

WHAT'S WATT

June
2024



Featuring: ACTOM – bolstering trading in Africa

Your One-Stop Global Energy Supply Partner

ACTOM

SINCE 1903

ACTOM positioned to maintain robust growth, despite continued volatility globally

The world economy still remains highly fluid and volatile, given the wars in Palestine and Ukraine, the Red Sea crisis, as well as geopolitical factors which impact the world.

Although interest rates are currently high, it is expected we will see a relaxation later this year and this will in turn bode well for emerging economies like ourselves. Mining has been adversely affected globally, with a major detrimental impact on platinum group metals operations. We have seen extensive rationalisation across our mining customer base because of this. There are also moves globally towards consolidation in the mining sector. The gold and copper mining sectors are however doing exceptionally well, given demand for these commodities.

ACTOM as a group has closed the March 2024 financial year with exceptionally good results across both our income statement and balance sheet. The diverse nature of our business from manufacturing, after-market as well as turnkey solutions has been instrumental in us achieving these outcomes. I am extremely grateful for these results and this could only be possible due to the hard work and commitment of every employee in our organisation.

Although our markets in the power generation, transmission and distribution sectors are undergoing major disruption, the group have been and continues to position ourselves to optimise loading for our factories.

We are expecting major increases in demand as power generation projects reach financial close and the transmission network is expanded to cater for the increased demand. We are actively pursuing increases in factory and work-



Mervyn Naidoo

shop capacities across various product lines and are actively investing into the future and sustainability of our business.

ACTOM as a group have stepped up our sales, marketing and business development initiatives through increased visibility to key stakeholders. This has been achieved through active participation through various industry bodies and a major increase in the use of social media platforms and public relations. The group has recently featured in CNN Africa and this has increased visibility of our group capability into international markets.

ACTOM continues to look towards succession planning to ensure sustainability of the group into the future. We have recently transitioned several senior roles in the company quite seamlessly.

Our health and safety performance

is currently at an LTIFR of 0.45. I would like to commend everybody for maintaining a safe work environment.

A key strategic initiative of ACTOM is that of impact on the lives of our employees and in those communities that surround us. We have made major progress in accelerating our education-related initiatives. I'm also pleased to highlight that we have embarked on an initiative to impact the lives of those who are differently abled. This training initiative is intended to ultimately lead to enterprise and supplier development opportunities.

As we emerge from our recent elections, let's stay focused on matters within our control and not be distracted by some of the short-term noise. We are a nation of resilience, and I am optimistic of a turnaround of our current economic situation.

Mervyn Naidoo

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Cover: The technical team from M&C Zambia ensures minimal client downtime.

ACTOM – bolstering trading in africa

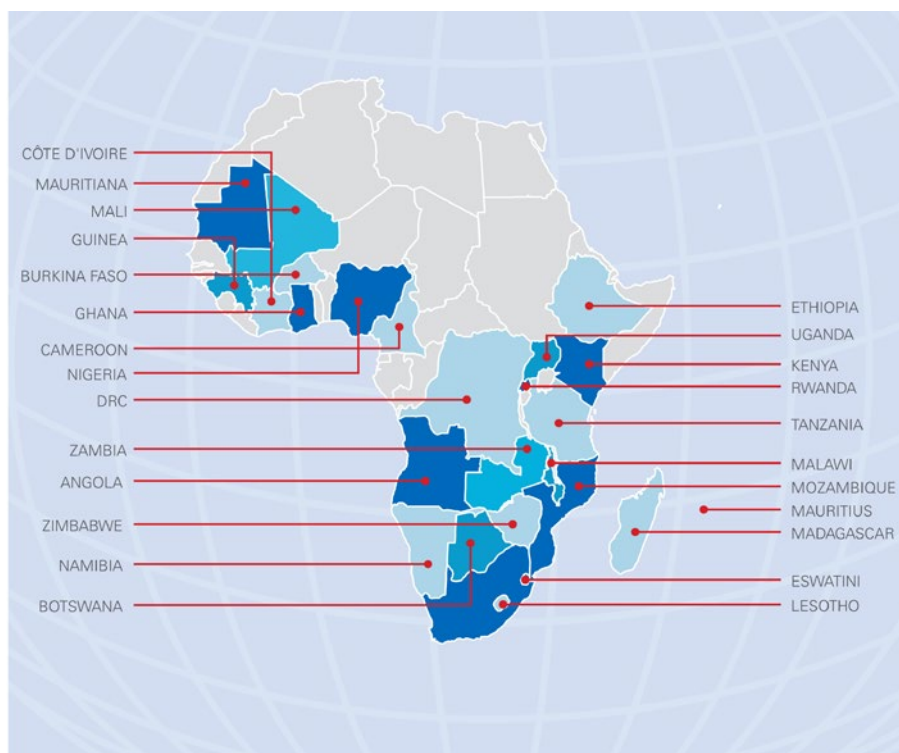
Continental Africa has long been considered the land of future opportunity. With the predicted exponential growth in population, the continent is predicted to almost double its population by the year 2050. It is further projected that the economically active population on the continent would be one of the largest in the world. This will create a major demand for products and services, which will result in significant growth in industrialisation.

According to the African Development Bank Group, the continent's overall real gross domestic product (GDP) growth is expected to average 3.8% and 4.2% in 2024 and 2025, respectively. This is higher than the projected global averages of 2.9% and 3.2%, and Africa is set to remain the second-fastest-growing region after Asia.

Sub-Saharan Africa, home to 30 per cent of the world's critical minerals, is on the brink of a major transformation with the global move towards clean energy. The extraction of select minerals could boost the region's GDP by 12 per cent or more by 2050, and advancing beyond exporting raw materials to developing and processing industries would present an even larger opportunity.

A regional strategy built on cross-border collaboration and integration can leverage the diversity of minerals and create a larger, more attractive regional market for much-needed investment. Moreover, structural reforms at the country level to nurture domestic firms in processing and supporting industries while steering clear of inward-looking industrial policy will amplify the gains from these minerals. Unlocking this potential can drive broader economic development, encourage technology transfer, and ensure sustainable, higher returns from the region's critical mineral resources. Be it extraction or processing, this transition requires sound fiscal regimes and policies to manage these gains responsibly.

The African Continental Free Trade Agreement (AfCFTA), implemented in 2019, offers a tremendous opportunity for manufacturers across the continent to flourish and expand their reach. With simplified trade regulations and reduced tariffs, African companies can concentrate on their core competencies, including creating high-quality products that compete globally. This agreement promotes economic growth



With ACTOM's various partnerships and operations in 31 African countries, they are undoubtedly your one-stop global energy solutions partner.

and prosperity for African countries and encourages industry cooperation and innovation. By harnessing the potential of this revolutionary trade agreement, manufacturers such as ACTOM can access new markets, attract foreign investments, and usher in a new era of industrial development in Africa. It is indeed an exciting time for the manufacturing sector, and with the right strategies and mindset, the possibilities are endless.

The African Continental Free Trade Agreement (AfCFTA) aims to achieve eight clearly defined goals:

- To deepen the economic integration of the African continent, create a single market for goods and services facilitated by the movement of persons.
- Create a liberalised market for goods and services through successive rounds of negotiations.
- Contribute to the movement of capital and natural resources and facilitate investments building on the initiatives and developments undertaken by the State Parties and Regional Economic Communities (RECs).
- Lay the foundation for establishing a Continental Customs Union.
- Promote and attain sustainable and inclusive socio-economic development, gender equality, and structural transformation of the State Parties.
- Enhance the competitiveness of

the economies of State Parties within the continent and the global market.

- Promote industrial development through diversification, regional value chain development, agricultural development, and food security.
- Resolve the challenges of multiple and overlapping memberships and expedite the regional and continental integration processes.

Mervyn Naidoo, CEO of ACTOM, says, "The potential for growth and increased competitiveness across various sectors is undeniable, making AfCFTA a significant development for South Africa's economy."

ACTOM is well-known as a mover and shaker in manufacturing circles. It has a footprint across sub-Saharan Africa and has strategically established industrial hubs in East, South, and West Africa.

ACTOM's industrial hubs are perfectly positioned to leverage significantly off the implementation of AfCFTA to drive local economic growth and create opportunities for businesses and individuals. These hubs are the heart of innovation, productivity, and collaboration, bringing together companies, entrepreneurs, and skilled workers to drive progress and success. With ACTOM's business model and the transfer of their intellectual property,

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An array of switchgear panels in one of the eight surface substations at Kamoa mine the DRC supplied and installed by MV Switchgear.

local communities can access state-of-the-art infrastructure, resources, and support systems that empower them to thrive and expand their operations. ACTOM is a beacon of inspiration for aspiring entrepreneurs and established companies by fostering a dynamic environment that encourages creativity and efficiency. “We embrace the economies of other countries by creating factories. We embrace the locals by employing them to work in the factories and manufacture products for their needs and those of neighbouring

countries. In doing this, the people of Africa become economically active. They pay taxes, the company pays taxes, and the country’s people and the economy benefits—so it is a mutually beneficial model to create industrial hubs in East, South and West Africa,” said Naidoo.

Eastern Hub

With African countries trading freely under the AfCFTA, one of many success stories saw the strategic establishment of an industrial hub in

Kenya in July 2023, providing a platform for the broader portfolio of ACTOM’s products and services. ACTOM Kenya, headed by General Manager Kelvin Ageng’o Oriwo, said, “Kenya is well positioned to offer goods and services to neighbouring countries like Tanzania, Uganda, Burundi, and Rwanda. Instead of importing products and services from South Africa, which can have logistical challenges, we use the Kenyan facility as the gateway to our neighbouring countries. We can deliver in a much shorter period than our South African business,” adding, “The AfCFTA presents significant opportunities for Kenya to expand its African export markets, contributing to GDP growth and sustainable economic development.”

ACTOM Kenya acquired a low-voltage panel building facility from Schneider Electric and is now expanding to a medium-voltage protection panel facility. According to Oriwo, they are planning to increase the facility to produce power solutions and transformers in the near future. With its 70 employees, Oriwo is eyeing a growth to 300 employees through expanding its operations.

Copperbelt Region - Zambia

The Copperbelt is a natural region in Central Africa, located on the border between northern Zambia and the southern Democratic Republic of Congo. It is known for its vast copper deposits and active copper mining industry.

Notably, one of ACTOM’s electro-



ACTOM Kenya’s team is the gateway to the Eastern Hub, supporting its clients and neighbouring countries.

mechanical divisions, Marthinusen & Coutts (M&C) took ownership of BPT in 2011 with a significant investment into the businesses. M&C services 10 African countries, offers full-on- and off-site electromechanical services and repairs on power generation equipment, medium and low-voltage AC and DC motors, transformers, and coil manufacture, as well as the full range of engineering, testing, diagnostics, balancing, and maintenance services. They employ 42 Zambians and 1 expat.

Over a period of four years, M&C Zambia successfully upgraded its test facilities, which accommodate both AC and DC motors. The facility also boasts a temperature-controlled burnout oven, curing ovens, and a vacuum pressure impregnation (VPI) tank. Furthermore, winding verification ensures that stators and rotors are wound to international and Original Equipment Manufacturer (OEM) specifications. Further upgrades have also been implemented to the mechanical repair shop, which offers machining, milling, and submerged arc welding.

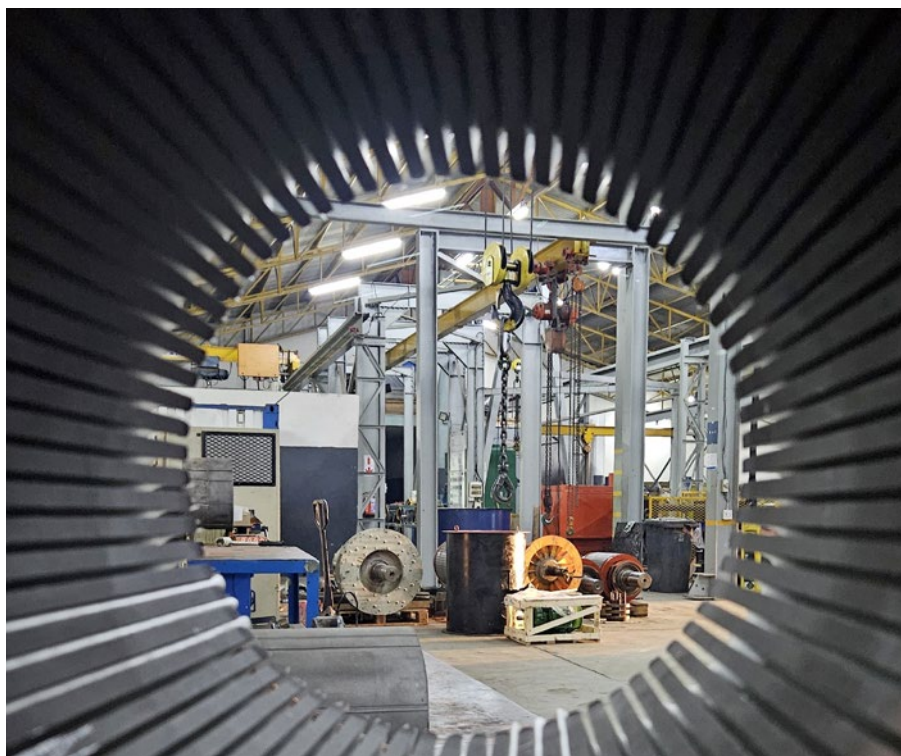
M&C Zambia offers various sectors within Zambia an in-country repair solution where, in the past, repairs would have been sent to South Africa for repair, resulting in additional downtime and costs for the Zambian mines.

