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P34 POISED FOR PRODUCTION



P60 AUTOMATED MILL RELINING

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MAJOR COMMODITIES SNAPSHOT

GOLD \$US/oz

The first day of trading for 2021 has resulted in exponential growth of bullish market sentiment in regards to gold pricing.



IRON ORE \$US/t 62% Fe CFR China



Seaborne prices climbed, supported by firm demand in steel and positive sentiment after the New Year holiday.

COPPER \$US/t LME Price

Copper surged as other base metals fell, attributed to increase in bets by participants, driven by pick-up in spot demand.



COBALT \$US/t LME Price



Rumors that the Chinese government was stockpiling further quantities of metal, primarily China-origin cut cathodes, triggered a flurry of activity.

ALUMINIUM \$US/t LME Price

The global aluminum market has been projected to register US\$221b by the end of 2023, growing at a healthy CAGR of 6.48% during the review period.



COAL \$US/oz LME Price



The global aluminum market has been projected to register USD 221.13 billion by the end of 2023, by growing at a healthy CAGR of 6.48% during the review period.

LEAD \$US/t LME Price

Analysts are forecasting a rebound in Chinese lead use of about 5% in 2021 after a quite flat 2020, compared to some 4% in the rest of the world.



NICKEL \$US/t LME Price



Nickel's rising price could be attributed to recent news around electric vehicles, of which the metal's by-product nickel sulphate is a key element for batteries.

* Prices as at the 1st January 2021

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FIRST ORE FROM ELIWANA

Members of the Fortescue Board and leadership team were joined by Mines and Petroleum Minister Bill Johnston and Native Title partners to mark the significant milestone of first ore through the ore processing facility at the new Eliwana mine. Image: Fortescue

A significant milestone has been achieved at Fortescue Metals Group's Eliwana iron ore mine and rail project, with first ore going through its onsite processing facility at its Western Hub in Pilbara, WA.

The celebrations were marked with an official opening event attended by Fortescue chief executive Elizabeth Gaines, Fortescue deputy chairman Mark Barnaba AM, WA Mines Minister Bill Johnston and representatives from the Puutu Kuntj Kurrama and Pinikura People (PKKP).

Ms Gaines said Eliwana was the next important stage of development of Fortescue's world-class integrated operations.

"Exploration commenced in this area in 2006, and we have now delivered a new 30mtpa dry ore processing facility and infrastructure, along with 143km of rail which is in the final stages of construction," she said.

"Eliwana will see us maintain our low-cost status and provide us with greater flexibility across our product mix.

"Construction of the mine, village and

infrastructure was completed safely over a 12-month period, in line with budget and schedule."

The project took a significant step forward at the start of 2020 when the WA government awarded a special rail licence for the supporting railway, allowing Fortescue to build and operate the rail project needed to transport Eliwana iron ore to Port Hedland.

The rail corridor connects Eliwana to the company's existing Kings iron ore mine at its Solomon production hub in the Pilbara.

A rail fleet of 126 ore wagons and four locomotives has been commissioned for Eliwana.

Ms Gaines said Fortescue is deploying innovative technology in its mining operations, and it has trained staff to embrace this new technology.

The company's autonomous vehicle fleet has travelled more than 39m km and moved 1.1bt of material, she said.

"Every day our autonomous fleet travels a distance equivalent to 3.5 times around Australia's highway one, without drivers at the wheel," Ms Gaines said.

Autonomous technology has already contributed to the company lowering its production costs.

WA Mines Minister Bill Johnston congratulated Fortescue and all stakeholders involved in the completion of the Eliwana project.

"This important project created around 2000 jobs during construction and will create 500 full-time site positions as the team move into operations," he said.

"Fortescue's Eliwana mine will deliver a significant boost to WA's economy, during the post-COVID-19 recovery phase, and contribute to the State's ongoing successful iron ore industry."

Under Fortescue's Billion Opportunities program, a total of 14% of the Eliwana operations workforce is made up of Aboriginal people and \$150m worth of contracts were awarded to Aboriginal businesses.

"In addition, 23% of our Eliwana operations team are women, contributing to our commitment to increase gender diversity across our operations," Ms Gaines said.

"The Eliwana project has delivered a significant boost to the State and industry, with contracts valued at \$1.83b awarded to Australian businesses.

