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Leading the way to the all-electric mine

Decarbonising the mining sector requires more than just new technology; it demands a structured methodology, collaborative partnerships, backed by an integrated suite of technology solutions. ABB eMine™ provides a strong portfolio of Electrification and Automation solutions, consulting, partnerships and technology applications to support Mining operations to accelerate achieving their goals related to reduced emissions, operational cost savings and superior efficiency.

ABB eMine™ also enables mine operators to plan, monitor, and control their operations with greater precision using solutions containing short interval control (SIC) functionalities, ultimately optimizing the use of resources and improving efficiency.

"Our eMine™ portfolio empowers miners to rapidly succeed in their all-electric transformation journey," says Martin van Zyl, Sales Manager, Process Industries at ABB.

ABB's eMine™ solutions are gaining traction globally, with different regions prioritising different aspects of the technology. In underground mining markets, battery FastCharge solutions are attracting considerable interest, while ABB's digital Short Interval Control (SIC) system has revolutionised efficiency in underground operations. Meanwhile, in countries such as Canada, Australia and South Africa, interest in Trolley Assist solutions is rapidly increasing.

Modular and Scalable Solutions for the Future

A major advantage of ABB eMine™ is its modular and scalable design, allowing mining companies to implement electrification strategies at their own pace. ABB supports clients in developing multi-year roadmaps that align with operational lifecycles, starting with quick wins and progressing toward broader, long-term transformations.

In addition, ABB offers tailored services such as remote monitoring, predictive maintenance, and system upgrades to maximise equipment performance throughout a mine's lifecycle. Advanced digital mining services enable real-time data collection and analysis, allowing for predictive interventions that shift maintenance strategies from reactive to proactive.

"We are committed to creating sustainable progress for both current and future generations by supporting our mining clients through their energy transition," says van Zyl. He emphasizes that full electrification will not simply happen overnight. Instead, an intentional plan to partner with Technology leadership teams such as ABB eMine™ will accelerate the journey towards Real Progress.

Regional Adaptations and Case Studies

One notable implementation of ABB eMine™ is at the Boliden Aitik Copper Mine in Sweden, located 100 km above the Arctic Circle. The mine's hybrid trucks are equipped with onboard electrical systems that connect to a trolley line, significantly reducing CO2 emissions and improving fuel efficiency. This infrastructure is expected to help Boliden transport up to 70 million tons of rock annually while cutting

greenhouse gas emissions from transportation by up to 80% along the electrified routes.

In another example, ABB delivered a complete open-pit Trolley Assist solution to Copper Mountain Mining Corporation in British Columbia, Canada. As the first such installation in North America in decades, the project demonstrates the region's shift toward mine electrification. ABB designed the overhead catenary system (OCS) infrastructure and delivered a rectifier substation providing over 12 MW of DC power. The trolley control system was integrated into the ABB Ability™ distributed control system (DCS) platform for seamless monitoring of operations and energy consumption.

Strategic Implementation Through Collaboration

Early-stage involvement is crucial for

effective electrification, as it enables comprehensive technology, economic, regulatory, and geographic assessments. ABB's approach involves conducting comparative simulation studies to gain insights into each mining operation and providing guidance for strategic project decisions.

Furthermore, ABB fosters collaborative partnerships with technology providers, investors, service providers, consultants, EPC/EPCMs, and OEMs to enhance electrification systems based on real operational data. By leveraging these partnerships, ABB ensures that its eMine™ solutions are tailored to the specific challenges and opportunities of each mining operation.

As the mining industry continues its shift towards sustainability, ABB remains a key partner in helping mines transition to an all-electric future through innovation, expertise, and a commitment to long-term progress.



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Seven years strong: *South African-engineered pinch valves set reliability benchmark in African gold mining*

A set of hydraulically operated Corflex pinch valves, installed in 2018 at a major North African gold mine, has delivered seven years of uninterrupted service in one of the continent's most demanding slurry-handling applications.

These robust pinch valves, which were designed and manufactured in South Africa by Corflex Engineering, in partnership with BMG Fluid Technology, offer a dependable solution

that demonstrates sustained performance under abrasive, high-pressure conditions, with minimal maintenance. The valves also boast zero operational failures to date.

The installation comprised 400 mm pinch valves rated to 25 bar, each actuated by a purpose-built hydraulic power pack, which was developed by BMG. The system was commissioned with integrated PLC and SCADA functionality, allowing for full remote operation and automated safety respons-

es. The system incorporates fail-safe closure, pressure-rated sleeves and a robust manifold configuration tailored to the application, also meeting stringent uptime requirements.

The reliability of this installation is attributed to both the valve construction and the hydraulic system design. The core wear component - the sleeve - was pressure-tested to 40 bar, ensuring a 60 percent safety margin over system pressure. With no internal obstructions or mechanical compo-

nents exposed to media, the valve body has required no servicing since commissioning.

"We didn't just supply a valve, we engineered a system," says Taylor Black, Business Development Manager, Fluid Tech Projects BMG's Fluid Technology division. "Seven years on, those units are still in service and still outperforming expectations. That's testament to proper specification, quality components, robust local manufacturing and successful technical partnerships."

The hydraulic power units, engineered by BMG and manufactured in South Africa, use premium hydraulic components and are tailored for the rigours of mineral processing environments. Key features include condition monitoring compatibility, simplified maintenance access and operational resilience in the event of power loss.

Corflex pinch valves - widely deployed across South African mines - are increasingly being selected for international projects due to their full-bore, low maintenance design and ability to accommodate challenging flow conditions. Units have been exported and installed in mining operations across Africa, Australia, Asia and the Americas.

The wear sleeve is the only wetted component and is designed for fast replacement, without removing the valve from the line, significantly reducing downtime. Each unit is individually tested to withstand pressures up to 200 bar, ensuring consistent reliability in both greenfield and retrofit operations

Corflex Engineering and BMG Fluid Technology continue to collaborate on integrated solutions that align valve

and hydraulic system performance with the operational objectives of the mining sector, including safety, uptime and life-cycle cost efficiency.

The seven-year milestone at this mine is a noteworthy example of the value delivered when fit-for-purpose design meets operational discipline.

The BMG Fluid Technology team designs and manufactures advanced lubrication systems, hydraulic power packs, bulk fuel filtration systems, grease systems, cylinders, manifold blocks and electrical panels. This equipment is supplied for various projects, including crushers, thickener drives, tailings applications, ball mills, filter presses, stacker reclaimers, fuel and oil filtration, furnace and wind-er applications, as well as load out stations.



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Bühler to showcase materials handling expertise at key MTE mining regions

Bühler Southern Africa is gearing up to exhibit its materials handling solutions at four upcoming Mining & Technical Exhibitions (MTE) taking place between July and October 2025. Known for its robust conveyors, chains, and customised process equipment, Bühler continues to support mining clients with solutions designed to thrive in Africa's most demanding production environments.

The first stop will be Steelpoort in Limpopo on 31 July 2025, followed by two exhibitions in Zimbabwe – Ngezi on 19 August and Gweru on 21 August. The final leg of the series will take place in Lephalale, Limpopo on 16 October.

With decades of local expertise and access to global innovation, Bühler

Southern Africa delivers complete conveying systems, spare parts, refurbishment services, and shutdown support for the mining and minerals processing industry. These systems are engineered to perform in harsh environments where reliability and uptime are critical.

Bühler's conveying technology is built for durability in high-temperature, abrasive and corrosive applications. Whether moving hot clinker, chrome, cement, or dust-laden coal, the equipment on display is designed to reduce maintenance intervals, lower operating costs, and extend service life helping clients minimise downtime and maximise throughput.

"These exhibitions allow us to connect directly with the operations teams on the ground, the people who deal with daily plant challenges. It's the ideal platform to demonstrate how Bühler's robust solutions can simplify maintenance, improve reliability, and ultimately support production continuity," says Francois Knoetze, Head of Manufacturing at Bühler Southern Africa.

Each location in the MTE line-up is strategically important to the regional mining economy. Steelpoort, located along the Eastern Limb of the Bushveld Complex, is a key player in South Africa's chrome and platinum belt industries that demand high-volume materials handling with minimum failure.

Ngezi, one of Zimbabwe's largest platinum mining zones, is an emerging hub for advanced underground and surface mining operations. Bühler's robust chain systems are ideally suited to the high-capacity movement required here. Gweru, in the Midlands province of Zimbabwe, is home to both ferrochrome and cement production facilities, making it an ideal environment for Bühler's flexible handling solutions.

Lephalale, located in Limpopo's Waterberg region, plays a vital role in South Africa's coal and power sectors. The area's dusty, high-wear conditions make it essential to deploy equipment that is tough, reliable, and easy to maintain.

Bühler remains committed to supporting the mining industry with smart, durable, and locally backed materials handling systems. Visitors to the MTE roadshows will have the opportunity to connect with Bühler's technical experts to discuss specific applications and explore ways to optimise their operations.



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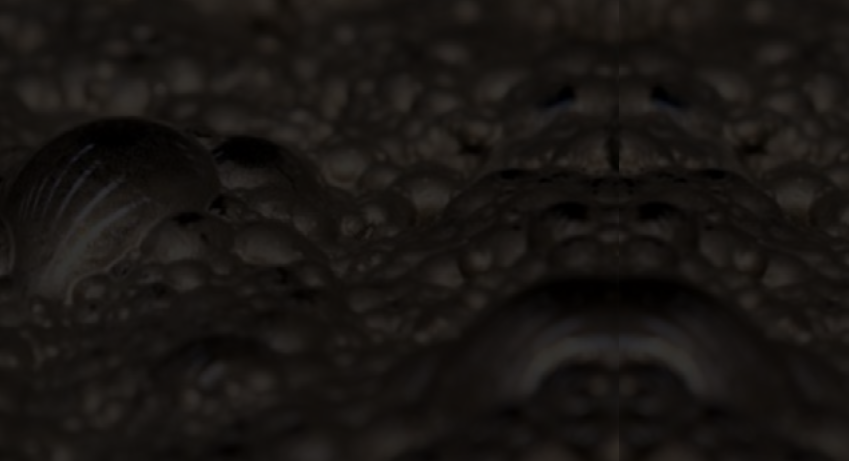
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RS SOUTH AFRICA TO SHOWCASE SMART INDUSTRIAL SOLUTIONS AT KITE 2025



As the industrial sector gears up for the KwaZulu-Natal Industrial Technology Exhibition (KITE) 2025, taking place from 22 to 24 July at the Durban Exhibition Centre, RS South Africa will showcase smart technologies designed to enhance efficiency, safety, and sustainability across the region's manufacturing landscape. The event offers a vital platform for industry professionals to explore emerging trends and innovative solutions.