According to Eugene Lottering, General Manager of Marthinusen & Coutts Zambia, "One of the biggest Copper Mines in Africa and Globally, mentioned that if it were not for M&C Zambia's repair shop, they would have had significant challenges operating their mines to full capacity."

With the support of ACTOM, M&C Zambia empowers individuals to enhance their career prospects and helps businesses improve their productivity and competitiveness. By focusing on leadership development, technical skills, and industry-specific training, M&C Zambia addresses the skills gaps in the local workforce, making the economy more resilient and adaptable to changing market dynamics. "With continuous guidance from our team in South Africa in training our employees in Zambia, M&C Zambia's skill set and experience were taken to a new level," said Lottering.

Southwestern Hub

In collaboration with the Economic Commission for Africa (ECA) and the United Nations System in Namibia,



With over 25 years of experience repairing and overhauling all types of AC and DC traction motors, ACTOM Energy Namibia is a strategic platform for servicing Namibia's prosperous mining industry.

the Namibian Government officially launched Namibia's National Strategy and Implementation Plan for the AfCFTA period 2022-2027. The Agreement allows Namibia to increase its intra-African exports and enhance its export-led manufacturing and services capabilities. Following the expansion of the port at Walvis Bay, the country is positioning itself as a gateway to the more than 345 million people in the broader African market.

ACTOM Energy Namibia (AEN), located in Walvis Bay, forms one of ACTOM's strategic platforms in servicing Namibia's rich mining industry. Their core competencies include overhauling and repairing low-, medium-, and high-voltage electrical motors, generators, and other AC and DC rotating equipment. The AfCFTA presents a significant opportunity for AEN to expand its reach and impact on the continent. "We established our footprint in Namibia to offer our hands-on expertise to our clients by offering them turn-key solutions and services when required," said Struan Steele, General Manager, ACTOM Energy Namibia. We offer a service platform to Namibia and its neighbouring countries, including Angola, Botswana and the Democratic Republic of Congo. We are actively training artisans and providing them with hands-on experience in

the industry," he added.

In 2023, AEN was awarded an R100 million contract to build a substation in Swakopmund for Namibia's utility company, NamPower. This substation will be completed in early 2025, with most equipment supplied by group divisions and business units.

Adopting the AfCFTA marks a significant milestone in the economic development of the African continent. By promoting intra-regional trade and manufacturing activities, ACTOM has the potential to drive future growth and development in Africa. As countries work together to harness their collective strengths and resources, we can expect to see a rise in GDP, job creation, and overall prosperity for the people of Africa.

Clearly, the future of manufacturing in Africa is bright, and the possibilities for economic advancement are endless. With a focus on collaboration and innovation, ACTOM paves the way for a more integrated and competitive African market. As we look towards the future, let us seize this opportunity to unlock the full potential of our continent and create a more prosperous and sustainable future for all. The future of Africa is in our hands, and with ACTOM leading the way, we can build a brighter tomorrow for generations to come.

ACTOM launches business management training initiative for people with disabilities

ACTOM has launched a bold new skills training initiative to assist people living with disabilities to make ends meet and earn enough to support themselves and their families.

The new initiative, launched in March this year, is a continuation of the socio-economic development (SED) drive ACTOM introduced last year when it recruited 20 young women from squatter camps in the vicinity of the group's main factory site in Knights, Germiston, to receive training in a variety of trade skills with the aim of earning a living by them.

"The new business development initiative is focussed on skilling up and helping to provide work and business opportunities to people living with disabilities, who are especially in need of assistance because their physical handicaps place them at a disadvantage in getting work compared with able-bodied people seeking employment," commented Group Human Capital Director **Sylvester Makamu**, who heads ACTOM's SED programme.

"Quite a lot of businesses and individuals who have work opportunities to offer have a prejudice against people with disabilities and automatically view them as being incapable of rendering services needed. This is unfair. Yes, they are of course less able than able-bodied people, but it is only to the extent that their specific condition handicaps them.

"In fact, we have found that the majority of people with disabilities are strongly motivated to work and keen to learn," Sylvester stressed.

How to find adults with disabilities in local disadvantaged communities initially posed a problem for Sylvester. But he was in luck: One day while driving to one of ACTOM's business units on the East Rand he stopped and spoke to two women on crutches he spotted at the side of the road. They put him in touch with **Gabriel Rampya**, 50, a disabled man living in Alexandra township who had helped them and others like them living in Alexandra and townships in Ekurhuleni to get work.

Through Gabriel's many contacts, two HR Managers conducted interviews and assisted Sylvester to select a group of 20 suitable candidates – 10 women and 10 men – based on the criteria that were in use to check suitability for supply chain related duties, to participate in the new training initiative.

"ACTOM is funding the business



All the people with disabilities selected for ACTOM's new SED training and employment generating initiative were presented with brand-new wheelchairs and/or crutches at the launch event on March 19. A smiling Gabriel Rampya, a key figure among the trainees, is shown above after being presented with his new wheelchair and crutches, accompanied by ACTOM top executives (from left): Andries Mthethwa, Group Chairman; Mamiki Matlawa, Group Business Development Executive; Danie Lubbe, Group Chief Financial Officer; Sylvester Makamu, Group Human Capital Director, and Mervyn Naidoo, Group CEO.

management skills training courses for them, with specific focus on procurement/supply chain, at a qualified training institution, along with covering transport and other expenses associated with this," Sylvester pointed out.

"As part of that training they will also be given workplace integrated learning to prepare them for entrepreneurship with specific focus on supply chain based on the procurement needs of ACTOM," he stated.

A Midrand-based business training college has been signed on by ACTOM to provide the business management training at its premises for a full working week of five days each month for 12 months – the first of these one-week-per-month set of courses having been held in April.

The courses cover the whole gamut of business management skills in detail, ranging from management principles, processes and operations to marketing and selling, as well as covering pricing and costing, communication fundamentals and mathematical literacy.

"A major part of the training will be concentrated on the various skills required to launch and run your own business, because we view this as a more realistic scenario right now in South Africa, with its appallingly high unemployment levels, than being wholly dependent on finding existing businesses willing and able to take on newly-trained people as employees," Sylvester explained.

A second key service provider, a Midrand-based specialist project management company, is charged with the responsibility of arranging transport for the trainees from their homes to the training college and back again on training days, as well as ensuring that they are provided with an adequate meal on each of those days, plus dealing with other situations relating to the trainees' needs as they arise during those periods. This company will also take full responsibility for the payroll duties whereby the participating trainees are paid monthly allowances for their own upkeep for the duration of the SED programme.

John Thompson is winner for third year in a row of newly revamped Chairman's Award competition

ACTOM's top management team who administer and judge the annual Chairman's Award have revamped the criteria by which the performances of the group's divisions during the year under review are assessed for the competition.

The changes are aimed at making the results of the contest more meaningful and effective and competition between the divisions keener than ever before.

Under the new set of rules that came into effect for the first time in the latest competition for the financial year to end-March 2024, John Thompson came through again as winner of the highly sought-after Chairman's Award for the third successive year in a neck-and-neck race with its closest rival Marthinus & Coutts, which took the Runner-Up prize.

Of the original set of criteria for the competition's main divisional portion, applied since the launch of the Chairman's Award in 2012, five remain unchanged, while three enhanced criteria have been introduced and one entirely new one added.

In the list below of the criteria now applicable in the competition's division-

al section – where the financial criteria, as always, play a dominant role over the non-financial criteria in the scoring – each criterion is categorised in brackets as “financial” or “non-financial”, followed immediately within a second set of brackets by the points scored for each criterion by John Thompson on its well-balanced scorecard.

The unchanged criteria are:

- EBIT Growth (financial) (19.0)
- Export Orders Growth (financial) (6.5)
- Export Sales Growth (financial) (8.0)
- IT Audit (non-financial) (4.5)
- LTIFR (non-financial) (4.5)

The enhanced ones are:

- EBIT Compound Growth over 3 years (financial) (8.5)
- Free Cash Flow excluding Capex as % of EBIT (financial) (17.0)
- B-BBEE score (non-financial) (9.5)
- The brand-new one is:
- Economic Value-Add (EVA) Growth (financial) (9.0)

In addition, four divisions, namely Electrical Equipment, MV Switchgear, ACTOM Turbo Machines and Engineering Projects & Contracts were awarded Divisional Certificates of Excellence.

In the business units section, which is treated as secondary to the competition's divisional section and is therefore subject to a simpler set of rules, four business units, namely: Transport, Protection & Control, Electrical Products and ACTOM Energy were presented with Business Unit Certificates of Excellence.

Finally, the prize for the best semi-technical article published in What's Watt during the period under review went to **Dr Brad Rawlins**, Design Engineer of John Thompson's Industrial Watertube Boiler business unit, for the article “Modelling power Islands using simulator & design software for biomass plants” published in the December 2023 issue of the magazine.

The Chairman's Award presentations were made at ACTOM's Annual Review function in Johannesburg on June 7.

Discussing the changes to the divisional competition criteria that are now in force, Group Chairman **Andries Mthethwa** said the rationale behind the introduction of the new Economic Value-Add (EVA) Growth criterion that has been introduced can perhaps be

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Senior John Thompson staff in attendance at ACTOM's Annual Review function celebrate the division's success in again winning the prized Chairman's Award. Jaco Grobbelaar, Chief Operations Officer – Industrial Sector, standing next to Chairman Andries Mthethwa, holds the winner's trophy, while Kim Manthey, Finance Manager of the Boiler & Environmental business unit, displays the framed winner's certificate, with Group CEO Mervyn Naidoo (left) sharing in the division's proud moment.

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best illustrated by the following negative example.

"A business discovers that the final independent test on the latest product it has developed has failed. What does this mean? It represents a comprehensive failure by the business management encompassing a combination of bad planning, bad supervision and bad workmanship. Not only have you wasted a lot of money in having a final test fail, but you are now obliged to go through the whole process again, at the expenditure of more money, to get it right and have the product re-tested, which would've been avoided if you'd done it right the first time.

"EVA in short means ensuring that you make a profit."

The introduction of the new "EBIT Compound Growth over 3 years" criterion, coming on top of the existing key EBIT Growth criterion, is aimed at encouraging businesses to maintain EBIT Growth continuously. Similarly, "Free Cash Flow excluding Capex as % of EBIT" replaces the former "Free Cash Flow" criterion to reflect a true picture of a business's operational cash flow in a given year, while at the same time encouraging necessary periodic capital expenditure to ensure that it keeps pace with important technological advances in the industry in which

it operates.

Up until now the B-BBEE criterion has been relatively static in terms of encouraging further improvements in ACTOM's B-BBEE contributions and record. By shifting the focus from simply maintaining the group's B-BBEE rating at its current Level to setting up a scoring system to reflect improvements in B-BBEE performance, in terms of actual points scored, by each of the divisions year-by-year makes the system both more dynamic and boosts the aggregate B-BBEE performance of the group as a whole.

ACTOM, two time Enlit award winners, do it again!



Johan Jordaan explains to visitors to the ACTOM stand at Enlit Africa how the automatic transfer switch developed by MV Switchgear ensures continuous supply of power to businesses and industrial operations.

ACTOM, which exhibits every year in the popular three-day Enlit Africa Power & Energy conference & exhibition at the Cape Town International Convention Centre in mid-May, has been named this year's winner of the best stand of the exhibition for the size of 36m² and bigger.

This is a repeat of the group's achievement of winning the same award at the show last year and is the third year in a row that it has been awarded a prize for its exhibition stand, as it won the "best engaging stand" award in the 2022 event.

ACTOM once again had a great

variety of equipment and systems on display on the group exhibition stand this year.

Displays that excited great interest among visitors included a special presentation version of one of MV Switchgear's 11kV RMV-brand ring main units (RMU's), controlled by an

automatic transfer switch.

This follows the recent development by the division of a switch to automatically transfer power via the main load break switch circuit to the generator backup load break switch circuit in the event of the mains supply being cut – typically when load-shedding occurs.

“The transfer switch ensures that power supply is automatically restored to the customer’s load as quickly as possible, using whichever power source on the incoming load break switches becomes available,” **Rhett Kelly**, MV Switchgear’s Design & Development Manager, points out.