"This includes contracts awarded to 290 WA businesses, with local procurement totalling 84% of the project spend."

These include PKKP-owned businesses Jilpanti Enterprises and Australian Indigenous Enterprises, to provide early civils and earthworks.

Additionally, PKKP Enterprises, 100%-owned by PKKP Aboriginal Corporation, was awarded the village services, hospitality and technical services contract with joint venture partner Action Catering; and Mallard Deemey, a 100% Aboriginal-owned business was contracted for the non-processing infrastructure development, including Eliwana's administration offices and building service.

Other mines operated by Fortescue in the Pilbara include Cloudbreak and Christmas Creek, which come under the company's Chichester hub. **AMR**

IGO GETS NOD FOR TIANQI MOVE

Australian explorer IGO has been given the nod from Tianqi Lithium Energy's shareholders to acquire 49% of the lithium giant's Australian stake.

The motion received a 99.7% approval vote from shareholders this month, which a company statement says validates the "win-win" nature of the transaction. Tianqi owns Greenbushes in WA, the world's largest lithium mine.

The move represents a further step towards IGO's objective to become a "unique clean energy metals investment," with Managing Director Peter Bradford welcoming the development.

"The resounding vote of support which Tianqi has received from its shareholders further validates the value creation from this transaction for the shareholders of both companies," he said.

"Tianqi and IGO continue to progress the completion workstreams and we will provide further updates to the market as the remaining conditions precedent required to complete the transaction are progressed."

The transaction is valued at \$1.9b and will provide IGO with a 25% interest in the Greenbushes lithium mining and processing operation.

The joint venture also grants IGO with a 49% interest in Tianqi's Kwinana lithium hydroxide plant. IGO and Tianqi will form Lithium HoldCo for the two companies' lithium investments outside of China.

IGO is also currently undertaking a strategic review of its 30% holding in the Tropicana gold operation, the remaining stake of which is owned by AngloGold Ashanti (AGG). In April last year, Chengdu-based Tianqi had announced that it expected to report a net loss of 450-510m yuan (\$64-72m) in the

first quarter of 2020, compared with a net profit of 111.29m yuan in the corresponding period of 2019.

The company had been struggling to repay loans taken out to finance its high-profile \$4.1b acquisition of nearly quarter of Chilean miner SQM - agreed in 2018 when prices for lithium, a key ingredient in batteries for

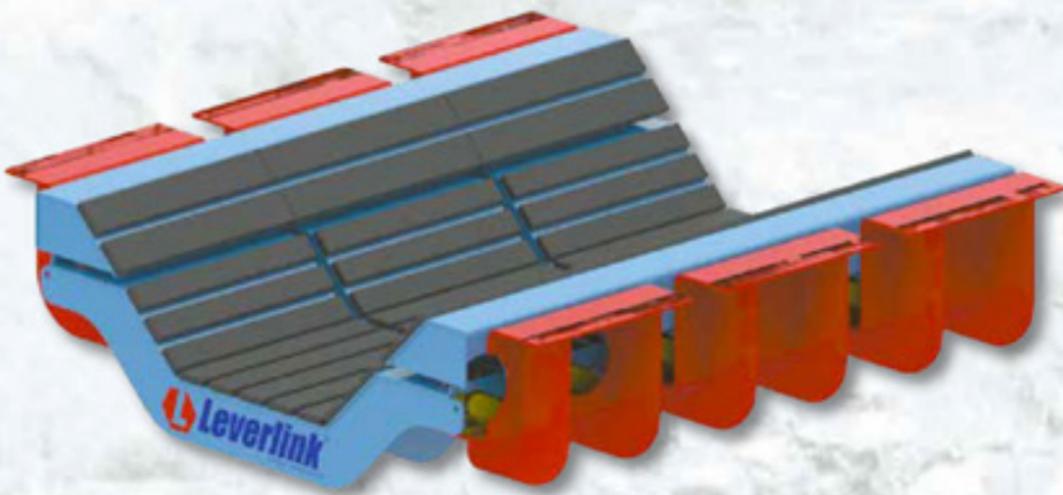
electric vehicles, were much higher.

The company said its "liquidity pressure increased" in the fourth quarter of 2019 due to falling lithium prices, which are currently around two-thirds lower than they were two years ago, as well as rising financial expenses. **AMR**



The Greenbushes lithium mine.