RS South Africa's presence at KITE 2025 will highlight technologies that address the growing need for operational excellence and sustainable practices, particularly in the food and beverage sector, a significant contributor to KwaZulu-Natal's industrial

economy. From connected safety systems and predictive maintenance tools to smart sensors and energy-efficient devices, the company aims to support businesses in boosting uptime and reaching their environmental targets.

"These technologies are designed not only to improve operational uptime but also to help businesses meet their environmental goals," says Erick Wesels, Sales Director at RS South Africa.

A key feature at the RS stand will be the expanding RS PRO range, offering cost-effective alternatives without compromising on quality or compliance. Also on display will be solutions from the company's 'Better World' product portfolio, which includes items

with improved environmental credentials to support customers committed to greener operations.

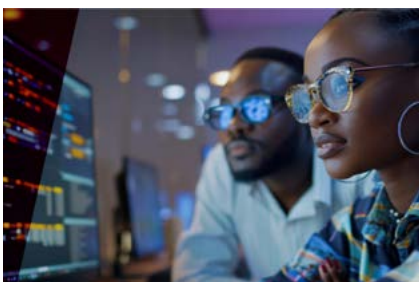
RS's offerings are particularly relevant to sectors that must meet rigorous health, safety, and hygiene standards. The company has carefully selected corrosion-resistant components, hygienic automation tools, and high IP-rated sensors to meet the demands of manufacturing environments in South Africa.

In addition to its product line up, RS South Africa is advancing digital enablement across industries. Its eCommerce platform and smart supply chain solutions simplify procurement processes, while platforms like

DesignSpark a free engineering and design resource help engineers and technicians innovate, build prototypes, and access key tools at no cost.

Wessels notes a particularly strong uptake in automation and IIoT (Industrial Internet of Things) solutions in the province. *"We have seen real momentum in the adoption of smart factory technologies, especially in food processing. KwaZulu-Natal based businesses are integrating PLCs and smart sensors from our range to improve traceability, reduce energy waste, and ensure food safety compliance. Our technical support team plays an active role in helping customers navigate this shift."*

RS South Africa's commitment to education and skills development remains central to its long-term strategy. Through partnerships with universities, technical institutions, and initiatives like STEM programmes and Super Skills training, the company is helping to nurture the next generation of technicians and engineers across the country.



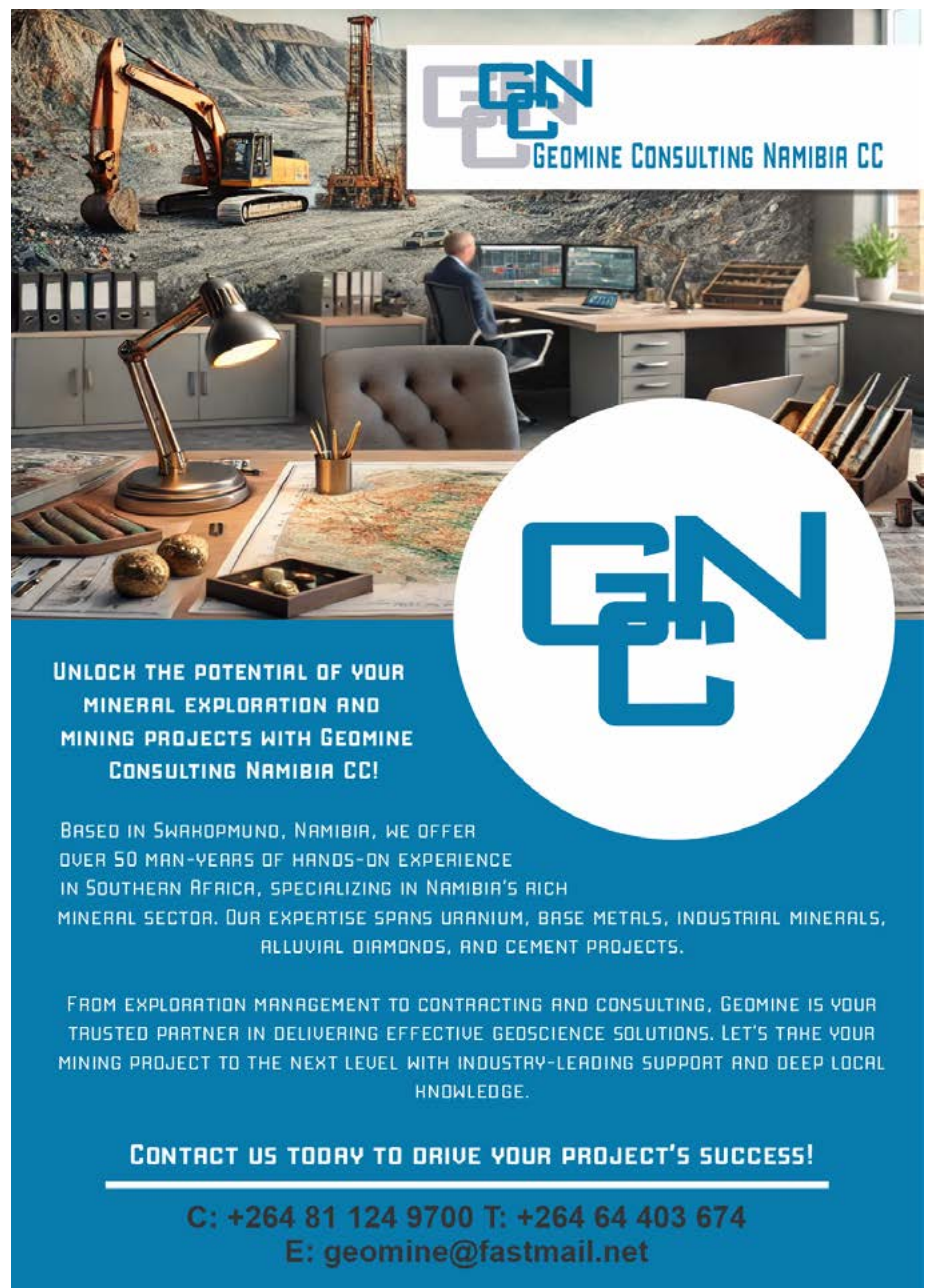
"Skills development is at the heart of our purpose-led strategy," Wessels continues. "We're committed to helping the next generation of technicians and engineers thrive in a digitally driven industrial economy."

For RS South Africa, KITE is more than a trade event, it is a platform to listen, collaborate, and co-create the future of the province's industrial economy. "KITE brings together industry leaders, decision-makers, and innovators under one roof," highlights Wessels. "It is a chance for us to strengthen relationships and demonstrate how RS

can help local businesses grow safely, sustainably, and efficiently."

Offering a wide range of technologies, technical insights, and customer support, RS South Africa invites all KITE attendees to visit stand A5 and explore solutions tailored to the region's evolving needs.

For more information about KITE 2025, visit www.kznindustrial.co.za and explore RS South Africa's full offering at <http://rsonline.co.za>.



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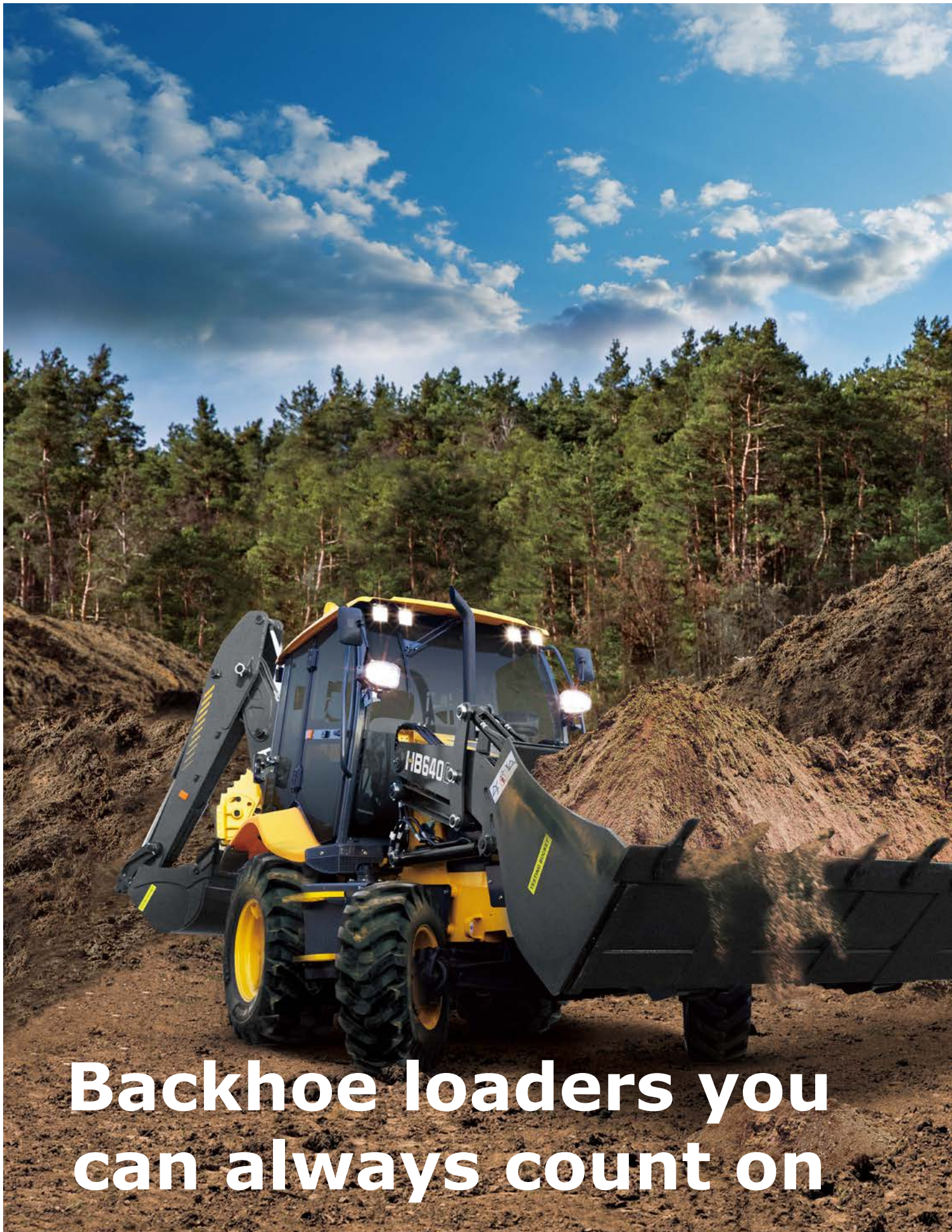
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**Backhoe loaders you
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HPE Africa's recent launch of the Hyundai HB640 backhoe loader marks a strategic extension of the company's portfolio of high-performance Hyundai earthmoving equipment that includes wheel loaders, excavators, motor graders and TLB's.