The RMV on display is connected to an automatic transfer switch controller. The loss of mains supply and generator startup simulation is achieved through a custom control and mimic panel designed and built by **Johan Jordaan**, MV Switchgear’s Technology Development Specialist.

Also on display by MV Switchgear was a GELPAG solid insulated switchgear (SIS) unit showing the internal construction and a fully screened SIS module. The switchgear was also connected to a remote SCADA display unit

to demonstrate the ability to monitor and control it from a remote location.

Protection & Control (P&C) showcased their engineering capabilities with a display comprising multiple schemes in one: A SCADA/HMI scheme, a transformer protection scheme, a metering scheme, and interfacing MV Switchgear’s GELPAG into the panel.

“These are all visualised and controlled through the HMI, using substation communication based on the IEC 61850 standard, which sets the parameters for the integration of the schemes, while also providing for high-speed substation protection,” said **Vincent Dreyer**, P&C’s Protection Tendering & Business Development Representative.

Another exhibit on the ACTOM stand that caught the attention of many interested observers was Static Power’s COM10 110V 20A subtrack unit, which was specially fitted with a transparent Perspex top to provide visitors with a view of its inner workings.

This remote monitoring and alarm unit is connected to a controller to immediately alert plant operators for local alarms, SMS or e-mail whenever

a fault occurs in the plant so that it can be attended to promptly.

Among other divisions that had special presentation versions of their products and systems on display to enable visitors to better understand the technologies involved were Distribution Transformers with a display model of an NECRT transformer, while Power Transformers featured its unique online condition monitoring system for transformers and also had on display a 3D model of a 250MVA 275/132/22kV autotransformer.

Focussing mainly on the customised industrial watertube boilers which it designs and produces for users in many parts of the world, John Thompson had a boiler holocube featured on the group stand showing a series of videos that provided 3D renderings of many of the components of these large and complex installations.

High Voltage Equipment had one of its well-known CTB 36 Plus Combi Circuit Breakers on show and Electrical Machines displayed two models of its popular low voltage motors, the LS7 premium efficiency motor and the QL3 aluminium motor, as well as an ARW gearbox.

SAIEE’s “Engineer of the Year” award for 2023 goes to Dr Mpho Nkambule

The SA Institute of Electrical Engineers’ (SAIEE) “Engineer of the Year” award for 2023 was won by **Dr Mpho Nkambule**, an Electrical & Instrumentation Engineer.

Dr Nkambule was presented with the ACTOM-sponsored award by **Mervyn Naidoo**, ACTOM’s Group CEO, at the SAIEE’s awards presentation evening in Johannesburg in early March this year.

Dr Nkambule, who is employed by a local engineering and project management company, is shown with his winner’s trophy in the right hand picture (left) next to Mervyn, while SAIEE **President Prof Jan de Kock** displays the framed award certificate he was also presented with at the event.

The award recognises a SAIEE member who has energetically and voluntarily worked towards promoting electrical science and its applications to benefit its members and the Southern African community.

Dr Nkambule has six years of experience as an Electrical and

Instrumentation Engineer, focussing on hardware and software design, installation, construction and commissioning, and four years of experience in research and development of renewable energy, using machine learning

and artificial intelligence techniques.

He has presented numerous papers at international conferences and has had many of his papers published in technical journals worldwide.



ACTOM – Engineering for the future

The shortage of engineers in South Africa is a pressing concern with far-reaching implications for economic growth and development. Without skilled engineers, South Africa faces significant challenges in addressing its infrastructure needs, driving innovation, and competing globally.

Limited access to quality education in science, technology, engineering, and mathematics (STEM) subjects, particularly in disadvantaged communities, means many potential engineers are lost early in the pipeline. Furthermore, South African universities produce only a small number of engineering graduates each year, and many choose not to practice engineering.

The brain drain of skilled engineers emigrating to other countries has also exacerbated the shortage. Many engineers seek better opportunities abroad, leading to a loss of talent and expertise that could be driving development in South Africa.

ACTOM, a leading manufacturer and solution provider, has acknowledged this critical skills gap and, over the years, introduced a three-stage approach to address this skill shortage.

At the grassroots level, ACTOM runs mentorship programmes at secondary schools to develop an interest in STEM subjects and the engineer-

ing field in scholars. At the tertiary level, ACTOM offers bursaries to South African students in Electrical, Industrial and mechanical engineering. The final stage, introduced in 2023, addresses the concern of graduates who lack practical experience and offers work-integrated learning.

To this end, ACTOM offers a high-level skills development programme called “Engineers in Training.” Engaging with ACTOM allows engineering students to explore different areas of engineering and discover their passions. Whether working on large-scale infrastructure projects or developing cutting-edge technology, students gain a deeper understanding of the industry and the impact their work can have on society. The collaborative environment at ACTOM encourages students to push the boundaries of their creativity and problem-solving abilities, ultimately shaping them into well-rounded engineers ready to tackle the challenges of tomorrow.

The 2023 intake saw 33 participants, aged between 21 and 30, who are engineering graduates from the Mechanical, Electrical, and Industrial Engineering disciplines. They have garnered technical skills in support base operation, focussing on Manufacturing, repair and services in ACTOM’s divisions. “Not only has this programme

enhanced these engineers in training skills, but the aim is to make these candidates employable at ACTOM with the required skills,” said **Sylvester Makamu**, Group Human Capital Director.

The 33 engineering students practically applied the knowledge they had learned from the tertiary establishment during the last 12 months. They spent approximately 3 – 6 months in a division and then rotated to get the required exposure. The selection process has been well defined and saw a huge uptake when first advertised. The second cycle of this learnership programme kicked off on June 1, 2024, for 12 months.

ACTOM is a valuable partner for engineering students seeking to enhance their education and gain practical experience in the field. By engaging with ACTOM, students can immerse themselves in the engineering world, develop essential skills, and build connections with industry professionals to aid them in their professional journey. As engineers in training, the opportunities provided by ACTOM are essential stepping stones towards a successful and fulfilling career in the dynamic engineering field.

For more information on ACTOM’s Engineers in Training Programme, visit www.actom.co.za



An Engineering student is undergoing on-the-job training at ACTOM Knights, rotating through different departments to learn new skills.

Using data-driven techniques to diagnose and maintain boiler health

Introduction

Biomass power plants play a critical role in sustainable energy production, utilising organic materials to generate heat and electricity. Within these facilities boilers convert heat energy (liberated from combusting biomass) into steam to drive turbines and produce power.

Diagnosing faults within biomass boilers can be challenging, as issues may not always be readily apparent or easily detectable through traditional means. To address this challenge, modern industrial water-tube boilers are equipped with an array of sensors capable of capturing vast amounts of operational data. While these sensors provide a wealth of information, extracting actionable insights requires sophisticated data processing and analysis techniques.

A biomass power plant located in Mpumalanga was dealing with a sudden drop in generation capacity with no clear signs of the root cause. This prompted an investigation to determine what may be causing this deficiency within the plant.

In this study, engineers leveraged historical sensor readings and control parameters from a biomass power plant to pinpoint defects impacting boiler efficiency and power generation at maximum continuous rating (MCR). Using exploratory data analysis [1], the aim of the study was to identify boiler components exhibiting abnormal behaviour which contribute to the reduction in power generation capacity. Moreover, by comparing data across multiple seasons, we enhance the reliability of the findings and gain insights into the long-term performance trends of the equipment.

Use of data mining as investigative tool

The approach required the extraction of useful information and patterns from boiler instrumentation data can be done in a logical and thoughtful manner. The process, known as data mining, is to analyse large amounts of raw data to search for patterns and extract useful information [1-2].

The most significant pattern extracted came from the exhaust steam pressure of the turbine into the condenser, which is presented below in Figure 1.

Based on previous performance tests, the heat and mass balance in-

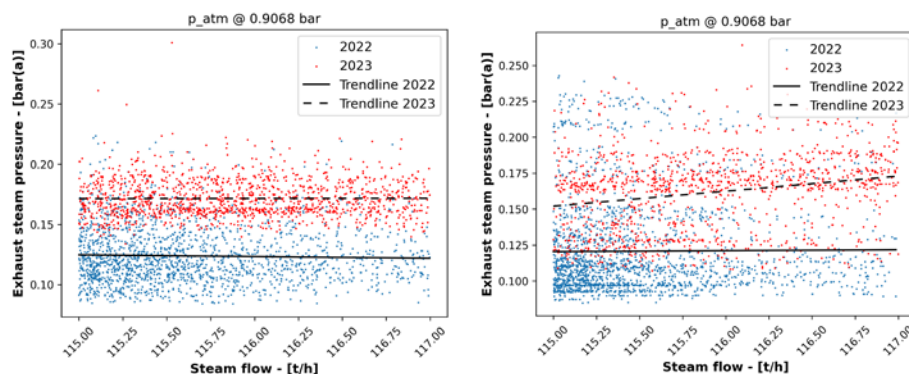


Figure 1: Exhaust steam pressure versus steam flow for April a) and May b) 2022 and 2023.

dicated an exhaust pressure of 0.09 bar (a). Figure 1 a) and b) show that for April and May 2022, the average turbine exhaust pressure readings was around 0.125 bara. While during April 2023 (Figure 1a), the exhaust pressure was up at 0.175 bara on average and during May 2023, the exhaust pressure had an upwards trend on average that varied between 0.15 to 0.175 bara.

Based on the analysis, it appears that the condenser performance was already out of specification in 2022. Possible issues may be fouling of the condenser, issues with vacuum control or underperformance of the cooling towers.

Figure 2 considers the effect the condenser pressure has on the generated power. The data was generated using a validated numerical thermal model of the plant. It can be seen that for a higher exhaust pressure a drop in the generated power is observed, thus indicating the condenser operation is currently sub-optimal.

This study has demonstrated the effectiveness of employing data analysis techniques to analyse historical boiler data for diagnosing faults and evaluating the performance of a biomass power plant, by following a systematic approach outlined in the data mining process, including problem definition, data processing and exploratory data analysis. Not all patterns extracted have been described within this article but still bear significance in providing insight into the plant's operation. They are, however, unrelated to the study.

Key factors behind power generation reduction

Through data analysis, engineers identified several key factors contributing to the reduction in power generation performance at the plant. These factors include variations in auxiliary steam demand, steam turbine performance, fuel feed consistency, combustion stability, and condenser operation.

To page 12

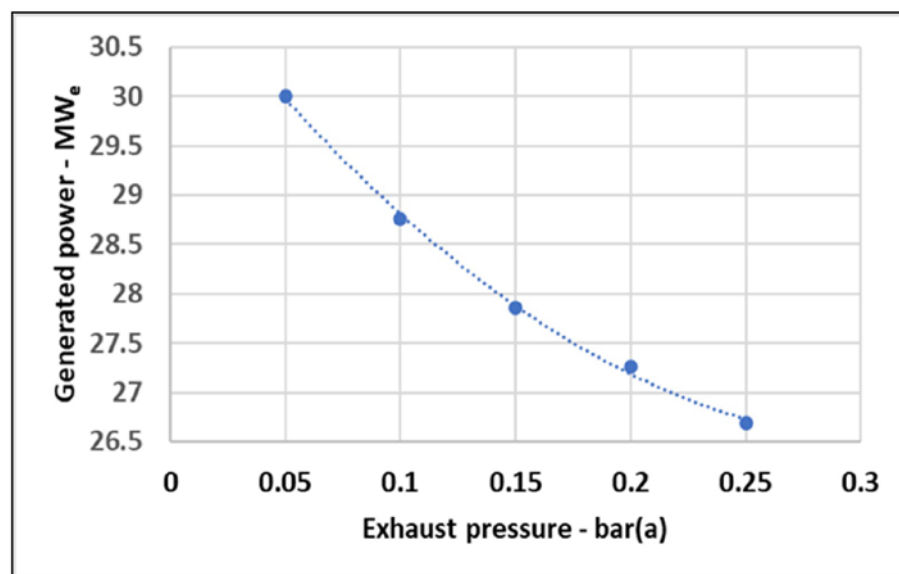


Figure 2: Condenser pressure versus generated power trend based on a numerical thermal model of the plant.

From page 11

By examining trends in exported power, generated power, parasitic load, reclaimer speed, economiser temperature differences, and condenser exhaust pressure, it was shown that the exported power dropped significantly over the period between 2022 and 2023 when operating at 100% MCR. Furthermore, analysis of the various data trends illustrated minimal increases in the parasitic loading and

the higher economiser outlet temperature seen in 2023 point towards combustion instability.

A substantial increase in the turbine exhaust pressure/condenser inlet pressure was observed, which was likely the main contributing cause for the power island underperforming. Subsequently, the effects of the condenser pressure were modelled numerically to understand the relation

between the exhaust pressure and generated power, which showed that for an increase in the turbine exhaust pressure results in a decrease in the generated power.