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COAL SWAPPED FOR 'GREEN' TECH

Acacia Coal Ltd has ditched its coal assets and relisted on the ASX as an "environmentally- focused" company after acquiring Graphene Technology Solutions.

The former coal developer has been rebranded and renamed Sparc Technologies in a reverse takeover deal, which will see Acacia's core business transition from coal and mineral exploration to the development and commercialisation of "new-world" products.

Sparc will initially harness graphene to develop technologies that could revolutionise the mining industry such as improved metals recovery from tailings and environmental remediation.

Graphene is a 2D material made of carbon atoms with a unique hexagonal lattice structure that makes it lightweight, thin, strong, super conductive, elastic, anti-microbial, anti-corrosive and hydrophobic, meaning it can separate toxins from water.

Sparc made a strong debut on the ASX today and was trading at 36c a share as at 11.30am, up 80% on the 20c IPO price.

About 20m shares were sold to raise \$4m to purchase Graphene Technology Systems (GTS) and recapitalise the company, which now has \$6.1m in its coffers to pursue business opportunities.

Sparc was relisted with 70.5m ordinary shares on issue, a market value of \$14.1m and an enterprise value of \$8m.

As well as developing products for the mining industry, graphene can also be used for marine vessels to coat the hulls of ships to prevent drag and corrosion.

The company also has a strong pipeline of other potential graphene applications which it will develop in due course.

From GTS, Sparc will inherit strong industry partnerships and government support through the Australian Research Council's Research Hub — the Graphene Enabled Industry Transformation Hub — in collaboration with the University of Adelaide.

One of the world's leading graphene research universities, UA will become a shareholder in Sparc.

Discovery Capital Partners acted as corporate advisor to the transaction.

The capital raising was underpinned by Perth-based technology investor Rod Jones and his Hoperidge Capital.

"We are delighted to support such an exciting emerging technology developer which is aiming to become a key part of the hugely disruptive graphene industry and create a local presence of scale," Mr Jones said.

"The level of academic, government and industry support we have seen behind these technologies and potential applications is truly impressive and we look forward to being part of the creation of a new global



Sparc Technologies plans to develop graphene for three initial target markets: metals recovery from tailings, environmental remediation and protective coatings for marine vessels.



Scientists discussing potential uses for graphene.

industry with a new base in Australia."

As part of the acquisition, the former Acacia Coal board, headed by chairman Adam Santa Maria, will retire to welcome a new board of directors.

The new board will be led by executive chairman Stephen Hunt, managing director Tom Spurling, a former CEO of medical device company Ellex Medical Lasers Ltd and non-executive director Daniel Eddington, a financial and equities market specialist.

Sparc will leverage its exclusive licensing, strategic partnership and research agreement with the University of Adelaide and collaboration agreement within the ARC Hub to develop and commercialise graphene-based products and technologies.

The goal is for these technologies to have significant environmental and economic benefits with industrial applications across many sectors. **AMR**



Glencore's Pathway to Net-Zero plan includes a commitment to help build a "supportive policy environment" for the low-carbon transition.

Minerals giant Glencore is aiming to reduce absolute emissions across all scopes by 40% by 2035, against a 2019 baseline.

The company's plans for meeting the 2035 and 2050 targets are centred around seven pillars, including reducing Scope 1 (direct) emissions through investments in energy efficiency, resource efficiency and recycled materials, and reducing Scope 2 (power-related) emissions through electrification, renewable electricity and low-carbon heat.

The majority of Glencore's climate impact lies in Scope 3 (indirect), where emissions are a large focus, with the goal to reduce coal production and increase the production of what it calls "transition" metals — the materials commonly used in technologies like electric vehicles (EVs) and large-scale battery storage arrays.

In a statement, Glencore also said it would remain in the coal market, rather than to divest entirely, and stressed the possibility for engagement.

"We do not believe that selling our coal mines would help reduce the associated emissions," the statement said.

"Responsible stewardship of our coal assets and responsible reduction of our coal portfolio, while maintaining a focus on our high-quality coal assets in Australia, supports our ambition to reduce our total emissions to achieve net-zero by 2050."

Aside from changing its production portfolio, Glencore's plans for addressing Scope 3 emissions also cover engaging with customers and policymakers to increase the demand for low-carbon metal; and training supply chain workers to use low-carbon technologies.