"This robust new machine – which has been designed to meet the operational demands of construction, agriculture and utility industries – offers the local market enhanced productivity, versatility, ease of use, greater comfort and low maintenance requirements," explains Peter Wilkins, HPE Africa's Sales Manager. "With the launch of the Hyundai HB640 backhoe loader, we have strengthened our role in supplying the local market with durable, high-efficiency earthmoving equipment, designed to meet the rigorous demands of challenging working conditions in Africa."

"The Hyundai HB640 backhoe loader combines durable mechanical systems with advanced operator support features to meet demanding site requirements in urban, mining, construction and rural environments."

"What's important for our customers is they are able to rely on dependable support from the HPE team throughout southern Africa, to ensure optimum performance from every machine. Our skilled specialists offer a technical advisory, repair and maintenance service to minimise downtime and extend the service life of equipment."

The HB640 is equipped with a Perkins 1104D-44TA Tier III engine that delivers 64.5 kW of net power at 2,200 rpm and features a maximum operating weight of 8,500 kg. The loader and backhoe buckets offer capacities of 1.26 m³ and 0.22 m³ respectively, which places the machine in the upper range of its class.

A major feature of the HB640 is its hydraulic and transmission design, incorporating a power shift transmission system with automatic and manual control. Four-wheel drive is standard, enhancing traction across arduous terrain, while the optional four-wheel steering configuration allows greater manoeuvrability in confined working spaces.

Hydraulic efficiency is delivered through an open-centre system with a gear pump supplying 145 L/min at 2,200 rpm and a main relief pressure rated at 230 bar.

The HB640 is engineered for stability and breakout power. A loader breakout force of 8,793 kgf and a bucket tear-out force of 6,320 kgf are enhanced by a dipper tear-out force of 3,580

kgf. At full reach, the lifting capacity to the loader arm hook pin is 3,600 kgf, to safely and efficiently handle a wide range of lifting applications. Ground clearance of 360 mm ensures compatibility with uneven terrain and improved site navigation.

Maintenance is simplified with a tilt-up engine hood allowing clear ground-level access to all service points. Key maintenance features include a visible hydraulic oil sight gauge and an integrated safety bar on the bucket cylinder for safe inspection and servicing. Cooling and filtration systems are positioned for effortless cleaning, reducing maintenance time and extending component life.

Cabin ergonomics are central to the HB640's design. The air-suspension seat, multi-adjustable steering column and backhoe control tower are configured for operator adaptability and long-duration comfort. Wide-span glass surfaces, front and rear wipers and a sloped engine bonnet enhance visibility. Optional climate control contributes to operational productivity in high-heat or cold-start environments.

Design features for efficiency, comfort and safety include the Adjustable Flow Control System (AFCS) which optimises travel power during road movement, while the Smooth Ride Control (SRC) function helps maintain material retention during loader travel, by reducing bounce and lift-arm oscillation. Oil-immersed, self-adjusting wet disc brakes act independently through dual pedals, offering precise stopping power and reduced component wear.

The HB640's modular design supports a wide range of attachments, including trench buckets, 6-in-1 loader buckets, hydraulic breakers and telescopic dipper sticks, for greater versatility in many industries. Optional features, like pilot or mechanical joystick controls, quick hitch systems and roll-over forks, are also available to match specific customer requirements.

Soosan hydraulic breakers and quick couplers - complimentary attachments to Hyundai construction equipment - are available locally from HPE Africa.





The lube kitchen part 6: *dispersant additives – the crowd-controller in engine oil*



By Steven Lumley, technical manager, WearCheck

As part of the ongoing discussion around different oil additives with condition monitoring specialist company, WearCheck, this time, the focus is on how dispersant additives function and why they make great crowd-control-ers at social events.

What are they?	Polymeric alkylthiophosphonates and alkylsuccinimides, organic complexes containing nitrogen compounds.
What do they do?	Keep insoluble soot dispersed in the oil.
How do they do it?	Insolubles are bonded by polar attraction to dispersant molecules, which prevents them from agglomerating.



Whenever I think of dispersant additives, an image of a night-club bouncer comes to mind. I know this might seem like a stretch of the imagination, but humour me. Among their many duties, night-club bouncers are also responsible for crowd control in their place of entertainment. Crowd control involves defusing potentially volatile situations by dispersing (keeping

apart) club-going patrons who might otherwise want to "agglomerate" into a brawl.

Similarly, the function of a dispersant additive is to disperse undesirable elements like soot particles, that might otherwise want to agglomerate into larger particles.

In this respect, dispersant additives and night-club bouncers display a high degree of commonality – they discourage agglomeration through the process of dispersion.

Unlike night-club bouncers, however, our dispersant additive utilises some pretty nifty chemistry – so let's take a look at how this additive controls crowds of soot particles in oil.

Dispersants are non-metallic, ashless cleaning agents that inhibit sludge-formation by keeping insoluble contaminants, like soot, dispersed in the oil and preventing them from coating metal surfaces. They are also mainly found in engine oils.

So, why all the fuss about soot particles agglomerating? Well, soot particles are sub-micron in size when formed, but with progressive fuel usage, large quantities of these particles are continually deposited in the oil, and will eventually agglomerate into larger particles which can cause all manner of evils.

Increasing concentration of soot contamination can cause sludge formation,

higher operating temperatures, loss of anti-wear performance and increased viscosity. Added to this, the additional soot-loading increases the strain on the dispersant's ability to function optimally.

With many engine manufacturers looking to extend oil-drain intervals, controlling soot agglomeration has become even more of an arduous task

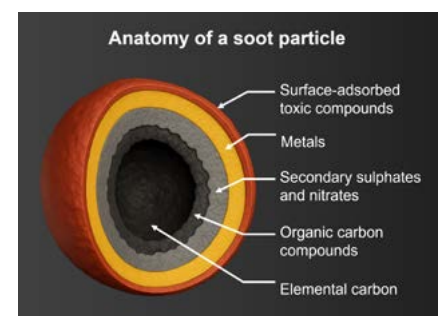
for this additive, as longer oil-drain intervals mean more soot-loading of the oil. If soot is not adequately dispersed by the engine oil, it can cause sludge to form on rocker and front engine covers, bearings to fail, valve bridges and fuel-injection links to wear, and filters to plug.

The durability of the oil and additive system in relation to the ability to disperse soot and maintain a regime of reduced wear, has led to significant changes in additive formulation in recent years and, as such, lubricant blenders have had to increase the treat rate of this additive. These days, dispersants are typically one of the major components of fully formulated engine oils, making up between 30 and 60 percent of the total additive package.

Now for the nifty chemistry part of how this additive works its magic – dispersant additives work by enveloping the soot particle in a single layer. The polar head of the dispersant molecule clings to the particle, directing the additive's "oleophilic" tail outward to dissolve into the oil. This causes the soot particles to be suspended in the oil, prohibiting them from agglomerating with other soot particles or depositing onto component surfaces.

In the next instalment of the lube series, we introduce you to a whole new class of fascinating lubricant additives – bulk property chemical additives, starting with detergents.

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- ABB also provides long-term service and support of the complete mine hoist system worldwide
- Each drum of a compact stage winder has its own dedicated motor driven by a ACS880 regenerative drive

From friction to single and double drum hoists, ABB is a complete supplier of various types of mine hoist systems. It also interfaces to shaft equipment for productive hoisting processes. A typical mine hoist delivery includes mechanical equipment, brake sys-

tems, electrical and control systems and shaft interface equipment.

As ABB designs both the mechanical and electrical equipment for a mine hoist in-house, the levels of productivity and safety are optimised for the entire system. Its advanced engineering is supported by a quality management system that covers all aspects from design to commissioning.

ABB can also provide long-term service and support of the complete mine hoist system. With a global and local presence, there is always a skilled ABB service engineer close at hand to ensure productivity is maximised. With more than a century of experience and a long list of over 700 active in-

stallations worldwide, a complete mine hoist system from ABB is not only a choice of proven, integrated technology, but also a choice of availability, reliability and safety.

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

"If we engage with mine design teams early on, the kibble winder can be sized for the permanent duty require-

ments, saving the project both time and cost. We can also participate in mine electrification and major switchgear installation. This is managed by another expert team within ABB, with the hoisting team handling the hoists and our electrification specialists managing the switchgear and related systems,” says Davis.

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

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

ABB mine hoist solutions provide a low lifecycle cost, high reliability and system availability, short project execution time and a single source of supply for the complete system, including service and spare parts. Its world-renowned engineering resources are also available for feasibility studies and conceptual solutions to advance a mine’s hoist system by tapping into a vast network of global hoist experts.

ABB is a global technology leader in electrification and automation, enabling a more sustainable and resource-efficient future. By connecting its engineering and digitalization expertise, ABB helps industries run at high performance, while becoming more efficient, productive and sustainable so they outperform. At ABB, we call this ‘Engineered to Outrun’. The company has over 140 years of history and more than 105,000 employees worldwide. ABB’s shares are listed on the SIX Swiss Exchange (ABBN) and Nasdaq Stockholm (ABB). www.abb.com

ABB’s Process Automation business

automates, electrifies and digitalizes industrial operations that address a wide range of essential needs – from supplying energy, water and materials, to producing goods and transporting them to market. With its ~20,000 employees, leading technology and service expertise, ABB Process Automation helps process, hybrid and maritime industries outrun – leaner and cleaner. go.abb/processautomation



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Graphalloy® bearings and bushings from ISO-Reliability Partners

A range of graphite-metal/alloy bushings and bearings is available from ISO-Reliability Partners. Graphalloy® is an ideal solution for any bearing or bushing application where lubricants fail due to the surrounding environment, says Craig FitzGerald. Known as Graphalloy®, the material is a graphite-metal/alloy that is solid, uniform, self-lubricating, non-galling, and can operate in temperature extremes from -260°C to 535°C, with a low friction coefficient.

"The material is basically graphite in solid form, with the pores filled with metal," explains FitzGerald. Graphalloy® is the registered name for graphite-metal/alloy materials manufactured by the Graphite Metallizing Corporation under ISO 9001:2015 Certification. Such bearings do not require oil or grease lubrication and instead depend on the combination of graphite and metal for lubrication and durability.

It means these bearings are extremely long-lasting. Whereas oil and grease-lubricated bearings can seize, and thermo-plastics fail, Graphalloy® provides lifetime cost-savings and significant operating advantages over

conventional bearing materials. Such bearings have operated for up to 20 years in some applications without any maintenance requirements.

The alloy is available in over 100 grades with specific properties to meet a diverse range of engineering solutions and specifications. FDA-accepted grades are available for food-contact equipment, while NSF® International and WRAS certified water grade for municipal well and water treatment applications.

Standard designs are available as pillow blocks, cam followers, and bushings, which can be customised to OEM requirements or retrofit applications. Graphalloy® bushings are ideal for remote locations and applications where lubrication is difficult or impossible to apply, such as cam rollers, vertical shaft guide bushings, or dampers. "There is no production loss due to bushing failure, product spoilage, or replacement or maintenance costs," highlights FitzGerald.