*By Christopher van den Berg
Cyber-Physical Systems Engineer
Industrial Watertube Boilers
John Thompson*

EFFICIENT ENERGY GENERATION AND SUPPLY

With John Thompson's Energy Management Solutions



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Energy
Contracts



Energy Operating
& Maintenance
Contracts



Optimum Boiler
Operation
Regime



Steam Utilisation
& Feasibility
Studies



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ACTOM

SINCE 1903

ACTOM fire & air velocity detection systems for explosive atmospheres

During 2023 ACTOM Industry acquired the sole and exclusive ownership of both the Safdy Air Velocity Detector and the Safdy Methane Detector. Our business now have the sole and exclusive rights to manufacture, market, and distribute all these products under one roof.

Our fire detection systems are approved as intrinsically safe for use in explosive atmospheres. Our systems are SABs approved and certified to meet the rigorous standards of SANS 1515. The Air Velocity Detector complements our line-up of robust and reliable fire detection systems range, which includes the following:

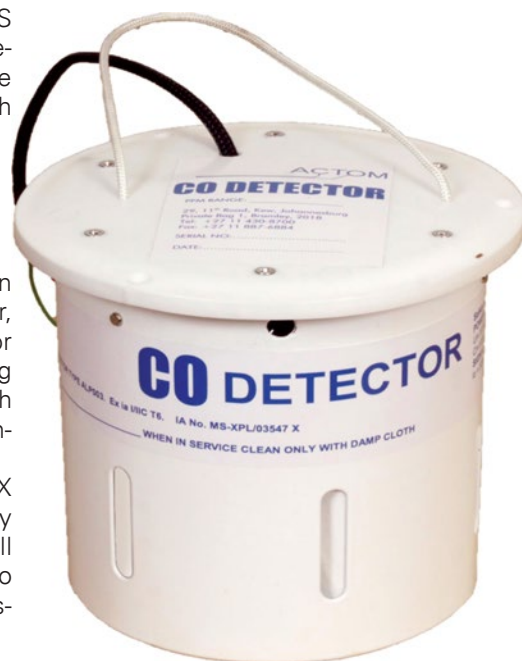
- Air Velocity Detectors
- Carbon Monoxide Detectors
- Methane Detectors
- Particle Smoke Detectors

The Safdy flow meter, now known as the ACTOM Air Velocity Detector, deploys a solid-state airflow sensor specifically developed for monitoring the "airflow rate" in dusty and high moist conditions associated with mining environments.

It uses the well proven VORTEX method to measure the airflow very accurate and independent of small particles, making it highly suited to monitor that the mine ventilation sys-

tem is performing within acceptable parameters.

Air circulation in the underground mines is achieved by using various extractor and/or intake fans. When an extractor or intake fan fails, the airflow will decrease, and this will be reflected in less than 10 seconds by the airflow sensor output signal to the SCADA system to alert operating teams and ventilation officials.



The measuring head, vortex-shedding beam and associated electronics is housed in a sturdy rectangular metal enclosure to provide protection against impact during handling and the effects of cross flow over the sensor head when in operation. The enclosure can be easily mounted from the hanging wall or side walls and in parallel to the direction of flow.

Our Air Velocity Detector has timeously emerged as the premier choice for underground applications during extensive independent evaluations within the South African mining sector. Renowned for its unparalleled durability and precise applicability, the unit outperformed all others tested, boasting an impressive accuracy rate of approximately 89%.

The presence of water mist and dust have no impact on the accuracy with resulting low demand of maintenance.

The ACTOM Industry line-up of robust and reliable fire detection systems range includes this Carbon Monoxide Detector which is SANS 1515 approved.



ACTOM Air Velocity Detector, deploys a solid-state airflow sensor specifically developed for monitoring the "airflow rate" in dusty and high moist conditions.

ACTOM FIRE DETECTION IN EXPLOSIVE ATMOSPHERES



AIR VELOCITY DETECTOR



CARBON MONOXIDE DETECTOR



METHANE DETECTOR



SMOKE DETECTOR

ACTOM Industry has acquired the sole and exclusive ownership of both the Safdy Air Velocity Detector and the Safdy Methane Detector. The Air Velocity Detector has timeously emerged as the premier choice for underground applications during extensive independent evaluations within the South African mining sector. It is easy to install, has a robust design, fast response times and offers an impressive 89% accuracy in dusty and high moist conditions.

Our fire detection systems are approved as intrinsically safe for use in explosive atmospheres.

ACTOM INDUSTRY
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MV Switchgear gains IEC certification for extra features in AMV17 and AMV12 switchgear

MV Switchgear has boosted the marketability of its AMV17 and AMV12 brands of air-insulated withdrawable pattern indoor switchgear after successfully completing additional IEC Standards type testing of the AMV17 product incorporating several new state-of-the-art features.

The advanced new features it has introduced in partnership with its international Chinese partner YIHE are the embedded pole design circuit breakers, in place of the formerly used shrouded pole units, and the 31.5kA 1 second rated arc coolers, in place of the arc deflector solution originally type tested at KEMA.

The arc deflectors have been less widely accepted in the marketplace compared to the latest technology arc coolers – primarily due to the compact design of the coolers, which don't overhang the switchboard perimeter nor obstruct top cable entry.

"Furthermore arc coolers have the advantage of not only reducing the temperature of the hot gases emitted from the switchgear during an internal arc fault, but they also reduce the pressure rise within the switchroom," said **Rhett Kelly**, MV Switchgear's Design & Development Manager.

"Where customers prefer arc venting to the outside of the switchroom, we have the arc ducting solution – type tested in 2021," he added.

MV Switchgear arranged for the type tests to be carried out in accordance with IEC 62271-200 at the XIHARI laboratory in Jimo City, Qingdao Province, China, under the supervision of TUV Rheinland, an international certification body, in mid-April this year.

The internal arc tests were conducted on two models of embedded pole AMV17 panels, both fitted with arc coolers, namely:

- a 1250A 31.5kA 650mm wide panel, and
- a 2500A 31.5kA 1000mm wide panel.

A series of tests, each for 31.5kA for 1 sec, were done on the cable compartment, the circuit breaker compartment and the busbar compartment to verify an internal arc classification of AFLR 31.5kA 1 sec (i.e. providing a tested level of safety for authorised personnel on all sides of the switchgear – Front, Lateral and Rear).

"In addition to the requirements of the IEC standard, we also fitted inter-

nal arc indicators on the inside of the LV compartment door to determine if the internal arc tests in the MV compartments had any effect on it. The outcome was that negligible heat and carbon transfer to the LV compartment took place," said **Johan Jordaan**, MV Switchgear's Technology Development Specialist.

"Also forming part of the round of tests was a temperature rise type test that was done on the 650mm wide panel," said Rhett.

"This was because we sought to increase the current rating of the 650mm wide switch-panel from 800A to 1250A. Temperature rise tests conducted in YIHE's plant in 2023 on the embedded pole circuit-breaker and panel combination showed that the lower overall main circuit resistance of the embedded pole resulted in substantially lower thermal losses during operation, resulting in turn in a lower temperature rise of the circuit breaker and thus an opportunity to increase the current rating. The increased current rating therefore had to be verified with a formal temperature rise test at

an independent accredited test facility," he explained.

Advantages of the embedded pole design over shrouded pole circuit breakers include:

- Increased reliability, due mainly to simplified primary circuit design, fewer parts and lower main circuit resistance.
- Increased mechanical strength, due to the more robust structure of the embedded pole.
- Improved insulation technology. The vacuum interrupter is embedded within epoxy resin, so keeping it free from exposure to pollution.
- Reduced maintenance. The embedded design results in greatly simplified maintenance.

"Following the latest successful type tests, we now have a complete test certificate for arc coolers, while the incorporation of embedded pole circuit breakers also represents important technological improvements in the product," said Johan, adding that the extended certification applies not only to AMV17, but also to the AMV12 product range.



Johan (left) and Rhett flank Ruihao Zhao, the TUV Rheinland Test Engineer responsible for certification of the type tests at the XIHARI laboratory in China in April.

ACTOM GELPAG MSS-H 12kV SOLID-DIELECTRIC INSULATED SWITCHGEAR (SIS)



- SF6 free, metal-enclosed, fixed pattern switchgear to IEC 62271-200
- LSC2B-PM (highest level of service continuity)
- 12kV Rated voltage
- 95kV Rated impulse withstand voltage
- Epoxy resin insulated and fully earth screened individual poles and busbars
- Up to 40kA and 3150A (4000A with forced cooling)
- Internal arc classification IAC AFLR 31.5 kA 1 sec
- Type "C" cable interface bushings
- Severe service conditions IEC62271-304-Class 2
- Visual isolation and earthing
- 3-position disconnecter with integral earthing
- Width: 500mm (1250A), 700mm (2500A), 1000mm (4000A)

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MV SWITCHGEAR

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MV Switchgear devises modified replacement post-insulators for petro-chemical plant

MV Switchgear's services unit, WPI Power Solutions, which procures, installs, repairs, refurbishes and maintains electrical networks in the local market, was contracted by a leading Mpumalanga-based petro-chemical company in September last year to procure and install new bus-ducting, busbars and post-insulators in one of the company's plants, following the destruction of these items of equipment in a fire.

High Voltage Equipment (HVE) was awarded the contract to manufacture and supply the bus ducting and busbars, while requesting one of its technology partners in Europe to quote for the manufacture and supply of the replacement epoxy resin post-insulators used to support the main conductor of the bus-ducting.

The customer however was unhappy with the lead time for delivery quoted by the overseas supplier and asked WPI to find an alternative solution for the required post-insulators to expedite the restoration of supply to their operations. WPI approached MV Switchgear to do so, as it manufactures similar post-insulators for some of its own switchgear equipment. These however were found to be unsuitable,

as their dimensions did not match those of the required units.

MV Switchgear then turned to Motic in China, an international electrical equipment manufacturer and supplier with which it has close ties, as one of Motic's subsidiaries has supplied specialised GELPAG-branded solid insulated switchgear (SIS) units to the division for installation in a number of major local projects in recent years.

MV Switchgear selected from Motic's catalogue the post-insulator model that most closely matched the originals and ordered 30 of these units, to which it still had to make substantial modifications to suit the application. These were:

- Trimming off a small portion of the top of each insulator to the correct length.
- Machining out a cavity at the top of each unit to accommodate a rubberised busbar support spacer that WPI arranged to have manufactured locally.
- Machining new aluminium busbar supports.
- Manufacturing by a local contractor arranged by WPI of purpose-designed flanges for mounting the new post-insulators to the bus-ducting.

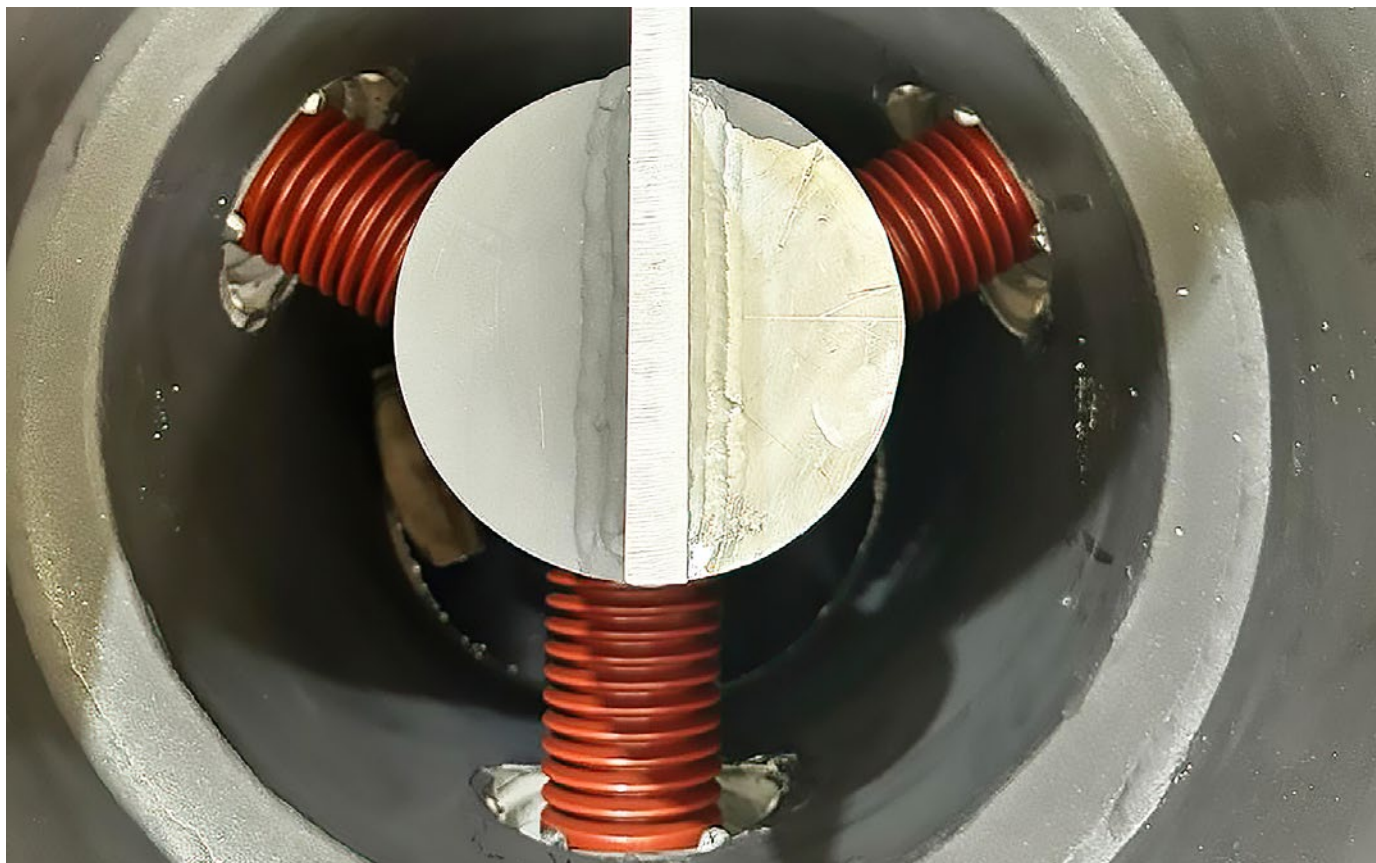
"After completing assembly of

the post-insulators we had them type tested for lightning impulse withstand at the SA Bureau of Standards' National Electrical Test Facility (NETFA) in Pretoria, followed by power frequency withstand and partial discharge tests conducted in our own plant," said **Johan Jordaan**, MV Switchgear's Technology Development Specialist.

