced by etching away the excess copper, which requires large volumes of chemical etchants such as ferric (III) chloride and cupric (II) chloride. Often around 70% of the copper initially applied to the board is removed.

One way to reduce this waste of copper is to employ additive manufacturing, in which copper is applied only where it is required. Adoption of these techniques has been limited due to the capital costs of switching manufacturing methods. A method that requires no manufacturing switch is to employ etchant regeneration systems, which recover both copper that has been etched from the laminate, and etchant chemicals. This recycled copper can then serve as an additional revenue stream for the electronics manufacturer. Such regeneration systems have been commercially available for over a decade and have been found to have a payback period of roughly 6 to 18 months. Systems are available using chlorine gas as an oxidising agent or using electrolysis. The latter has a larger energy requirement, but both can extend the lifetime of etchants. For ferric (III) chloride the lifetime is roughly tripled, and hydrochloric acid consumption can be reduced by around 95%.

Further insights

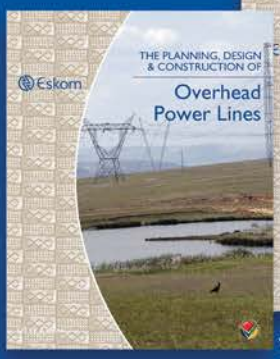
Increased recycling has the potential to reduce material waste from electronics recycling, as well as potentially reducing energy requirements as less material production is required. Recyclable and biodegradable materials also tend to be less harmful to the environment than some of the conventionally used materials. However, increasing the use of recyclable materials is just one way the sustainability of electronics manufacturing can be improved.

IDTechEx's report *Sustainable Electronics and Semiconductor Manufacturing 2025-2035: Players, Markets, Forecasts* provides analysis of more techniques for sustainable electronics manufacturing, in the PCB and semiconductor manufacturing value chains.

For more information visit:
www.IDTechEx.com/SustainableElectronics

Eskom

The Eskom Power Series was conceived in response to the continuing worldwide loss of critical technical skills and experience. The aim of the series is to promote international best practice, including experience acrued by Eskom over the years, as a guide and legacy and to serve as a source of reliable, reputable and highly technical information.



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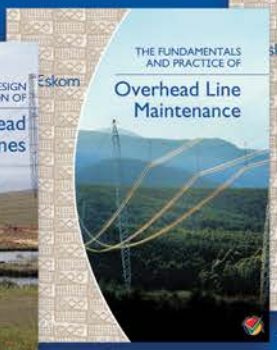

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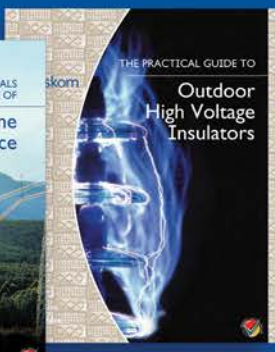

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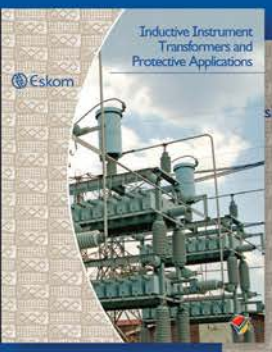

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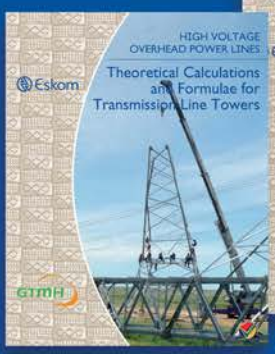

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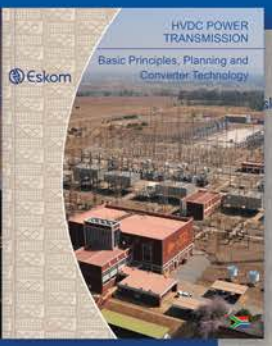

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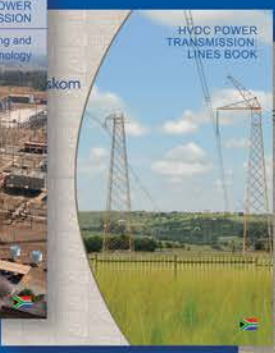

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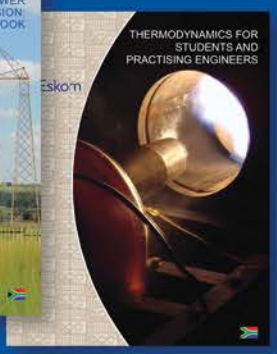

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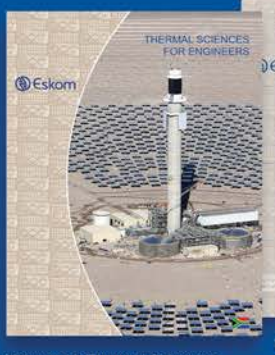

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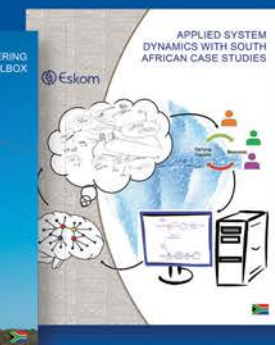

Volume 13: Applied System Dynamics with South African Case Studies

The Eskom Leadership & Management Series was introduced by Eskom at the request of readers and stakeholders of the Power Series who felt that the series should be expanded to include non-technical topics. These topics are often not well understood by technical practitioners and can pose a risk to the sustainability of their businesses. To date, the Power Series team, with assistance from experts in the various fields, has produced two volumes.

Volume 1: Mentorship and Coaching

Volume 2: Winning with People ... Insights for Leaders and Organisations

Volume 1: Procurement Management Key Concepts and Practices

Based on the success of the Eskom Power Series and the Eskom Leadership & Management Series, the Professional Development Series was created. It aims at developing various professions within South Africa so that large state-owned enterprises and the private sector can grow and facilitate job creation in the country. Unlike the Power Series, both the Eskom Leadership & Management Series and the Professional Development Series have a broad readership, including those residing in the private sector, State Owned Companies (SOCs) and academic institutions.

Eskom has also published: GENERATION, TRANSMISSION AND DISTRIBUTION: A large Southern African utility. This is an introduction to the technology that has developed, over time, in response to growing demand in the electricity utility industry in South Africa. It provides a 'soft-landing' for those who need, or want, to engage with the technology in a large electricity utility.

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