Graphalloy® is particularly advantageous in extreme conditions where traditional bearing materials fail. Its ability to withstand harsh environments makes it suitable for high-tem-

perature furnaces, ovens, and submerged pump applications where conditions such as high humidity, caustic substances, or abrasive materials are present. It can also be used in cryogenic applications, demonstrating its versatility across a broad temperature spectrum. In addition, its non-galling nature ensures smooth operation even in instances of marginal misalignment or shaft deflection.

Another significant benefit of Graphalloy® is its resistance to chemical corrosion, making it ideal for use in the chemical, wastewater, and process industries. Applications where traditional lubricants would wash-out, degrade or contaminate the environment benefit greatly from Graphalloy®'s solid, self-lubricating properties.

ISO-Reliability Partners is an own emblem manufacturer (OEM) of class-leading micro fine oil filtration solutions, vacuum dehydration systems, automated water removal for compressed air, and high-efficiency industrial air scrubbing. "Our high production standards ensure customer satisfaction and unrivalled protection of their critical production equipment," concludes FitzGerald.

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Babcock takes the wraps off new-generation Volvo machines

Amid great anticipation from customers across southern Africa, Babcock is introducing the new generation Volvo articulated haulers and excavators. The new range has been updated with some of the most exciting features, meeting customer needs in areas of productivity, operator comfort, safety and efficiency, resulting in lower total cost of ownership.

Following their global introduction in January this year, the new generation articulated dump trucks (ADTs) and their excavator counterparts from Volvo Construction Equipment (Volvo CE) have generated a buzz across the global earthmoving equipment market. Customers in southern Africa can finally get their hands onto these new machines, with Babcock set to officially take the wraps off at a grand launch event at the end of June.

"This launch marks a significant milestone in our long-standing partnership with Volvo CE, and in our commitment to helping reshape construction and mining operations across Southern Africa. These new-generation machines are more than just equipment – they are smart, efficient, and aligned to our customers' need for sustainable productivity. We are proud to bring them to market," says Roger O'Callaghan, CEO Africa at Babcock International Group.

The updated ADT models mark a significant technological leap forward thanks to innovations such as the new electronic system and an in-house developed transmission, delivering fuel efficiency improvements of up to 15% depending on model and application.

"We are excited about the arrival of the new-generation, most technologically advanced Volvo articulated haulers to date, which we believe will reinforce our leading position in this market segment. While the range comprises seven models, we are initially bringing to market the updated A40, A45 and the all-new A50. The A30 and A60 will be introduced at a later stage," says David Vaughan, MD of Babcock's Equipment business.

With its ability to identify and remember any slippery road segments, the Volvo drivetrain with Terrain Memory ensures superb fuel efficiency without compromising on power. Automatic drive combinations, with 100% differential locks and all-terrain bogie and hydro-mechanical steering, also combine to provide unmatched traction, stability and precision control.

In addition, Volvo Dynamic Drive – with its predictive gear selection – adapts to operating conditions. The downhill speed control function and industry-leading braking systems further enhance efficiency, safety and comfort.

With simplified servicing, longer change intervals and easy component access, servicing is now quicker and easier than ever before, maximising uptime and reducing costs. Industry-leading greasing intervals of 250 hours also eliminate the need for daily or weekly greasing, boosting productivity and reducing downtime. In addition, Volvo articulated haulers are said to require less fluid volume compared to the competition, benefiting the environment and reducing operating costs.

While all the new models break new ground with key innovations, Vaughan is particularly excited about the arrival of the all-new A50, which not only broadens the model line-up to cover more applications, but also plugs an important gap between the existing 42-t A45 and the 55-t A60.

The major talking point on the new A50 is the full hydraulic suspension concept. Pioneered by Volvo CE in 2007, the full suspension has proved to be a reliable system for the toughest of driving conditions. Many mining and quarrying companies worldwide have praised the unique technology for the benefits it has brought them in terms of productivity and operator comfort, all while being just as durable and dependable as a traditional suspension.

The new Volvo excavator range comprises the EC210, EC220, EC260, EC300 and EC360. However, Babcock will initially bring in the EC210, EC220 and EC300. The range combines cutting-edge technology, robust design and industry-leading efficiency to benefit various industrial applications.

In the 20-22-t market segment, Babcock is launching the 21-t EC210, which replaces the previous EC200DL, as well as the new EC220, which replaces the old-generation EC210DL. The two models are ideally suited for general construction, plant hire and earthworks applications. The larger 30-t EC300 fits the bill for mid-size construction sites, sand works and small-scale quarrying operations.

Each of the models integrates engine-pump optimisation technology, delivering up to 15% fuel efficiency compared to previous models. The

new range features increased hydraulic flow for responsive, accurate control in digging and loading operations. Operators benefit from smoother, easier movement when digging as well as travelling and lifting simultaneously, due to the harmonised boom and arm movement.

The revamped cab offers improved ergonomics, intuitive controls and advanced human-machine interface (HMI) systems, providing operators with a comfortable, productive working environment, with enhanced visibility, reduced noise levels and efficient HVAC systems.

In recent tests conducted by Volvo CE, the EC210 delivered an up to 7% productivity edge and 14% better fuel efficiency over competitor offerings in a similar weight class – even when operated at lower RPMs. For contractors in Africa, juggling performance expectations with fuel economy and uptime, the EC210's results suggest it is more than capable of punching above its weight – particularly in applications such as road construction, site prep and utilities.

The new EC220 was tested against the EC210, where it delivered 32% greater productivity, while maintaining similar fuel efficiency at a similar RPM. This highlighted its value in high-volume operations such as materials handling and bulk excavation. The EC220 therefore makes a strong all-rounder, marrying power and precision for work that demands both.

All models are compatible with Volvo Dig Assist, an optional intelligent machine control system that improves excavation precision and productivity. Operators can utilise tools such as real-time weighing, automated digging, and smart monitoring, which enhance efficiency, with Volvo Smart View producing 360° machine visibility. Additional features such as preset depth, height, and swing limits further enhance on-site safety.

"Southern Africa is a key market for Volvo CE, and Babcock is an essential partner in delivering on our customer promise here. The feedback from early global adopters of these models has been exceptional – especially around operator comfort and fuel efficiency. We are confident these innovations will resonate with customers across the region," says Joakim Arndorw Head of Sales Region International at Volvo CE.

The selected models making their debut are immediately available at all Babcock branches across southern Africa. Equally, all the relevant parts have been stocked throughout all Babcock equipment outlets in the region well ahead of the launch.

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Babcock takes the wraps off new-generation Volvo machines



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The efficient SmartROC D65 consistently delivers high-quality blast holes with accuracy and precision. It is loaded with smart features such as automated drilling and rod handling. The extra-long feed option with 8 meters pipes makes it possible to drill 16m production holes with just one rod-adding. It's also possible to drill 229 mm holes (9 inches) thanks to the power of the COP M7 hammer. All these features and flexibility are packed in a rig which is economical to run due to the intelligent control of the compressor and engine rpm.

The SmartROC D65 also uses 300 liters less hydraulic oil than previous versions and features fewer hoses and pumps. This helps to further reduce costs and makes servicing easier, whilst increasing sustainability and reducing the environmental impact of the rig. The SmartROC D65 is controlled via an advanced rig control system displayed on a touch screen inside the comfortable, air-conditioned FOPS and ROPS-certified cabin. It presents everything from drilling parameters to real-time Measure While Drilling data (MWD). A SmartROC rig from Epiroc can significantly raise quality across the whole operation.

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Innomotics Powers Largest Heat Pump System in the Netherlands

- Innomotics, ENECO and Johnson Controls successfully complete collaboration project
- Innomotics' motors and drives help deliver 25-27 MW of sustainable heat from treated wastewater
- 30,000 tons of CO2 emissions reduced annually, heating 20,000 households

Utrecht, February 03, 2025 – Innomotics, a globally leading provider of electric motors and large drive systems, has played a pivotal role in the realization of the largest heat pump system in the Netherlands. It is located at the municipal wastewater treatment plant in Utrecht. The system harnesses residual heat from 65 million liters of treated wastewater daily, generating 25-27 MW of heat. This translates to 15% of the district heating demand in Utrecht and Nieuwegein or approx. 20,000 households in total. Thanks to Innomotics' state-of-the-art motors and frequency drives, the project achieves unparalleled energy efficiency while saving 30,000 tons of CO2 annually.

Innomotics supplied:

- 8 Perfect Harmony GH180 frequency drives
- 8 A-Compact Plus units, with one spare, providing optimal operational flexibility

The system consists of four heat exchangers, each with two compressors driven by an Innomotics 1MW motor, which in turn are each controlled by an Innomotics GH180 frequency drive. These components are integral to extracting residual heat from 65 million litres of treated wastewater daily. The system uses ammonia—a natural, environmentally friendly refrigerant—to supply heat to the Utrecht district heating network. Additionally, 1 MW of extra heat is recovered from the motors and drives, contributing to the district heating network's efficiency.

"This project exemplifies how advanced motor and drive solutions can transform energy challenges into sustainable opportunities," said André Hillebrink, Technical Sales Support Professional at Innomotics. "We are proud to contribute to a system that not only brings us closer to achieving renewable energy goals but also directly benefits local communities."

Collaboration project with showcase character

The project is the result of a seamless collaboration between ENECO, Johnson Controls, and Innomotics. ENECO spearheaded the development of the facility, Johnson Controls provided the advanced heat pump systems, and Innomotics delivered the cutting-edge motor and drive technologies that ensure its exceptional performance. Combined, the companies have created a replicable model for modern urban renewable energy systems.

"This project exemplifies ENECO's commitment to innovation and sustainability. Innomotics' innovative motors and drives were essential to the success of this project," said Sander Tensen, Manager Engineering at ENECO. "Innomotics' cutting-edge technology and reliability ensured that we could achieve both high energy efficiency and substantial CO2 savings, making a real difference for our district heating network and the environment," adds Sander Tensen.

A game-changer for industrial efficiency.



Specialists in the design and manufacture of specialised screen, transmission and materials handling products - Oscillating Systems Technology Africa (OST-Africa) – offers the market robust self-tensioning motor bases, developed to enhance the efficiencies of power transmission systems.

"The OST-Africa team works closely with our customers looking for smarter ways to increase productivity, while lowering operational costs. As part of our commitment to deliver more efficient industrial solutions, the company has made a substantial investment in the advancement of our self-tensioning motor bases, which were launched over 30 years," explains Chantelle Scheepers, Marketing Manager, OST-Africa, part of Invicta Holdings Limited. "OST self-tensioning motor bases enable quick and accurate change out and tensioning of V-belts, to ensure optimum machine performance and permanent alignment. Other advantages include reduced maintenance, replacement and labour costs, minimal downtime and extended service life of the system.