"We then did a trial assembly of the post-insulators on the newly-manufactured busbar ducts to verify the assembly interfaces of the post-insulators and bus-ducting before having them shipped to site for installation by the contractor appointed by WPI," he added.

The insulators were ready to be shipped to site on December 5 last year, with installation on site being performed by WPI's Secunda branch and completed on December 22.

"We succeeded in cutting the lead time for manufacture, modification and delivery of the replacement post-insulators by about two months, compared with the lead time first quoted from Europe. Due to our quicker delivery the customer was able to return the plant to service much sooner, thereby achieving substantial savings," Johan concluded.



This picture shows the trial assembled post-insulators on the busbar ducts that MV Switchgear performed prior to delivery to site.

ACTOM WPI received the Sasol Platinum Award



Mr Gerrit Viljoen, Senior Vice President, Sasol Secunda Operations, handing over the Sasol Platinum Award certificate to Marnewick Loubser, WPI Branch Manager of WPI in Secunda.

ACTOM WPI is a proud recipient of a Platinum Award, the highest accolade bestowed on them by Gerrit Viljoen, Senior Vice President, Sasol Secunda Operations, for their exceptional work performed under complex and time-sensitive constraints to restore the eMbalenhle substation to operations.

In January 2024, Langverwacht, eMbalenhle's main substation, experienced a catastrophic electric flash failure. The substation with ACTOM's SBV4E product range installed feeds the various ring substations to the eMbalenhle township near Secunda.

Established in the 1970s, the eMbalenhle township is located in Govan Mbeki Local Municipality outside Secunda in Mpumalanga and stretches for 19,65 square kilometres. The substation and the township are located in South Africa's energy belt, highlighting

the importance of a reliable electricity supply in this region.

Ryno Oosthuizen, Senior Manager at Sasol Secunda, requested assistance from **Marius Lombard**, Services Manager at WPI. WPI specialises in repairing, installing, retrofitting, and maintaining electrical networks via MV Switchgear's After-Sales department and WPI regional branch network, which is technically well-equipped and strategically placed close to the customer base. The WPI team jumped into action to minimise the community's downtime.

Marnewick Loubser, Branch Manager of WPI in Secunda, and his team rushed to the site to evaluate the damage. They found the main incomer panel no. 1 damaged. They repaired it by first using dry ice to clean away the carbon and ensure the board's integrity. The team managed a miracle by strip-

ping a spare panel and rebuilding the damaged incomer with the stripped spare parts. Marnewicke took the lead and restored power to the community by 22:00 that evening.

"I received numerous compliments on Marnewicke and his team's work ethic in this regard, working non-stop through the day and night. From my side, it is only appropriate to also compliment Marnewicke and his team on a job well done. Keep flying the ACTOM WPI flag high," said Oosthuizen.

This achievement showcases the ACTOM WPI team's dedication and expertise in delivering high-quality solutions and after-installation services to their clients.

Congratulations to ACTOM WPI on this well-deserved recognition of their hard work and commitment to excellence.

Distribution Transformers launches high-quality robust NECRT's into the African market

Distribution Transformers recently developed and launched into the market a new design of NECRT that is well in advance of the former model produced by the division, as it is substantially more robust and therefore better suited to Africa's harsh operating conditions.

Distribution Transformers developed the new product in close collaboration with Eskom, which extended the specifications from those that applied previously to encompass a voltages range of 2.2kV up to 44kV, an Amperes range of 360A to 2800A and a power rating range of 50kVA to 500kVA for the auxiliary transformers of the NECRT's.

"We worked together with an Eskom delegation of engineers – assisted by an international expert from Germany on their side and a local specialist consultant on our side – in developing the new set of Eskom specifications," said **Lee Mbenge**, Distribution Transformers' Divisional CEO.

"This was after we had been assigned by Eskom to do a root cause

analysis of the original product, which resulted in us determining that the specifications applicable were not adequate for the conditions they were exposed to."

NECRTs are used in transmission and distribution substations for earthing power transformers and are also extensively deployed in renewable energy collector substations.

"The new model NECRT's are optimally designed to withstand the high harmonic content from the invertors in renewables' collector substations," Lee pointed out.

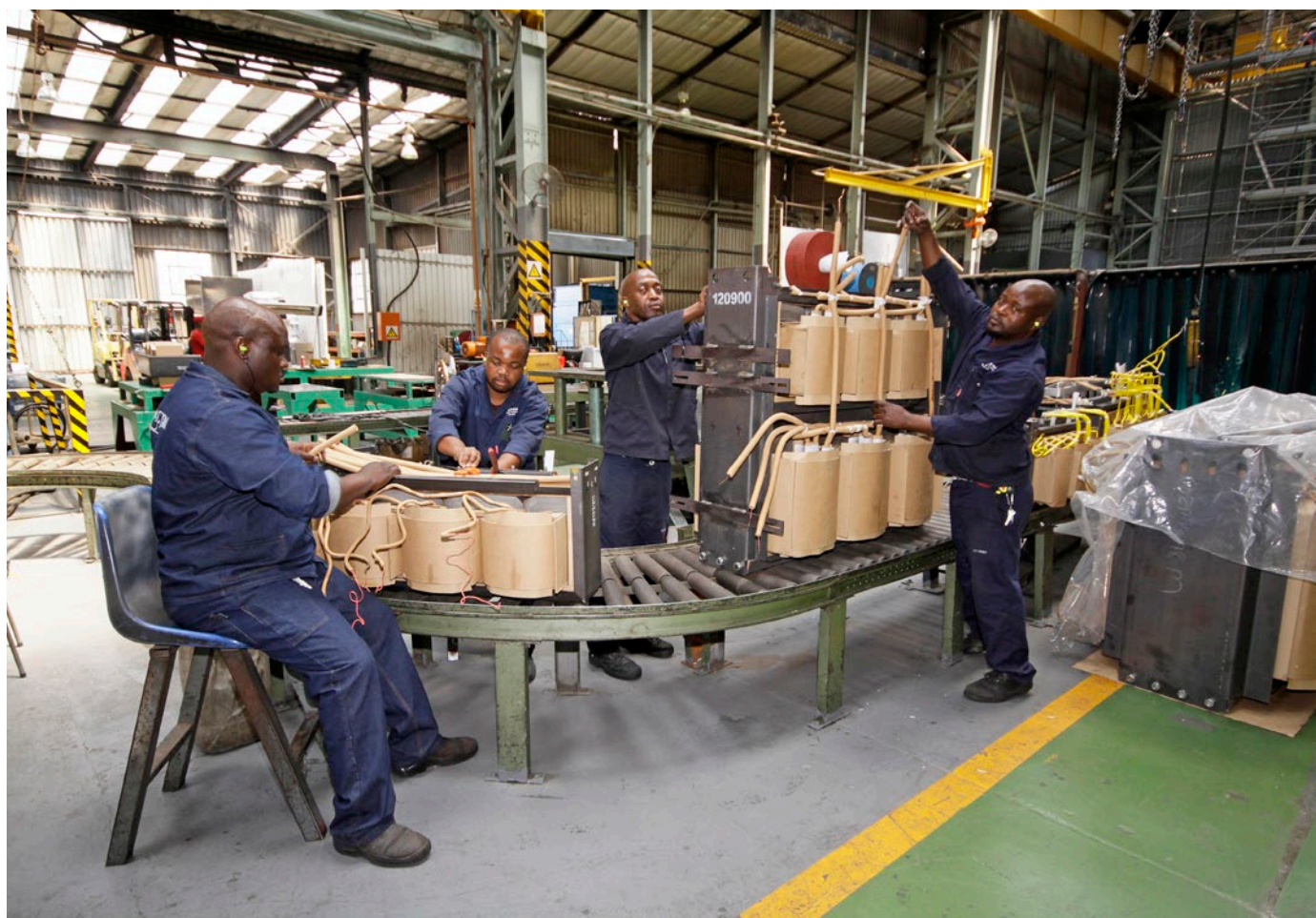
To date, since the new model NECRT's were launched in January 2013, Distribution Transformers has made sales to several independent power producers (IPP's) and data centres in the local market. It has also sold units to mining customers in Zimbabwe, Botswana, Ghana, Namibia, Lesotho and Zambia.

In addition, the division recently scored success in the Democratic Republic of Congo (DRC), where it has

sold a total of 49 NECRT's for installation in newly-established substations for substantial extensions to the large Kamoakakula underground copper mine, which commenced production in early-2021.

Distribution Transformers won its first order for the NECRT's for the Kamoak Copper Project in June 2020, comprising five 33kV 100A and four 11kV 300A units, which were delivered at the end of 2020, while the second order in February 2022, comprising two 33kV 100A and five 11kV 300A units, were delivered in mid-2022. A third order, comprising seven 33kV 100A and 14 x 11kV 300A units, were delivered at the end of 2023.

Distribution Transformers currently has a fourth order in hand for five 33kV 100A and five 11kV 300A units for delivery in mid-2024, plus a fifth order for the Kamoak Copper Smelter Project for two 33kV 100A units, delivered at the end of April this year.



Distribution Transformers Wiremen and Tankers are shown assembling components of NECRT Auxiliaries in the division's Knights factory (from left): Mbuso Sikhakhane connects Delta on 22kV Auxiliary, Given Nedzamba mounts copper link on U-frame top for each core of the 22KV Auxiliary, Mothapisa Seetsi fastens 33kV Auxiliary on its NEC U-frame and Ben Nalana connects NEC main leads with the 33kV Auxiliary.

Reid & Mitchell upgrades its stator winding processes with the introduction of 'clean rooms'

Reid & Mitchell (R&M) has established three clean rooms for the winding of stators in its Benoni workshop to prevent contamination during the winding process, thereby improving their integrity when they resume operation after being repaired.

"A controlled environment such as this minimises the risk of insulation faults occurring in the stators, as it keeps chemicals, moisture and dust particles out of the winding process, so greatly reducing the chances of failure due to contamination," explained **Rene Rajzman**, R&M's Operations Executive.

Rene and his colleagues designed, constructed and installed the clean rooms entirely in-house at R&M. The clean rooms, enclosed by thick transparent plastic sheeting on all four sides and the top, are each 15m² in area and 2.2m high.

"They're each equipped with a purpose-designed winding table that automatically turns the stator to facilitate the winding, which is performed by two winding operators, who wear special laboratory suits for the purpose," Rene pointed out.

"The end-side wall of the clean room closest to the winding table is temporarily removed by hand to permit entry of the stator for winding, while the room itself is mounted on trolley wheels running on rails so that it can be rolled out of the way to enable the



A pair of technicians wind a stator in one of R&M's newly-established clean rooms.

stator to be installed onto the winding table from an overhead crane. The enclosure is then rolled back into place and the removeable wall re-installed. Access for the working personnel is gained via a door at the other end of the room. The cleanliness of the room is maintained through the supply of a controlled volume of air, which blows all contaminants out at floor level, while the positive air pressure in the room prevents their entry."

The prototype first clean room was installed and commenced operation in November last year and the other two

were installed in May this year. "Now, with all three rooms and winding tables in place, we are able to keep pace with the demand with all the stator windings we are required to perform in the contaminant-free conditions we've established for this purpose," Rene commented.

All of the AC stator windings and some of the DC armature windings at the workshop are now done in this way.