"OST self-tensioning motors successfully address three critical areas in

power transmission - efficiency, which is key to operational performance, vibration prevention to protect equipment and to extend V-belt lifespan."

According to specialists, it is critical in all power transmissions systems to focus on high efficiency by minimising power and speed loss. In conventional systems, V-belt slippage is a common and costly issue that leads to significant losses – sometimes in excess of 10% - in power (kW) and speed (rpm). This not only wastes energy but also impacts production speed and output.

OST motor bases have been designed to mitigate power and speed losses by automatically maintaining optimal belt tension, ensuring the motor operates at its intended output levels. This results in fewer interruptions, reduced downtime and more reliable power transmission.

Excessive vibration is another consequence of V-belt slippage, leading to premature wear of components, where bearings are damaged, shafts over-heat and with continued use, entire assemblies require replacement – all contributing to costly downtime and repairs.

OST motor bases are equipped with a Neidhart unit, which effectively absorbs and neutralises vibration. The rubber inside the Neidhart unit has the capacity to be pre-tensioned, retaining torsional force and releasing it when necessary. This results in smoother operation and significantly lower maintenance demands.

OST motor bases maintain the V-belt at its optimal tension, as specified by the V-belt manufacturer, to ensure durability and extend the belt's service life. With "set-it-and-forget-it" alignment, this solution minimises the need for constant monitoring and manual adjustments. In conventional systems, V-belt maintenance is traditionally time-consuming and misalignment, corrosion and tension inconsistencies reduce belt lifespan.

OST self-tensioning motor bases are designed for use in many applications, including pumps, crushers, mills, fans, feeders, belt conveyors and other V-belt driven systems.

The team offers a technical advisory, support and repair service throughout southern Africa.



Innomotics wins twice at the German Brand Award 2025



Innomotics, a globally leading provider of electric motors and large drive systems, has received two awards at this year's German Brand Award in Berlin. The brand strategy "Redefining reliable motion for a better tomorrow" won in the categories "Excellent Brands – Corporate Brand of the Year" and "Excellent Brands – Industry, Machines & Engineering".

The international jury of the German Design Council praised Innomotics' consistent brand management and the company's strong visual profile: „Innomotics has succeeded in creating a brand that impressively embodies its expertise in drive technology. With a clear strategic focus and a consistent emphasis on sustainability and digitalization, it has developed a corporate identity that is both authentic and impactful. The combination of

traditional engineering craftsmanship and modern technology is reflected in every detail. This brand captivates with its charismatic presence and sends a strong signal for the future of industry".

Michael Reichle, CEO of Innomotics: "We are very excited about this double award. It sends a strong message to both our customers and our teams worldwide. Our brand promise is not only lived, but also recognized. The jury of the German Design Council confirms that with Innomotics, we have created a brand that stands for reliability, future orientation, and innovative strength. This makes us proud and motivates us to continue pushing forward".

Julia Ebenberger, Executive Vice President Marketing & Communications: "We are honored to add these awards

to a series of renowned international prizes we have received for our brand work since the founding of Innomotics. These awards demonstrate that our bold approach to creating a brand with strong recognition value has proven successful – and that with our strategy and design, we are striking the right chord".

The German Brand Award is one of the most widely recognized marketing awards in the Germanspeaking region. Organized by the German Design Council – an internationally active foundation promoting design and brand competence, founded in 1953 on the initiative of the German Bundestag – outstanding brands are annually honored by an independent expert panel based on criteria such as brand quality, brand management, design, and impact.



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Research Project on Production Technology Transformation Enters Second Phase



The research project EA 2.0 aims to further develop the electric drive to create sustainable and highperformance solutions for industry and the environment through more efficient manufacturing, reduced material and energy consumption as well as increased power density. (Picture: Innomotics)

Innomotics, a globally leading provider of electric motors and large drive systems, is coordinating the consortium for the research project “EA 2.0 – Integrated Product and Process Innovation for Electric Drives”. The project is hosted under the umbrella of the Werner-von-Siemens Centre for Industry and Science e.V.

The research initiative aims to develop disruptive approaches and explore the potential of digitalization in the manufacturing of electric machines. The focus lies on increasing power density and enhancing sustainability. The results are intended to make production processes more efficient and to further reduce material and energy consumption without

compromising performance.

In the first project phase, it was demonstrated that permanent magnets can be produced by extruding neodymium-iron-boron metal powder, which could be used in electric drives. This potential will now be further explored. The goal is to create magnets that enable entirely new possibilities in the design of customized, energyefficient, and high-dynamic electric motors.

Robert Schwengber-Walter, consortium spokesperson and project manager for digitalization and process management at Innomotics, stated: “As an industrial company, we serve as the connecting element between the partners involved along

the value chain. We are convinced that successful research will enable the integrated application of novel magnets and digital data structures in the shared product of the electric drive. This will create a solid foundation for long-term collaboration with our partners and unlock new potential for further optimization of our portfolio.”

Other project partners include the Fraunhofer Society, the Technical University of Berlin, Datalyze Solutions GmbH, INGWERK GmbH, and Siemens AG. The project is funded by the State of Berlin and co-financed by the European Regional Development Fund (ERDF).

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A simple guide to understanding the importance of IP ratings



When selecting electrical products for industrial, commercial, or even domestic use, it is crucial to consider how well they can withstand environmental factors like dust and water. This is where IP (Ingress Protection) ratings come into play. "However, despite their importance, many users of electrical equipment are unfamiliar with what IP ratings truly mean," points out Pratley Technical Projects Manager Tristan Blades.

An IP (Ingress Protection) rating is a globally recognised standard that indicates the level of protection that an electrical enclosure provides against the intrusion of solid objects and liquids. It is denoted by two

digits. For example, in IP68, the first digit (ranging from 0 to 6) represents the level of protection against solid particles like dust, while the second digit (ranging from 0 to 9) signifies the protection against water. A higher number indicates a higher degree of protection.

Understanding IP ratings is essential to ensure the longevity and safety of electrical equipment, particularly in demanding industrial environments. "An appropriate IP rating ensures that the product can safely operate in specific environmental conditions without risk of damage or failure due to dust or water ingress," explains Blades.

This is especially important in sectors

such as mining, construction, and manufacturing, where components are regularly exposed to harsh elements. Without the appropriate IP rating, electrical enclosures and fittings can fail, leading to safety hazards, system malfunctions, and costly downtime. An IP rating gives both professionals and DIY users peace of mind, knowing the product is built to last and function reliably in the conditions it was designed for.

Pratley's approach to ingress protection goes beyond industry norms. All IP-rated Pratley products such as cable glands and junction boxes are subjected to rigorous third-party testing, in addition to being tested continuously at the company's advanced in-house laboratory. "This ensures that they do not just meet the required standards but exceed them," highlights Tristan.

Pratley's junction boxes and cable glands, including those designed for hazardous areas, are often certified with a dual IP66/68 rating. This means it is completely dust-tight (IP6X), resists powerful water jets (IPX6), and can also withstand continuous submersion in water up to 2 m deep (IPX8).

Tristan notes that Pratley's IP-rated junction boxes and cable glands are specifically engineered for use in extreme environments. Its compression glands for unarmoured cable, along with its Ex e and Ex d glands for armoured and unarmoured cable, deliver dependable performance where failure is not an option.

In addition to high-performance design, Pratley also considers the longevity of its products. Rubber sealing components can degrade over time, potentially compromising their effectiveness. To address this, Pratley specially formulates its rubbers in-house



to ensure maximum longevity.

Replacement gaskets for all junction boxes and cable glands are also available, enabling customers to maintain the integrity of the seal without replacing the entire unit. This not only extends the product's lifespan but also provides a cost-effective solution for long-term reliability.

Choosing the correct IP-rated product is vital for safety and operational continuity, especially in environments where exposure to dust and moisture is unavoidable. "Our range of IP-rated electrical termination products offers the level of protection needed to meet the demands of industrial and hazardous area installations. In addition, our commitment to quality and innovation places Pratley products in a class of

their own," says Blades.

"When it comes to electrical installations, selecting products with the appropriate IP rating is not just a technical decision, it is a safety imperative. Our friendly team of technical sales specialists is always on standby for any customer advice or technical queries," concludes Blades.



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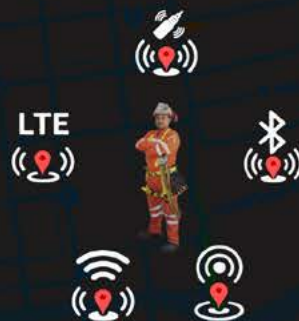
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Becker Mining South Africa Unveils Advanced Missing Person Locator System to Boost Mine Safety

Becker Mining South Africa has enhanced its state-of-the-art Missing Person Locator system, a powerful module integrated into the company's comprehensive SmartFlow™ digital mine visualisation and management platform, designed to enhance emergency preparedness and personnel safety in mining operations worldwide.

The Missing Person Locator module represents a major leap forward in real-time tracking technology, enabling rapid location and response to underground emergencies. With capabilities extending from surface to underground environments, the system empowers mining operations with precision tracking, historical traceability, and automated evacuation protocols.

Our priority is safety, and this technology provides both peace of mind and actionable intelligence during critical situations. By combining cutting-edge wireless technologies with a user-friendly interface, we ensure that every second counts when it matters most.

Key Features and Technologies

- Real-Time Tracking & Location:

Tracks personnel and mobile equipment with support for man-down detection and full evacuation management.

- Multi-Network Integration: Compatible with VHF, UHF, Wi-Fi, LTE, and other wireless systems, ensuring continuous coverage across vast and complex mining environments.
- 3D Viewer Interface: Provides intuitive, real-time visualizations of personnel location and movement through advanced graphics motion technology.
- Surface Mapping: Uses GPS and integrates with Google Maps and satellite imagery for seamless surface tracking, including mine-specific overlays.
- Access Control Integration: Syncs with HR systems to manage and monitor workforce movement securely.
- Historical Traceability: Maintains logs and supports custom reporting for incident investigation and safety audits.

One of the standout aspects of the solution is its integration with Becker's Leaky Feeder Technology, allowing LTE, Bluetooth, RF Tagging, and remote diagnostics to operate seam-

lessly in underground workings. This backbone, combined with Wi-Fi and GPS for surface operations, makes it one of the most comprehensive tracking systems available today.

Seamless System Integration

A component of the overall SmartFlow™ suite, the Missing Person Locator module interconnects with other operational systems such as environmental monitoring, power reticulation, conveyor systems, and telemetry with industry standard open communication protocols. This ensures a holistic view of mining operations whilst prioritizing safety and sustainability.

Becker Mining Systems has deployed this innovation globally across operations in South Africa, Chile, Australia, and North America, setting a new standard for underground safety technology.

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RS SOUTH AFRICA POWERS INNOVATION AT MTE HOTAZEL, KATHU AND STEELPOORT



RS South Africa, a trading brand of RS Group plc (LSE: RS1) and a leading provider of industrial product and service solutions, will showcase its cutting-edge technologies and engineering expertise at the upcoming Mining and Technical Exhibitions (MTE) in Hotazel on 8 July, Kathu on 10 July both in Northern Cape, and Steelpoort on 31 July in Limpopo.

Hotazel, Kathu, and Steelpoort are vital nodes in South Africa's mining landscape. Hotazel, located in the John Taolo Gaetsewe District of the

Northern Cape, is home to 80% of the world's known manganese ore bodies and has been a mining hub since the 1950s, when manganese was discovered during underground water testing. Kathu, also in the Northern Cape, lies between Upington and Vryburg and is known as the iron ore capital of the region, hosting major operations such as Sishen, Khumani, and Sedibeng.

Steelpoort, in Limpopo's Sekhukhune District, sits near the Mpumalanga border and is surrounded by numerous chrome and platinum mining oper-

ations, including Samancor Chrome's extensive network of mines, beneficiation plants, and tailings re-treatment facilities. Together, these towns form the backbone of South Africa's mineral wealth, each playing a strategic role in the global supply chain for critical resources.

At each MTE stop, RS South Africa will demonstrate its commitment to powering productivity, safety, and innovation in demanding environments by providing hands-on access to the latest industrial technologies and expert-driven insights tailored

to the challenges of the local mining and engineering sectors. RS understands that each mining site has its own unique set of conditions whether it's the extreme heat and dust of the Northern Cape or the vibration-intense environments of chrome processing facilities in Limpopo.

RS South Africa's participation in the MTEs is not just about showcasing hardware; it's about sharing smart, connected, and efficient solutions that support long-term operational goals, such as predictive maintenance, energy efficiency, workforce safety, and automation readiness.

Through live product demos and technical discussions, RS team will help visitors explore how to leverage integrated technologies to reduce downtime, extend equipment life, and meet growing sustainability requirements. This hands-on, solutions-oriented approach reaffirms RS's role as a trusted partner in mining innovation, helping companies transition into more resilient, data-driven, and digitally connected operations.

"Our role goes beyond supplying components we are here to support our customers with the knowledge, tools, and technologies they need to build smarter, safer, and more efficient operations," says Erick Wessels, Sales Director at RS South Africa. "Whether it's enabling predictive maintenance or streamlining procurement through digital solutions, RS is committed to

being a true partner in driving sustainable mining innovation."

RS South Africa's exhibit will feature a wide array of critical solutions, including:

- Test and Measurement Equipment (Fluke, Megger)
- Automation and Control Gear
- Electrical Connectors, Cables, and Wiring Solutions
- Pneumatics, Hydraulics, and Power Transmission Products
- Industrial Hand Tools (DeWalt, Wera)
- Personal Protective Equipment (3M, Ansell)
- Machine Safety and Electrification Technologies (Siemens, Schneider Electric, Eaton)

Visitors can also explore RS South Africa's own brand, RS PRO, comprising over 90,000 value-driven products across multiple industrial technologies.

With a digital catalogue of more than 800,000 products from 2,500 global

suppliers, RS offers easy online ordering and fast delivery across South Africa, helping mining and industrial customers minimise downtime and optimise operations. Learn more on: rsonline.co.za.

For more information on upcoming MTE shows, visit mteexpos.co.za.



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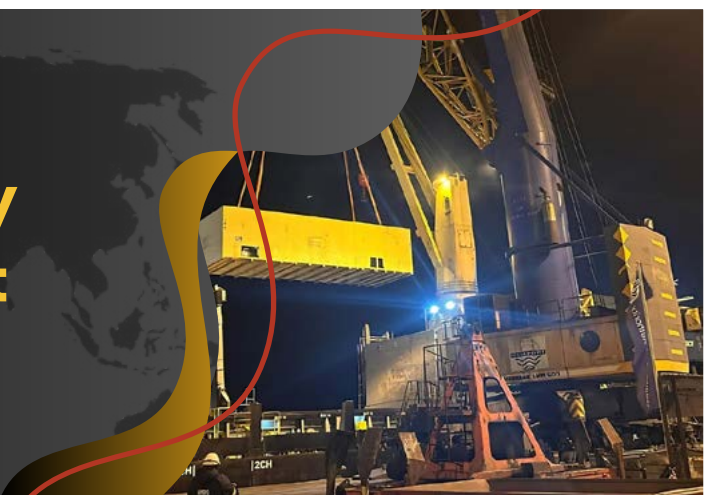
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Shumani appoints new National Operations Manager

Shumani Industrial Equipment is pleased to announce the appointment of Marius Booyens as National Operations Manager, effective 1 June 2025. Marius brings with him nearly two decades of experience in the material handling, logistics, and crane industries, both mobile and overhead.

His impressive career includes 14 years at Toyota Material Handling, where he held multiple senior positions and concluded his tenure as General Manager for the Gauteng Region. Most recently, Marius served as Managing Director at Dosco Precision Hydraulics, a division of Hudaco Trading.

Throughout his career, Marius has been instrumental in driving operational efficiency, increasing profitability, and cultivating cohesive, high-per-

formance teams. He is well known for implementing systems and processes that deliver measurable results and long-term value, with a strong focus on strategic leadership and customer-centric service delivery.

Commenting on his appointment, Marius said: "I am excited to join a powerhouse like Shumani and look forward to taking the company to the next level of operational excellence and customer service. With our exceptional team, national footprint, and extensive fleet capabilities, I am confident we will continue to set new benchmarks in the industry."

Shumani, a key player in the industrial and construction equipment space for over a decade, boasts the largest rental fleet of port handling equipment in South Africa. The company is the exclusive importer and dealer of its

own Bheka Forklift and warehouse equipment brand and is known for its price competitiveness, reliability, and commitment to service excellence.

As part of the Bud Group, Shumani has access to extensive technical expertise and financial backing, allowing it to supply complex equipment and support large-scale projects. With over 100 technicians, many based on-site with clients, and a 24/7/365 support model, Shumani achieves up to 98% uptime on customer fleets.

Marius's appointment signals Shumani's continued commitment to operational leadership and delivering world-class service to its growing customer base across South Africa. "We welcome Marius to the team and look forward to the value he will bring to Shumani's next chapter of growth," concludes MD Victor Nemukula.





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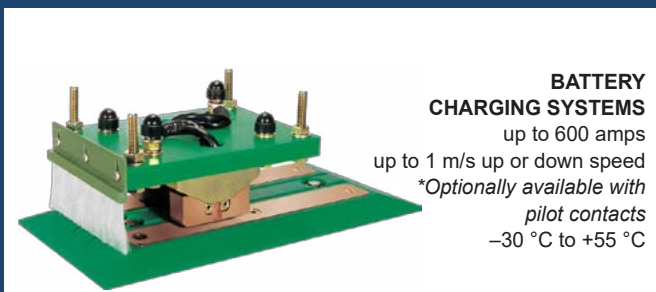
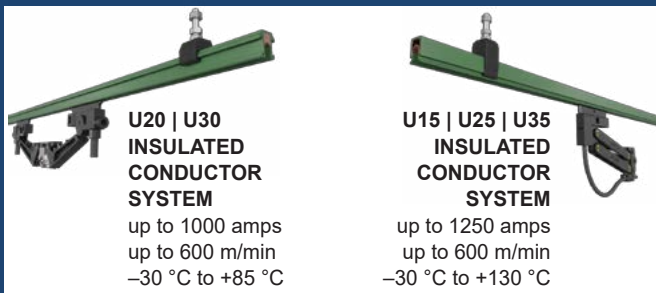
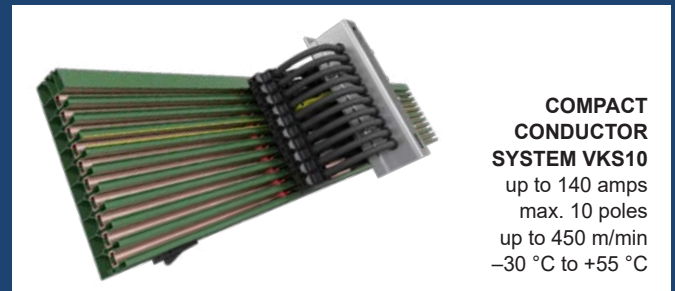
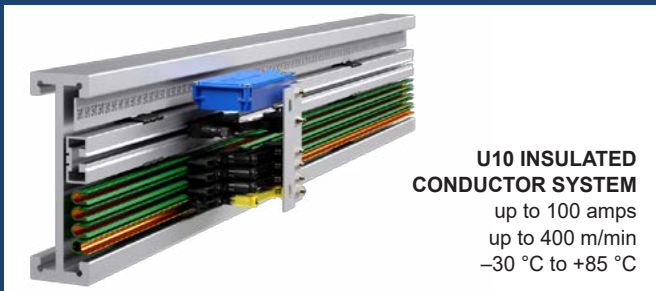
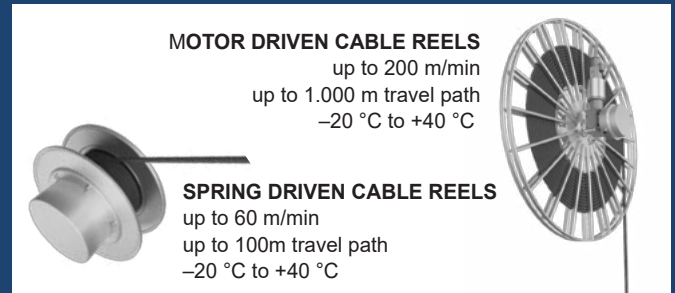
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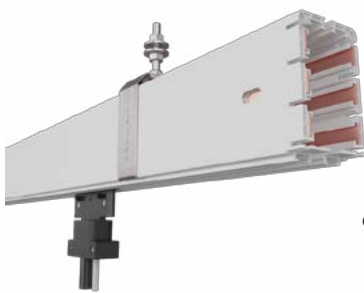
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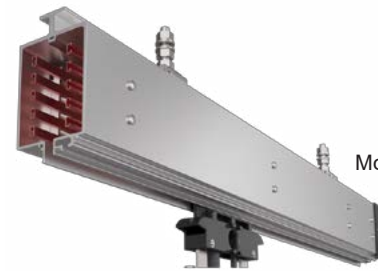


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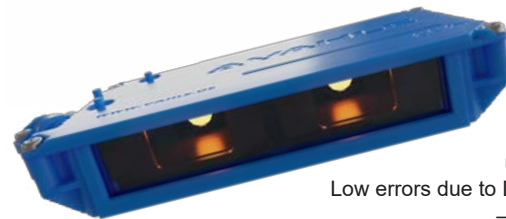
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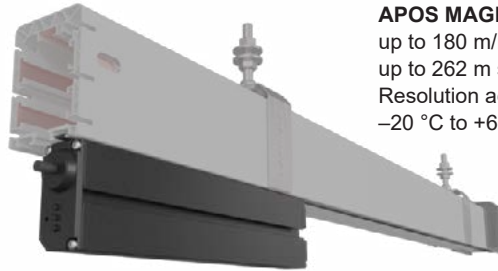
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**WEAR
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**TECHNICAL
BULLETIN**
ISSUE 88



SLIDING THROUGH TIME: Lubrication from stone age to modern age

Part 1 of 3

by Steven Lumley – technical manager, WearCheck

Lubrication from Stone Age to Modern Age



From stone age to modern age, pharaohs to phenols, the history of lubrication is a story that demonstrates how a seemingly simple substance - oil - has propelled human progress, shaped industries, and ushered in a world of smoother operations and optimised performance.