"By establishing these clean rooms we have taken a further step in applying R&M's longstanding policy of continuous improvement," Rene concluded.

R&M collaborates with Komatsu SA in Switched Reluctance motors & generators repairs

Switched Reluctance (SR) technology

Reid & Mitchell (R&M) has joined forces with Komatsu SA on a new project as its local service provider on key electrical machine components.

This new venture commenced when Komatsu SA approached R&M recently to repair and test Switched Reluctance generators & motors used on SR hybrid front-end loaders in the mining industry.

Switched Reluctance technology has been developed as a viable alternative to DC and AC technology in electric traction drive applications, as it has been found not only to significantly improve machine efficiency, reliability

and durability, but also achieves substantial cost savings by comparison with the conventional technologies in this field.

How does this "revolutionary" new technology work and what are the significant benefits it has been shown to have over the standard technologies applied for similar purposes?

Although SRM is dubbed today as "new," it was in fact invented way back in 1838 and was initially designed to propel locomotives which used mechanical switches to control the motor speed.

After development had been undertaken by a team of engineers in Europe in the early-1990's, Komatsu, in recognising the potential of the



Switched Reluctance motor layout.

technology for use in some of its own equipment, made further advances in its development in the early-2000's and shortly thereafter transitioned its entire wheel-loader product line to SR technology.

An SR motor can put out the equivalent power of a larger one in a smaller package. The rotating portion of an SR motor is lighter, which translates to less stress on the gear train, improving life cycle and duty cycle on components. Additionally, SR has a significantly higher speed capability compared to other motors.

Komatsu sought to best meet customers' needs for improved efficiency, reduced fuel usage, lower cost per tonne and equipment that is rugged and durable enough to stand up to harsh conditions and constant use, plus extra reliability and reduced maintenance costs.

The company has also increased energy storage by creating the Kinetic Energy Storage System (KESS) deep energy storage system to work with its current SR technology, reducing a machine's overall fuel consumption by up to 45%. The KESS unit provides a means of deep storage of regenerated energy, which can be used to supplement engine power to enhance machine acceleration and dramatically improve loading cycle times, with reduced diesel emissions.

The **Switched Reluctance Motor (SRM)** is an electric motor that runs by reluctance torque and thus is a subgroup in reluctance motors. Unlike common brushed DC motor types, power is delivered to windings in the stator rather than the rotor. This greatly simplifies mechanical design as power does not have to be delivered to a moving part, which eliminates the need for a commutator, but it complicates the electrical design as some sort of switching system needs to be used to deliver power to the different windings. Electronic devices can precisely time the switching of currents, facilitating SRM configurations. Its main drawback is torque ripple. Controller technology that limits torque ripple at low speeds has been demonstrated.

Furthermore the switched reluctance



Switched Reluctance equipment layout in a hybrid loader.

tance motor has been extended to become a switched reluctance generator (SRG), since topology that is both motor and generator is useful for starting the prime mover, as it saves a dedicated starter motor.

SRM operating principle

Even though the construction is simple, the control is not an easy task for the SRM, since the phase energizing should be implemented at the right angle, to have less speed oscillations.

Another issue is the double saliency construction on both the rotor and stator, so that torque production by separate phases result in large torque ripples. This effect also produces current ripple in the DC supply and to a demand of a large filter capacitor. In addition, another negative effect of the torque ripple is the acoustic noise, due to the induced radial magnetic forces.

Great advances have been made recently with power electronics and microprocessors to overcome some of the other complications arising from SRM. More accurate control allows precise control.

To sum up, SRM's are cheap, robust, no winding in the rotor, have a very simple construction and are fault tolerant. The SRM has wound field coils, as in a DC motor, for the stator windings. The rotor is a solid salient-pole rotor made of soft magnetic material. When power is applied to the stator windings, the rotor's magnetic reluctance creates a force that attempts to align the rotor pole with the nearest stator pole.

To maintain rotation, an electronic control system switches on the windings of successive stator poles in sequence so that the magnetic field of the stator "leads" the rotor pole, pulling it forward. The switched-reluctance motor uses an electronic position sensor to determine the angle of the rotor shaft and solid state electronics to switch the stator windings, which enables dynamic control of pulse timing and shaping.

In an SRM the rotor magnetisation is static, while an induction motor has slip. SRM's absence of slip makes it possible to know the rotor position exactly, allowing the motor to be stepped arbitrarily slowly.

How SRM technology works in SR hybrid vehicles

The process to capture the regenerated energy begins when diesel energy is converted to electrical energy



Switched Reluctance motor and gearbox.

through a SR generator, which provides power to the motors to make the wheels rotate.

When the operator eases off the accelerator, the demand for diesel stops but machine momentum keeps the motors rotating. At this point, the motors become generators, supplying energy to a Kinetic Energy Storage System (KESS). When the operator presses the pedal again, the KESS supplies the stored energy while the engine simultaneously supplies diesel energy. The result is the equivalent of doubling the engine horsepower.

To make this possible, Komatsu's engineers investigated ultra-capacitor energy storage along with battery storage. Compared to other motor technologies, the SR hybrid drive's high-speed capability made SR kinetic energy storage feasible and more favourable against other available energy storage devices.

SRM's advantages

The advantages of SRM over AC and DC technology include :

- Less impact stress on gearing and high-torque-to-inertia ratio means faster response.
- Lower switching frequency as compared to AC systems, resulting in longer power electronics and motor insulation life.
- Simple rugged design made up of a stack of electrical steel laminations.
- No windings, rotor bars, magnets or contacts of any kind.
- Short end turns permit very high torque/volume ratio for an electric drive
- Independently wound coils have no overlap areas.
- Good thermal management, since losses are easily dissipated through the outer circumference.

By Willie Liebenberg
Technical Executive
Reid & Mitchell

Voith Hydro and ACTOM partner in providing solutions in Steenbras hydropower project

Marthinussen & Coutts (M&C), has a maintenance contract with the City of Cape Town at Steenbras hydropower station. The Power Station is situated in the Gordon's Bay area and has four pump turbine motor generator units each with a capacity of 45MW which supplies power to the city.

Power demands necessitated a new operating philosophy of the units with more stop-start cycles. The City of Cape Town along with M&C performed periodical Non-Destructive Testing (NDT) inspections as advised by Voith Hydro. Recommended were inspections after a certain amount of stop-start cycles as a precautionary measure to prevent catastrophic equipment failure.

Over a period of time cracks had developed in the rim of the rotor on some of the generator units.

M&C and Voith's collaboration on the project enabled a first-of-its-kind solution for a pole fixation reshaping to reduce localized stresses, reducing the crack propagation and increasing the number of stop-start cycles between Non-Destructive Testing inspections.

A fatigue and fracture mechanics analysis of the rotor rim and the hammerhead poles performed by Voith Hydro and the MPA University of Stuttgart showed that the existing motor-generator pole fixation design was susceptible to forming fatigue cracks in the pole fixation radii.

In order to reduce time and due to the complexity of removing the entire shaft from the stator, the City of Cape Town requested that the reshaping of the rotor rim be performed in situ to avoid extensive disassembly works of the motor generators.

Space constraints and contamination prevention of the stator made this a challenging and ambitious task to perform. The reshaping design and machining drawings were prepared by Voith Germany and special machines and tooling were designed by Voith Hydro South Africa, which also performed the round-the-clock in-situ reshaping of the rotor rim.

The matching rotor pole hammerheads radii also had to be reshaped to conform to the changed geometry of the rotor rims. ACTOM Turbo Machines was assigned this task, for which they had to design and make a special milling head for machining of the boring mill at its Sasolburg workshop.

The rotor rim and rotor pole reshaping design was performed in a way that allowed the existing wedges to be re-used, reducing the costs and the time required to custom-fit new wedges. The wedge landing surfaces on the rotor poles and the rotor rim were not machined as they would have been done in the conventional reshaping of the pole fixations.

An integrity assessment of the pole fixation for pumped storage plant (PSP) Steenbras was performed so that calculations could be done to determine the required geometry changes. The following analysis covered:

- Non-Destructive Testing inspections and materials testing.
- Identification of crack configurations and fatigue crack growth calculations.
- Evaluation of subcritical cyclic fatigue crack growth with regard to governing operation conditions.
- Elastic fracture mechanics calculations that included detailed analysis of geometry finite element analysis loading and calculation of the stresses on the materials.

Tests and inspection of the pole coil insulation by M&C and the City of Cape Town showed that the pole

coils required re-insulation for all four units, which M&C performed by using the 800t automatic hydraulic press at its Power Generation repair facility in Benoni.

The insulation of the salient pole coils necessitated removal of the coil retaining plates to gain access to the coils and re-welding of the retaining plates back into position after re-insulation had been completed.

ACTOM's Metalplus business performed the welding for refitting of the retaining plates over the re-insulated coils. "This was an intricate operation, due to the very close proximity of the retaining plates to the windings and the necessity for the welding to be done at a very low temperature to avoid damaging the windings through over-heating," **Roman Mornau**, Metalplus' Divisional CEO, pointed out.

The division's recently-acquired robotically-operated cold metal transfer (CMT) welding system proved the ideal method for achieving the required result.

The Steenbras maintenance team removed and reassembled the 40 poles onto the rotor rim. This was no easy feat, due to the space constraints and the low tolerance fit of the ham-



The Voith team machining the rotor rim at Steenbras Hydro Pump Station.

merhead coils.

Generator units 1 & 2 were repaired from April to June last year and units 3 & 4 in October to November last year and all units are back in operation. From April to November the geometry of 80 slots were modified, 40 rotor pole

hammerheads were modified and 40 salient pole coils were fully reinsulated.

"This was a world first as this type of in-situ rotor rim reshaping has not been performed before, with Voith designing and manufacturing the on-site machining device. All the

planning and repair teams involved in this complex project had to work round-the-clock to ensure that the tight schedules required were achieved," **Mike Chamberlain**, M&C's Marketing & Commercial Executive, stated.

M&C manufactures spare generator rotor for Illovo sugar mills in complex reverse engineering project

Spare units are one way to ensure a reliable plant that suffers the least downtime. But spare components are very difficult to obtain from the older machines – and complete spare machines are either unavailable or prohibitively expensive.

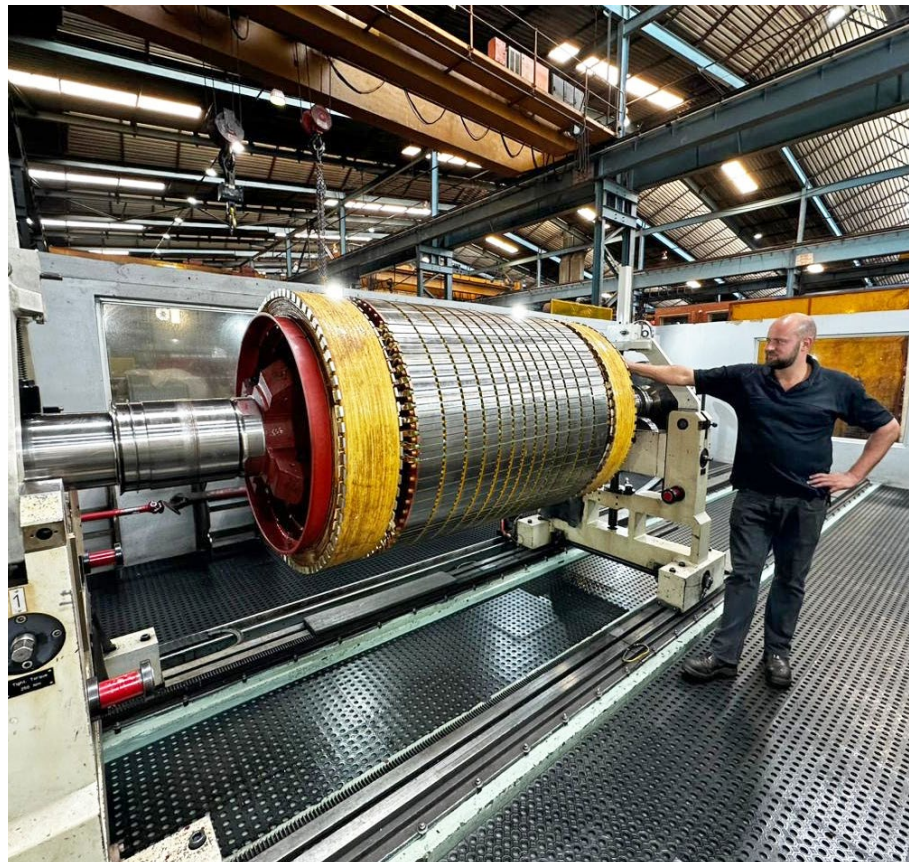
Illovo Sugar has two 10MVA 8MW 4-pole cylindrical rotor synchronous generators utilised at their Noodsberg and Sezela mills in Kwazulu-Natal. These machines were originally of AEG manufacture and are approximately four decades old.