Now, while the field of tribology - which is the science of friction, wear and lubrication - has advanced significantly over the last 100 years, the roots of lubrication extend back further than one might imagine. Lubrication, in its simple form, has been in existence at least since the beginning of documented times.



Early humans recognised the importance of reducing friction, and intuitively understood that applying a lubricant between two surfaces would ease their movement. Before the Common Era, tallow (animal fat) and naturally occurring elements were used for lubrication for chariots and in transporting construction materials. In fact, one of the earliest examples of tribological practices can be found in the ancient Egyptians' use of lubricants to reduce friction in the movement of large stones during the building of the pyramids. Other ancient civilisations like the Greeks and Romans used olive oil and other plant-based oils as lubricants.

Fast forward past the dark ages, (trust me, nothing much happened with lubricant development then) and twelve centuries later, tribology as a scientific discipline begins to take shape during the Renaissance with our favourite Italian polymath - Leonardo da Vinci - whose observations about friction and lubrication laid the foundation for further exploration.

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TECHNICAL BULLETIN

Before the dawn of the industrial revolution, whale oil was commonly used as a lubricant, but with the worldwide decline in whale populations and the widespread use of machines, other sources of lubricants had to be found.

The discovery of crude oil in Pennsylvania in 1859 set the stage for the new oil economy, and led to the development of petroleum-based lubricants, which quickly replaced animal- and vegetable-based lubricants due to their superior performance and availability.

Today, lubricants are highly developed, using complex chemical methods designed to push their potential to the absolute limit. There are specific oils formulated for specific purposes, and our machines - from shipping, to transportation, to industrial factories - work faster and more efficiently than ever before. Our world could not function as it does today without modern lubrication advancements.

But how did we get here? Who first decided that mechanical lubrication was a good idea? And who helped develop these processes over thousands of years to get us to where we are today?

In this trip down memory lane, we will chronicle the significant milestones of lubrication through the ages - but don't be fooled, this isn't your run-of-the-mill timeline of notable inventions and courtly characters. Au contraire, like all good sagas, this tale is filled with intrigue and subterfuge, heroes and villains, great victories and heartbreaking defeats, all played out against the backdrop of human progress. So, join us as we pay tribute to the true significance of these early achievements and the remarkable people through history who pioneered an industry.

ANCIENT HISTORY (AKA A REALLY, REALLY LONG TIME AGO)

3500 BCE (Before Common Era) – 476 BCE

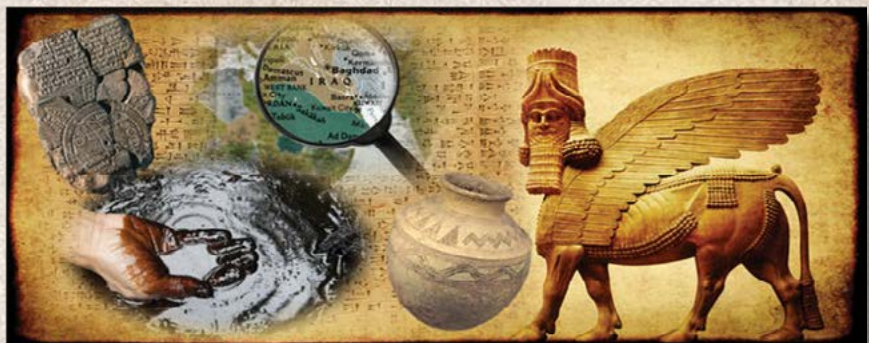
Historical context

Ancient history is the historical time period between the origins of human civilisation and the fall of the Western Roman Empire. Honourable mentions – this epoch includes the birth of civilisation in Mesopotamia, the emergence of written records in cuneiform and hieroglyphs, the rise and fall of fourteen different empires and kingdoms, with guest appearances by the bronze and iron age and one great flood.

3500-ish BCE

The oldest historical evidence of ancient oil use was discovered in archaeological records near the city of Hit in Mesopotamia, modern day Iraq. Hit, which straddles the Euphrates River, is the site of an oil seep known locally as The Fountains of Pitch.

This petroleum-derived pitch (bitumen) had the advantage of being both adhesive and slippery, making it suitable for a variety of applications, and so began our love affair with one of the world's most powerful substances.





TECHNICAL BULLETIN

Our Sumerian friends used the black goo as a caulk agent for waterproofing ships, as a lubricant on wheeled carts and as an adhesive to secure the handles of various tools, and even as a setting agent for jewels and mosaics, which no doubt made it a firm favourite with the arts and crafts crowd.

3000-ish BCE

Some of the most widely known uses of petroleum in ancient history were undertaken by the Egyptians. There are Egyptian hieroglyphs that depict the use of bitumen as an embalming fluid, to grease chariot wheels and in the construction of monumental structures like the pyramids. Egypt's primary source of bitumen was the Dead Sea, which the Romans later named Palus Asphaltites (Asphalt Lake).

2600-ish BCE



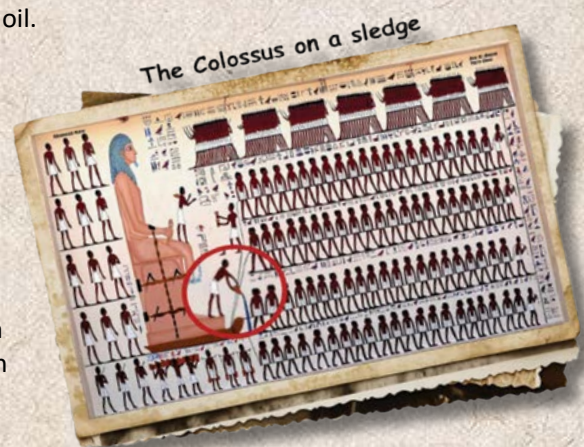
Archaeologists discover a greasy substance on a sled wheel dating back to 2600 BCE that belonged to an Egyptian pharaoh. Analysis later showed that this substance was a mixture of beef and sheep tallow (a rendered form of animal fat made up of triglycerides) mixed with lime powder. This discovery led to the conclusion that our ancient Egyptian friends also used tallow as a lubricant for their sleds to transport materials such as wood and rocks.

1900-ish BCE

Paintings and hieroglyphics found in the tomb of Tehuti-Hetap (a fourth-dynasty nomarch) in Deir El-Bersha in Egypt showed a giant statue of the man himself, being moved with the aid of a liquid that controversially is believed to be either water or oil.

The painting, aptly known as "Colossus on a sledge", depicts many labourers dragging the statue along the ground, with one man standing on a sledge pouring a mystery liquid on the ground, presumably to reduce friction between the two surfaces.

Unfortunately, no traces of this colossus have ever been found, but this has not stopped archeo-tribologists from arguing over whether this depiction was ceremonial in nature or proof of ancient tribological prowess.



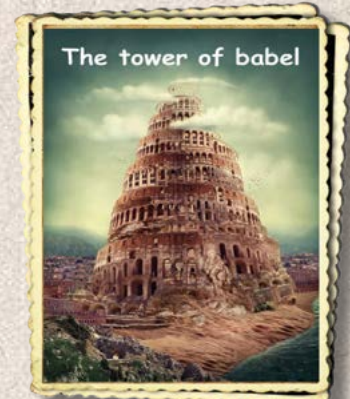


TECHNICAL BULLETIN

1800-ish BCE

Back to Mesopotamia and following hot on the heels of their Akkadian predecessors (the people who conquered the Sumerians), we find the Babylonian civilisation using bitumen to construct roads and bridges. Bitumen was applied to road surfaces to help bind gravel and create smoother, more durable roadways. (Which is not a million miles away from how we make roads today.)

More than a millennium later, the Greek historian Herodotus, often referred to as the father of history, told how bitumen was used as mortar to construct the famous walls of Babylon, and the world's first skyscraper – "Etemenanki", also known as the Tower of Babel.



780-ish BCE

Meanwhile in East Asia, during the reign of the Western Zhou Dynasty, the Chinese discover the friction-reducing properties of a concoction made with vegetable oil and lead, making this momentous event the first historical record of what would later become known as a compound lubricant.

680-ish BCE

The inaugural Olympic Games were held in Olympia, Greece, in 776 BCE, but by 680 BC our Zeus-loving Hellenes had added four-horse chariot racing to the momentous event, and with that, the requirement for high-speed wheel-axle lubrication in the form of animal fat, making this milestone the first historical record of racing lubricants.

200-ish CE (Common Era)



Still in the Mediterranean, but 879 years later and during the Roman Empire heyday - also known as Pax Romana (Roman peace) - we find a multitude of olive oil-based lubricants in everyday use.

Experimentation at the time led to the use of more sophisticated lubricants, including those from olive oil and other vegetable derivatives. The Romans discovered that some of these more viscous liquids not only dissipated heat better than tallow, but also allowed mechanisms to move more freely. Writings by Cato the Elder (famous Roman senator, and historian) recommend that wagon axles should be lubricated with the boiled, viscous by-products of olive oil production.

Greases made from calcium salts and olive oil (basically calcium grease) were used to lubricate axles in horse-drawn chariots used for travel and warfare, and different oils were used in various metalworking processes, to lubricate moving parts in water clocks and to keep door hinges from squeaking in temples.



TECHNICAL BULLETIN

It was even rumoured that Caligula (3rd Roman emperor and all-round whack job) had his engineers make up a concoction of beeswax and olive oil to lubricate the bronze bearings on the rotating platform of his palatial pleasure barge on Lake Nemi.

These early experimentations marked the dawn of machinery lubrication and the world's love of olive oil as a salad dressing.

THE MEDIEVAL PERIOD (AKA THE DARK AGES)

475 CE - 1400 CE:

Historical context

The medieval timeperiod falls between the fall of the Western Roman Empire and the beginning of the Renaissance, and was mainly characterised by economic, intellectual, and cultural stagnation with feudalism, Viking raids and the bubonic plague also thrown in for good measure.

Long story short, people became superstitious, were mostly illiterate, and there was plenty of violence to go around. Honourable mentions for this period include advancements in armour technology, gothic architecture, the Wells Cathedral Clock and guest appearances by Attila the Hun, Charlemagne, King Arthur and Beowulf.