Marthinusen & Coutts (M&C) has long been involved in maintaining such machines for end-users, but mostly in overhauling, repairing and rewinding the machines. Complete spare components are sometimes considered when the end-users are unable to procure them from the OEM's. M&C has been assisting customers in these cases and has been building up expertise and equipment to design and manufacture components and machines to satisfy their requirements.

M&C undertook to produce a spare complete rotor in response to Illovo's request for a service spare. The specific unit in question here is a 4-pole cylindrical rotor of 10MVA (8MW) rating, including the rotating brushless exciter and diode ring subassembly.

The division had been in detailed discussions with Illovo Sugar with the objective of producing spare components for their alternators. A spare stator has already been manufactured that can operate at both 3.3kV and 6.6kV to satisfy the supply voltages of the various units at the two different mills.

"During a scheduled maintenance visit to Noodsberg we gathered the bulk of the design data for the project, comprising all the essential dimensions and configurations, supported by photographs, which we used to design our unit for manufacture," explained **Dominik Krob**, M&C's Project Manager.



The 10MVA rotor being balanced in M&C's 32t balancing machine by Senior Balancing Technician Andrew Step.

"After being awarded the contract, we had the rotor in again for service during the off-crop season at the end of last year, which enabled us to gather the balance of the data we needed for the reverse engineering design, with the help of a state-of-the-art electronic probe we'd recently acquired to accurately measure the geometry of the rotor. Thereafter we created a 3D CAD model, from which we generated the manufacturing drawings we needed to work from."

M&C's scope of manufacturing tasks also included doing the windings, VPI process, exciter rotor and the diode carrier subassembly, the assembly, testing and high-speed balancing of the completed new rotor. ACTOM's

Electrical Machines business manufactured the lamination core-pack and Metalplus procured the material for the rib-shaft and welded and precision machined it. The welding was done using Metalplus' well-known qualified submerged-arc welding (SAW) system.

"This was a great achievement by M&C, as to carry out these complex reverse engineering manufacturing processes you need to have the engineering design capability and a skilled team of artisans to perform all the complex tasks involved," Dominik commented.

"We reverse engineered the unit in less than four months – including the exciter rotor and the diode carrier subassembly."

ACTOM Turbo promoted to service provider for global oil & gas equipment OEM

After demonstrating within a short time its ability to achieve a high standard of workmanship in maintenance and repair, ACTOM Turbo Machines was promoted by Baker Hughes to the status of service provider in Sub-Saharan Africa for the wide range of industrial equipment it has supplied into the region over many years.

ACTOM Turbo's certification as a service provider for the internationally

renowned industrial equipment manufacturer and supplier came into effect at the beginning of 2023 after the local repairer, refurbisher and maintainer of turbo-machinery and high-speed rotating equipment had served as "channel partner" in Sub-Saharan Africa for Baker Hughes' Turbomachinery & Process Solutions (BH TPS) company during the previous five years.

Now as the company's service provider in the region it is responsible

for maintenance and repair of the equipment, whereas previously its role was confined to marketing, selling and supplying it into the market.

"Through winning certification as a service provider we have graduated to the position of being able to realise and demonstrate our full potential in technical knowledge and expertise in service to BHTPS for its diverse range of equipment in the field," commented **Chris Bezuidenhout**, ACTOM Turbo's Divisional CEO.

The installed base of BHTPS equipment in the region includes a wide range of oil & gas equipment, steam turbines, compressors, pumps and industrial gearboxes.

In the 18 months since its certification the division has already shown itself to be worthy of its elevated level of responsibility in its current designation as service provider to BHTPS.

However, in June 2020, well before receiving its accreditation, ACTOM Turbo Machines was assigned a special project that is normally classified as being part of the responsibility of a certified service provider in terms of BHTPS' rules applicable to such work, rather than that of a channel partner, as the division was still designated at that stage.

It consisted of the swop-out of an emergency stop-valve (ESV) for the 50MW turbine at the Khi Solar One concentrated solar generation plant in Upington, Northern Cape.

"It was a crucial project towards the next phase. We achieved it in a very short time and in accordance with OEM specifications," said **Jurie Erasmus**, ACTOM Turbo's Projects & Business Development Manager.

Then in February this year the division was contracted to perform its first project as a fully accredited service provider, the overhaul of a reciprocating compressor at plastic products manufacturer Sefrol's plant in Sasolburg – again being required to meet an extremely tight deadline of only 14 days, which it achieved well in time.

In May this year, Khi Solar One, heading for its regular June shutdown, authorised for ACTOM Turbo to take responsibility for a major overhaul of its concentrated solar plant at Upington during the shutdown, involving complete disassembling on site of its 50MW steam turbine, replacing the turbine's rotor and servicing all the turbine auxiliaries.



Jurie Erasmus (left) and Channel Partner Co-ordinator Michal Piotrowski in front of the Khi Solar One concentrated solar power tower in Upington, where ACTOM Turbo successfully performed a fast-track swop-out of an emergency stop-valve in 2020.

Metalplus meets tight deadline in performing complex repair work on power station turbine



Roman Mornau stands in front of the massive power station turbine rotor after completion of the fine grinding of the unit's blades at M&C's Benoni workshop.

In February this year a power utility in Sothorn Africa approached Metalplus with an urgent request: Could it perform a complex repair procedure on a 30t 2.9m diameter low pressure steam turbine rotor from one of its coal-fired power stations in just four days?

This extremely daunting challenge was promptly taken on by Metalplus, which quoted to perform the work on the massive CNC lathe located at Marthinusen & Coutts' Power Generation workshop in Benoni.

The power utility's own engineering company had already taken the first step towards repairing the rotor by having installed locally manufactured last stage blades to replace all the blades that had been damaged over time during the 200MW turbine's extended operating lifetime. However, the new

blades still needed to be ground down to the correct size and profile, which was where Metalplus' grinding expertise came into play.

"The tight time limit of four days in which we were required to perform this task was due to the engineering company having booked a slot on the following day for balancing of the rotor in the large balancing machine at its own works. If this time slot had been missed a new slot would not have been available for a number of weeks, which would have resulted in a long delay in completing the job and having the rotor returned to service at the power station" explained **Roman Mornau**, Metalplus' Divisional CEO.

Steven Rudd, Metalplus' Supervisor, was instrumental in setting up the precision grinding wheel on the tool-post of the 40t CNC lathe

and thereafter supervised the grinding process to ensure complete accuracy of workmanship in grinding down the tips of the blades to the correct conical geometry, while at the same time correcting the blades' outer diameters to specifications.

"Verification of the slope was then done with the recently acquired state-of-the-art mobile 3D scanning arm, which digitally records millions of surface points and uses colourful software analysis to project the shapes onto the original design to identify any discrepancies and provides accurate protocol data for the dimensional quality records," Roman added.

"Everything was done within the stipulated period, with Steven and the team working extended hours to ensure completion in just four days."

P&C achieves important milestone with 50th Mini-APPS course for protection practitioners

Protection & Control (P&C) conducted its 50th five-day Mini-APPS course in February this year.

ACTOM'S protection, control and metering solutions business unit, along with Measurements, its predecessor, have been running the Mini-APPS course for protection engineers and technicians from all over Africa since the mid-1980's.

"We are very proud at having reached the 50 mark in the courses we have run to the benefit of the protection industry as a whole," commented P&C's **Joe Steyn**, who has been Course Co-ordinator for the Mini-APPS course since 2005.

"Attendees include electrical practitioners from all sectors of the industry, utilities, municipalities, industrial end-users, primary equipment suppliers and consulting engineers. At least 30% of those attending each course comprise people from outside South Africa," he pointed out.

The Mini-APPS course was developed locally as a shorter version of the original six-week APPS (Analysis and Protection of Power Systems) course that was run in Stafford, England, by Alstom, a major stakeholder and technology principal of ACTOM's predecessor Alstom SA at the time.

"Our Mini-APPS course is by far the longest-running course of its kind on offer in South Africa and the demand for it has been very consistent over the years.

There were only two years during that whole period when we did not run the course, which were in 2020 and 2021, when the restrictions on movement and gatherings to prevent the spread of COVID-19 were in full force," Joe said.

"At one stage – for a number of years in the 1990's – the course was so much in demand that we were able to provide two courses a year, but in the main they have been held once a year.

To ensure that delegates could get the maximum benefit out of it, attendance has always been limited to no more than 32 people per course."

The course covers the full range of protection applications and is presented by senior P&C staff, complemented by at least one visiting protection expert from industry or a university at each course.

Although the technologies of protection schemes have changed radically over the years, from electromechanical systems in earlier times to microprocessor relays today, the content of the Mini-APPS course remains essentially unchanged, because the electrical fundamentals are the same as always.

"In the course we teach advanced theory and on the practical side in the tutorials the participants are required to carry out mathematical calculations," Joe stated.



The Mini APPS Team are: Front Row: Andre de Jongh, Marius van Rensburg, Anthony Marks - all lecturers. Sy Gourrah, Senior GM; Herman Mare, GM; Sandra Colquhoun, Course Co-ordinator; Joe Steyn, Course Facilitator; Armien Edwards, Lecturer; Lucia Sebage, Course Secretary. Back Row : P&C Staff - Vaughn Berger, Morgan Mogajane, Kamogelo, Khumalo, Wincent Dreyer, Johan Hannekom, Darshan Singh.

P&C completes assembly of upgraded protection system for Koeberg's Unit One

Protection & Control (P&C) recently completed the assembly of a state-of-the-art digital protection system from Schneider Electric for Unit One of the Koeberg nuclear power station in the Western Cape.

The new system, an upgrade of the original analogue system supplied and installed in the 1980's when the power station was under construction, was factory accepted recently and is due to be installed and commissioned at the end of this year during the scheduled shutdown of Unit One.

The protection system, for which Eskom awarded P&C the contract in late-2022, consists of three protection panels, plus four auxiliary units comprising:

- A panel for 100% stator earth fault,
- A panel for rotor earth fault,
- A panel for CT and VT transformers interface, and
- A panel for the distribution of 24 kV VT secondaries.

"The suite of three protection panels will be integrated with the existing fault recorder panel P&C supplied in 2015, as procured from fault recorder specialist company Novatech of the US," said, **Andre de Jongh**, one of



This photo shows the highly skilled Generation Protection Wireman; Bafana Mnisi, Dumisani Msimango, Stanley Malange and Thabang Tlhapi with Mzwakhe Vilakazi, the Schemes Foreman.

P&C's Design & Commissioning Engineers.

"We've designed our system to cater for a future upgrade of the alarm system from the existing analogue system to a fully-fledged digital system," he added.

The protection upgrade contract applies to both Unit One and Unit Two, with P&C being responsible for design-

ing and assembling the two identical systems, arranging factory acceptance testing, overseeing installation and assisting with commissioning.

"The protection panels for the second generator unit will be manufactured this year, with the full contract due for completion by October 2025," Andre concluded.

Static Power develops DC 'chop-over box' for easy supply of temporary power to DC systems

Static Power has developed and manufactures a DC chop-over box to facilitate the prompt provision of temporary power to substations in the event of failure of the Substation DC system.

Tony Gordon, Manager, Technical Sales, of the business unit, which has been providing DC back-up power solutions for substations for many years, said the new product will also prove highly safe and convenient as a temporary power connection into the existing substation DC system during breakdowns or when the station battery is capacity tested at site.

"The chop-over box, known as the DCC7 box, has been developed to act as the interface between a substation DC system and an external battery trailer that can be towed to the site. The trailer contains a backup battery and charger together with a permanently built-in battery discharge unit," he explained.

"The DCC7 box is mounted on the outside of the substation, with the

substation DC wired to it.

This provides quick and safe access to the substation DC system whenever a temporary DC system is required via supply from the battery trailer. It is simply a matter of plugging it into the

DCC7 box and switching it on."

The DCC7 box is IP65 rated and is equipped with a weatherproofing flap over the plug connection points to prevent weathering and corrosion of the plug terminals.



A view of one of the first DC chop-over boxes developed and manufactured by Static Power to facilitate the prompt and safe provision of temporary power to substations.

Key appointments

Pedro Adams has been appointed Divisional CEO of the Electrical Equipment division with effect from March 1, 2024.

Nicholas Msibi has been appointed Divisional CEO of the Engineering Projects & Contracts division with effect from March 1, 2024.

Kelvin Ageng'o Oriwo has been appointed General Manager of ACTOM Kenya with effect from 1 January 2024.

Varusha Naidoo has been appointed Senior Legal Officer at ACTOM head office with effect from February 2, 2024.

Richard von Moltke has been appointed General Manager of Static Power with effect from February 1, 2024.

Kobus Strydom has been appointed Divisional Financial Executive of

the Engineering Projects & Contracts division from April 1, 2024.

Wynand Snyman has been appointed Financial & Commercial Manager of Contracting with effect from April 1, 2024.

Catherine Pereira has been appointed Financial Manager of Static Power with effect from May 1, 2024.