500-ish CE

During the medieval period, lubrication techniques were less advanced compared to later periods, and likewise the availability of specific lubricants and their use varied by region and technological development. During this dark time, tallow was predominantly used as a lubricant in Northern Europe to lubricate items like pivots and bearings. The stuff was often thickened with agents like clay or lime to form grease that was mainly used to lubricate gearing mechanisms in vertical watermills and post mills, for opening the gates of castles and on carriage wheel axles.

600-ish CE

During the late 7th century, warfare took a nasty turn with the invention of a devastating incendiary weapon called Greek fire – this stuff was nothing less than the medieval equivalent of a napalm bomb. This formidable weapon was invented by a Jewish refugee from Syria called Callinicus of Heliopolis during the reign of Byzantine Emperor Constantine IV.





TECHNICAL BULLETIN

Greek fire, or liquid fire as it was also known, was used by the Byzantine Empire during naval warfare and sieges. It was a highly flammable and adhesive substance that could stick to targets and continue to burn – not even water could extinguish it. The stuff would be fired at enemy ships from siphons, or hurled in pots, or sprayed using a basic handheld flamethrower-like device, or even used to create fire arrows.

The recipe for Greek fire was a closely guarded secret that was lost to history, so its exact composition is still a matter of speculation and debate, but many historians believe that it was composed of liquid petroleum, bitumen, and quicklime.

In spite of its name, Greek fire was not a Greek invention. The etymology of the term, just like the recipe for the stuff, is also shrouded in mystery, but historical records dating back to this time period claim that the term was coined by western crusaders 100 years after the stuff had disappeared from historical records.



700-ish CE

While Vikings are often associated with raiding and warfare, they were also skilled traders and boat builders. In fact, Viking warriors were considered the quintessential shipwrights of the 8th century and built longships called Drakkars - a term believed to derive from the Old Norse words “dreki” and “kar,” meaning “dragon” and “ship,” respectively.

These ancient mariners are believed to have used whale oil to lubricate the sails’ hinge supports, rowlocks and the rudder axes. This ‘new’ type of oil was obtained from the blubber of whale stomachs.

With their Drakkars well lubricated, these seafaring Northmen could go about their business of exploring new territories and raiding coastal regions.

THE RENAISSANCE (AKA THE AGE OF REBIRTH)

1400 CE – 1600CE

Historical context

Whatever we lacked in the dark ages we made up for in the Renaissance – this incredible period in human history was a cultural, artistic, and intellectual movement that marked a profound transition from the medieval to the modern world and, just like Ferraris, good espresso and Luciano Pavarotti, this movement traces its origins to Bel Paese - otherwise known as Italy

As civilisation continued to develop in Italy through the 15th and 16th centuries, some of the greatest revolutionary minds developed inventions and mechanical tools.



Honourable mentions of this era include astronomical discoveries, the development of artistic and scientific methods, and the invention of the printing press, microscope and barometer, to name a few.

As for guest appearances, the Renaissance was littered with the world's biggest ensemble of overachievers - Nicolaus Copernicus, Galileo Galilei, Johannes Gutenberg, Christopher Columbus, Dante, Andreas Vesalius, Michelangelo and, of course, Leonardo da Vinci.

1500-ish CE

With animal fats and primitive oily compounds in use throughout the world, the next true evolution in lubrication came from the father of invention, Leonardo da Vinci.

Signore da Vinci introduced the idea that the coefficient of friction is the ratio of its force to the weight or load applied. He made significant observations about friction and lubrication, including the concept of reducing friction by using a layer of lubricant between moving surfaces. To this end, he created a self-oiling lubrication system for wheel axles, using bearings, which he lubricated with animal fat and opium oil.

Da Vinci's mechanical inventions and designs, including those related to lubrication, reflected his deep understanding of engineering principles and his desire to improve various aspects of technology during his time. His creations laid the groundwork for many advancements in mechanical engineering and lubrication techniques that followed in the centuries to come.

'The noblest pleasure is the joy of understanding.' — Leonardo da Vinci



1600-ish CE



As iron and brass replaced wooden machine parts, animal fat fell short of our lubrication requirements. As a result, people in Europe began experimenting with mixtures of vegetable oil, including castor, peanut, rapeseed and canola oil. Whale oil, however, saw continued use throughout this century - not only as a lubricant, but also as a fuel in lamps, and for the manufacturing of candles.

Meanwhile on the other side of the pond in the new world, we find Seneca Indians in North America – upstate New York and Pennsylvania - using crude oil to waterproof baskets and wigwams, as a glue to make arrowheads, but mainly for medicinal purposes to cure a variety of ills.

Seneca Oil, as it became known, was traded by the Seneca tribe to European settlers as a tonic, insect repellent and salve that could treat anything from rheumatism to toothache.



TECHNICAL BULLETIN

THE AGE OF ENLIGHTENMENT (AKA THE AGE OF REASON)

Late 1600 - late 1700 CE

Historical context

The Age of Enlightenment was an intellectual and philosophical movement between the late 17th century and the 18th century, that emphasised reason, individualism, and the pursuit of knowledge and human rights. It played a crucial role in shaping modern thought, including political and scientific developments.

Honourable mentions for this period include René Descarte's first principle of "I think therefore I am", the invention of the steam engine, telegraph, lightning rod, the mechanical calculator and the hot air balloon.

Apart from a think tank of philosophers and engineers, this movement gave us some heavyweights in the natural science fields of zoology, physics and chemistry, with guest appearances by Carl Linnaeus, Daniel Bernoulli, Benjamin Franklin, Anders Celsius and Alessandro Volta, Charles-Augustin de Coulomb and the father of modern chemistry, Antoine Lavoisier.

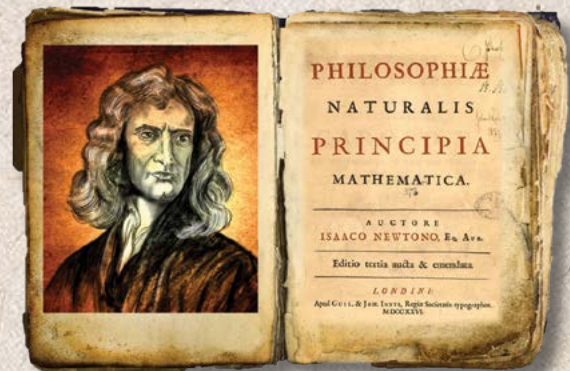
1687 CE

Sir Isaac Newton was an intellectual giant of his time and one of the most influential scientists and mathematicians in history. He made groundbreaking contributions to physics, mathematics and astronomy, laying the foundation for many scientific principles that are still in use today.

Newton's most famous work, *Philosophiæ Naturalis Principia Mathematica*, commonly referred to as the *Principia*, was published in 1687. In this monumental book, he outlined his laws of motion and universal gravitation, providing a mathematical structure for understanding the physical world around us. He also formulated the mathematical framework for understanding viscosity and its relationship to the flow of fluids.

Newton's work in the *Principia* laid the groundwork for the study of viscosity and a fluid's resistance to flow. While he did not provide a comprehensive theory of viscosity or use the term itself, his contributions to the mathematical description of fluid motion and forces within fluids were foundational for later developments in fluid mechanics and our understanding of viscosity in the modern sense.

Isaac Newton's work had a profound and enduring impact on science and mathematics, ushering in a new era of scientific understanding. His work provided the framework for classical physics, and paved the way for subsequent scientific discoveries by geniuses like Albert Einstein, Niels Bohr, Werner Heisenberg and Erwin Schrödinger – the famous theoretical physicist who lost his cat in a box.





TECHNICAL BULLETIN

1699 CE

Guillaume Amontons was a self-taught French physicist and engineer known for his pioneering work in the field of friction and thermodynamics.

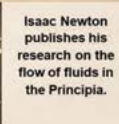
In 1699, Guillaume presented a paper to the Royal Academy of Sciences in Paris, France titled "De la résistance causée dans les machines" (On the Resistance Encountered in Machines), which discussed various aspects of friction and the resistance generated in machines.

Expanding upon the earlier works of Leonardo da Vinci, Amontons' paper explored the frictional forces that occur when surfaces come into contact with each other. This groundbreaking research laid the foundation for subsequent developments in the study of friction and the laws governing it, namely Amontons' first and second laws of friction.

But that's not all! In addition to his work on friction, he also made contributions to the field of thermodynamics. He discovered a relationship between the pressure and temperature of gases, that became known as "Amontons' first law of gas." Not bad for a deaf guy who never went to university.

Illustration of Guillaume Amontons showing off one of his inventions in 1690



 3500 BCE Evidence of oil use from the Fountain of Pitch by Sumerians in Mesopotamia.	 3000 BCE Egyptians using bitumen for construction and embalming.	 2600 BCE Egyptians using tallow to lubricate sled wheels.	 1900 BCE The tomb of Tehuti-Hetap in Egypt shows giant statue been moved with the aid of a lubricant.	 780 BCE Chinese using vegetable oil and lead as a lubricant during the Zhou dynasty.	 680 BCE Ancient Greeks using tallow to lubricate chariot wheel axles during the Olympic games.	 200 CE Ancient romans using olive oil and calcium salt as a lubricant.
The story so far...						
 500 CE Tallow mixed with clay used as a lubricant in Northern Europe during medieval times.	 600 CE Byzantine empire use Greek fire made with petroleum.	 700 CE Vikings using whale oil to lubricate their Drakkars.	 1500 CE Leonardo da Vinci creates self oiling lubrication system using opium oil.	 1600 CE Seneca Indians using and trading crude oil for medicinal purposes.	 1687 CE Isaac Newton publishes his research on the flow of fluids in the Principia.	 1699 CE Guillaume Amontons presents his work on friction.

TECHNICAL BULLETIN



Be sure to catch the next instalment of our timeline in *Technical Bulletin 89*, where we will brave the age of revolution and take you on a journey through the events that defined one of the most incredible periods of human progress and spawned the modern petroleum industry.

We will recount how the invention of kerosene saved a species of majestic sea titans from extinction and how a small antique shop in London evolved into one of the most prominent multinational energy companies in the world. We will live vicariously through a retired train conductor as he goes wildcatting for oil in Pennsylvania, learn how Rockefeller rose to prominence and discover who the real McCoy was.

About the author...



Steven Lara-Lee Lumley is in charge of technical development and training for WearCheck. She holds an N6 mechanical engineering diploma (HND N6) as well as Honeywell aerospace and ICML III accreditations.

Steven joined WearCheck in 2008 as a diagnostician and worked her way up to the position of senior diagnostician, during which time she diagnosed her millionth used oil sample, in addition to running oil analysis training courses for customers in several countries. In 2015, Steven was promoted to the position of technical manager.

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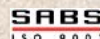


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