Virushin Naicker has been appointed Technical Sales Manager of Static Power with effect from January 8, 2024.

Mandla Malomane has been appointed Divisional HR Manager of Reid & Mitchell with effect from June 1, 2024.

Thobezweni Mcineka has been appointed Contracts Engineer at High Voltage Equipment with effect from August 1, 2023.

Christo Horn has been appointed Inventory & Warehouse Manager at High Voltage Equipment with effect from November 30, 2023.

Sanele Linda has been appointed Proposals Engineer at High Voltage Equipment with effect from April 1, 2023.

Jabulani Ngobese has been appointed Proposals Engineer at High Voltage Equipment with effect from April 1, 2023.

Blessing Chipatiso has been appointed Service Department Manager of Protection & Control with effect from February 1, 2024.

Goodness Maziya has been appointed Metering Manager of Protection & Control with effect from May 6, 2024.



Pedro Adams



Nicholas Msibi



Kelvin Ageng'o Oriwo



Varusha Naidoo



Richard von Moltke



Kobus Strydom



Wynand Snyman



Catherine Pereira



Virushin Naicker



Mandla Malomane



Thobezweni Mcineka



Christo Horn



Sanele Linda



Jabulani Ngobese



Blessing Chipatiso



Goodness Maziya

LH Marthinusen supports Radio KFM 94.5's "Stationary Vehicle Drive"

LH Marthinusen (LHM) Cape Town, with generous funding from LHM Denver, donated R 75 000-00 to Radio KFM 94.5 for their "Stationary Vehicle Drive." This drive aimed to collect and donate stationary and sanitary products to underprivileged schools in the Western Cape. Through this initiative, LHM were

able to significantly impact the lives of many children who do not have access to these basic necessities.

"With our donors' support, we could provide essential school supplies such as notebooks, pens, pencils, erasers, rulers, and sanitary products. These items may seem small, but they make a difference for students who

may not have the means to obtain them," said **Tosh Odendaal**, Sales and Commercial Manager LHM Cape Town.

"We are so grateful to Radio KFM 94.5 for organising this drive and our donors' generous contributions. Together, we can positively impact the lives of underprivileged children in our community," he concluded.

ACTOM proudly supports Youth Day,
celebrating the power and potential of our nation's youth. We embrace the theme:
"Actively Embracing the Socioeconomic Gains of Our Democracy."



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John Thompson is a leader in energy and environmental solutions through value engineering and innovation. We are firmly focussed on serving global and local markets and we offer the following products and services: design, engineering, manufacture, construction, repairs, maintenance, retrofit, installation and commissioning of industrial water-tube and packaged fire-tube boilers, and industrial air quality solutions including HVAC, bag filters, scrubbers and ESP systems. Our Boiler and Environmental business unit offers the following solutions for utility plants: maintenance, repairs and retrofit of utility plant boilers, ESP systems, FFP systems, mills, burners, ducting, HP piping and ancillary equipment - geared towards keeping large power plants operating optimally, as well as providing a plant and equipment hire solution for construction work.

John Thompson also provides outsourced steam via its Energy Management Solutions business unit. Our service further includes capacity and efficiency improvements to older boilers, supply of original equipment manufacturer (OEM) spares, reliability studies, metallurgical services and computational fluid design (CFD) modelling.

ENGINEERING PROJECTS & CONTRACTS

Industry: (011) 430-8700

ACTOM Industry, the group's Mine winder experts with modern power electronic drive, control and switchgear technology, providing turnkey solutions worldwide for specialised industrial rotating drive and power applications in mining, metals, paper and process industries. We manage projects from design to commission; inspect & maintain; provide emergency support; do repairs and we perform magnetic rope testing.

Contracting: (011) 430-8700

Contracting is the electrical and instrumentation business unit which provides turnkey solutions for electrical power and instrument & control systems in the mining and manufacturing industries as well as the public sectors.

Power Systems: (011) 430-8700

ACTOM Power Systems, the group's substation construction contractor, is ACTOM's systems integrator, responsible for turnkey projects for the electrical power, mining and manufacturing industries, as well as for public sector infrastructure. It specialises in Renewable balance of plant installations.

Transport: (011) 871-6600

Transport has three trading units:

ACTOM Signalling; design, manufacture, install and maintain railway signalling equipment and turnkey systems.

ACTOM Transport Equipment and Projects (TEP); a contractor and supplier of rolling stock equipment, parts, maintenance and specialised depot machinery and test equipment.

ARNOT Vibration Solutions (AVS); suppliers of anti-vibration products and engineered solutions to a wide range of industries, including rolling stock.

ACTOM Energy: (021) 510-2550

ACTOM Energy is a solutions business and in collaboration with various divisions within the ACTOM Group, provides electrical automation, power automation, protection and control, remote condition monitoring and fluid technologies (motion controls, hydraulic and pneumatic) system integration services across all sectors.

LH Marthinusen - Coastal

Durban: (031) 205-7211

Africa's leading maintenance partner for rotating machines - servicing traction, power generation, mining, utilities, oil & gas and general industry.

HIGH VOLTAGE EQUIPMENT

High Voltage Equipment: (011) 820-5111

High Voltage Equipment, is a designer, manufacturer, supplier and installer of high voltage equipment to power utilities, electricity generation, transmission and distribution industry, mining sector and contracting companies. Manufacturer of isolators, instrument transformers, outdoor circuit breakers and insulated phase busbars. Supplier of high voltage Gas Insulated Switchgear, Compact Hybrid Switchgear, surge arresters, substation and overhead line insulators. HVE specialises in the repairs, supply of spares and maintenance of high voltage equipment.

MEDIUM VOLTAGE SWITCHGEAR

MV Switchgear: (011) 820-5111

www.actomswitchgear.co.za

Leading manufacturer and supplier of air-insulated (AIS) and gas-insulated (GIS) switchgear for use up to 36kV. The product range consists of indoor switchgear, containerized switchgear solutions, compact substations for renewable energy applications, minisubs, free-standing outdoor kiosk ring main units and bulk metering units. The division also specializes in the repair and maintenance of electrical networks.

WPI Power Solutions: (011) 820-5111

24 Hour Emergency Service: (082) 801-3171

WPI specialises in the repair, installation, retrofitting and maintenance of electrical networks via MV Switchgear's After Sales department and WPI regional branch network that is technically well equipped and strategically placed close to the customer base. The department offers 24/7 customer support for substations, MV and LV switchgear and associated products.

Current Electric: (011) 822-2300

Current Electric designs, manufactures and supplies medium voltage current and voltage transformers to switchgear manufacturers and repairers, electrical distributors and a diverse range of end-users locally and internationally.

POWER TRANSFORMERS

Power Transformers: (011) 824-2810

Power Transformers designs, manufactures and supplies a wide range of power transformers from 2MVA to 315MVA up to 275kV to power utilities, renewables projects, electrical contractors, the mining sector, local authorities and industry locally and internationally.

DISTRIBUTION TRANSFORMERS

Distribution Transformers: (011) 820-5111

Distribution Transformers designs, manufactures and supplies distribution transformers ranging from single phase 16kVA to three phase 7MVA up to 44kV, can be Single or Dual MV or LV and NECRT's up to 44kV to power utilities, the mining sector, local authorities and industry, and renewable applications locally and internationally.

LH MARTHINUSEN

LH Marthinusen Johannesburg: (011) 615-6722

Cape Town: (021) 555-8600

www.lhm.co.za

LH Marthinusen repairs and refurbishes transformers, electric motors, alternators and industrial fans. Manufacture of electric motor components, insulation components and specialised transformers and motors. It also provides engineering services for its products to the mining, industrial and petrochemical sectors and local authorities, as well as for the export market.

REID & MITCHELL

Reid & Mitchell: (011) 914-9600

www.reidmitchell.co.za

Reid & Mitchell is a repairer and manufacturer of electrical equipment for open cast mining, steel, rail transportation and marine industries. Motors and generators for excavators, off-highway vehicles, locomotives, drilling and pumping applications. The division is also a specialist repairer of DC motors and generators, including rebuilds, rewinds and commutator manufacture.

Electrical Machines: (011) 899-1111

Electrical Machines supplies medium and low voltage motors, starters, gearboxes and speed reducers to the mining, industrial, processing and utilities markets.

Large Motors designs and manufactures medium voltage motors that include its reputable customised large UNIBOX series and its high specification MS4 totally enclosed fan-cooled (TEFC) cast-iron motors.

Laminations & Tooling manufactures laminated components and tooling for the electric motor manufacturing and repair industries.

Energy Namibia – Electrical Products: +264 (61) 423 150

Supplier of Electrical products throughout Namibia.

Namibia Armature Rewinders (NAR): +264 (64) 220 352

Repairer of electrical machines, hydraulics, boilers, transformers and switchgear throughout Namibia

MARTHINUSEN & COUTTS

Marthinusen & Coutts: (011) 607-1700

www.mandc.co.za

M&C repairs, maintains, services, and carries out specialised manufacture of HV, MV and LV, flameproof, DC and traction motors, transformers, generators, alternators and ancillary power generation equipment up to 373 MVA. M&C also provides a full range of 24/7 engineering on-site services and unique motor and generator management and maintenance solutions and programmes.

ACTOM TURBO MACHINES

ACTOM Turbo Machines: (016) 971-1550

www.actomturbomachines.co.za

ACTOM Turbo Machines is a mechanical turbo-machinery and high-speed rotating equipment service provider, for manufacturing, maintenance, overhauls, repairs, installations and commissioning of all types of steam and gas turbines, compressors, blowers, pumps, fans, gearboxes, centrifuges, as well as general fabrication and machining.

METALPLUS

Metalplus (011) 433-1880

www.metalplus.co.za

Metalplus has earned a reputation over many years in the petrochemical, power generation, machine repair, mining, and rail & transport industries, for its reliability, accuracy and speedy turnaround times in performing mechanical repairs that include submerged arc micro-welding, machining and grinding. Further to our multitude of shaft and crank shaft repairs our products extend to new shaft manufacturing, casing welding and stitching, hard facing, component manufacturing and specialised welding repairs.

ELECTRICAL EQUIPMENT

Electrical Products: (011) 878-3050

www.actomep.co.za

Electrical Products is ACTOM's trading and representation arm, with a national network of strategically located branches. The business unit supplies products produced by ACTOM divisions and other manufacturers, including cable, cable accessories, lighting equipment, heating and ventilation equipment, circuit breakers, distribution transformers, minisubs, protection and control equipment, electric motors, meters, fusegear and overhead line materials.

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Satchwell: (021) 863-2035

Satchwell manufactures and supplies domestic and industrial heating elements, temperature controls, refrigeration components, solar water heating components and appliance spares to the domestic appliance manufacturing industry and the chemical, mining and construction industries, among others.

Genlux Lighting: (011) 825-3144

www.genluxlighting.co.za

Genlux Lighting is a leading designer and manufacturer of luminaires for roadway lighting, floodlighting, outdoor commercial lighting and industrial applications. It produces a wide range of high quality products in both HID and LED technologies.

ACTOM SMART TECHNOLOGIES

Protection & Control: (011) 820-5111

A market leader in the supply of protection, metering and low voltage solutions to the electrical industry. Our offering includes a comprehensive range of automation systems, protection relays, credit, smart and prepayment metering systems and hosted services as well as LV motor control centres and power DB's, variable speed drives (VSD's) and components and accessories.

ACTOM Kenya: Pedro.adams@actom.co.za

The product offering includes the supply of transmission and distribution equipment including power transformers, distribution transformers, MV Switchgear, HV products and protection and metering equipment. Under the John Thompson business it also includes the sale of steam (biomass boiler, ancillary equipment).

Static Power: (011) 397-5316

Static Power specialise in the design and manufacture of AC and DC standby equipment for the Industrial, telecomms, rail and renewable energy markets including thyristor type chargers, (Micro Process Controlled option), industrial batteries, power supplies, industrial UPS's, furnace control panels, power distribution boards and battery tripping units. All systems are designed and engineered to suit their purpose for both the local and export markets. We offer specialized technical training to enhance practical and theoretical knowledge of our products. After Sales division to support and maintain installed equipment in the field.

COM 10: (011) 552-8368

COM10 is a local assembler and integrator of Alpha switchmode rectifiers, DC/DC Converters with sophisticated supervisory controllers, Lead Acid Batteries, stands, battery cubicles and power enclosures.

Alkaline Batteries: (011) 397-5326

Alkaline Batteries is the South African distributor for ALCAD and SAFT nickel cadmium and Lithium Ion batteries as well as the Intelli Connect battery monitoring systems for the industrial, telecoms, rail and re-newable energy markets. The local assembly plant on the East Rand includes a collecting point for spent nickel cadmium batteries for recycling. Services offered include Installation and Commissioning, Battery Sizing, Testing, Investigations, Maintenance and Repairs, Maintenance and Service Contracts, Discharge Tests and Training.

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