Glencore's Pathway to Net-Zero plan notably includes a commitment to help build a "supportive policy environment" for the low-carbon transition, to fend off pressure from investors and consumers as well as environmental campaigners.

Glencore chief executive Ivan Glasenberg, who will retire from his role next year, said that the company was well positioned to meet the demand for commodities used in renewable technologies.

"A significant portion of Glencore's earnings is derived from the metals and minerals that enable the transition to a low-carbon economy," he said.

"As the world prioritises renewable technologies, battery storage and electric mobility, our business is well-positioned to meet the growing demand for the commodities that underpin these future

focused industries.

"Our ambition to be a net zero total emissions company by 2050 reflects our commitment to contribute to the global effort to achieve the goals of the Paris Agreement."

As one of the largest global suppliers of copper, cobalt and nickel, Glencore highlighted the necessity of these metals for batteries, electric vehicles and energy storage.

"The world is going to require many times more metal than is currently produced," Glencore stated.

"Glencore has a large production footprint and pipeline of projects in the commodities needed to build renewable energy grids, electrify transport and meet everyday needs." **AMR**



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MAKE YOUR OWN DIAMONDS

ANU PhD scholar Xingshuo Huang holding the diamond anvil used to create diamonds at room temperature. Image: Jamie Kidston/ANU

The formation of diamonds in the natural world takes billions of years, huge amounts of pressure and ultra-hot temperatures.

Now an international team of scientists, led by the Australian National University and RMIT, have managed to defy nature by creating diamonds in a lab in just a few minutes.

The team made two types of diamonds: the kind found on an engagement ring, and another type of diamond called lonsdaleite, which is found in nature at the site of meteorite impacts such as Canyon Diablo in the US.

Lead researcher and ANU Professor Jodie Bradby said lonsdaleite, which is 58% harder than regular diamonds, has the potential to be used for cutting through ultra-solid materials on mining sites.

"Creating more of this rare but super useful diamond is the long-term aim of this work," she said.

"Natural diamonds are usually formed over billions of years, about 150km deep in the earth where there are high pressures and temperatures above 1000o," Prof Bradby said.

The team, including former ANU PhD scholar Tom Shiell – who is now at the Carnegie Institution for Science – previously created lonsdaleite in the lab only at high temperatures.



This new, unexpected discovery shows both lonsdaleite and regular diamond can also form at normal room temperatures by applying high pressure—equivalent to 640 African elephants on the tip of a ballet shoe. Prof Bradby said the key was in how the pressure was applied.

"As well as very high pressures, we allow the carbon to also experience something called 'shear', which is like a twisting or sliding force," she said.

"We think this allows the carbon atoms to move into place and form lonsdaleite and regular diamond."

Co-lead researcher Professor Dougal McCulloch and his team at RMIT used advanced electron microscopy techniques to capture solid and intact slices from the experimental samples to create snapshots of how the two types of diamonds formed.

"Our pictures showed the regular diamonds only form in the middle of these lonsdaleite

veins under this new method developed by our cross-institutional team," he said.

"Seeing these little 'rivers' of lonsdaleite and regular diamond for the first time was just amazing and really helps us understand how they might form."

The team, which involved University of Sydney and Oak Ridge National Laboratory in the US, have published the research findings in the journal *Small*. **AMR**

MT DOVE PROJECT SPREADS WINGS

Sayona Mining (ASX: SYA) will commence exploration over its Pilbara gold portfolio, targeting Hemi-style mineralisation. Initial work will focus on the Mt Dove project, which includes testing for intrusion-related gold mineralisation.

Sayona Mining managing director Brett Lynch says the company is excited to launch this exploration program.

"A recent assessment identified a number of targets across our 100% owned Pilbara gold portfolio," he said.

"The Hemi discovery has highlighted the region's potential and we look forward to unlocking the prospectivity of our large tenement holding for the benefit of shareholders, adding to our flagship Authier Lithium Project and other lithium projects in Canada and WA."

De Grey Mining's Hemi discovery is a large-scale, high-value, near-surface gold discovery. The gold price has reached above US\$2000poz and Goldman Sachs forecasts price to reach US\$2300 in 2021.

Sayona Mining is an emerging lithium miner with projects in Quebec, Canada and WA, including its fully-owned 824m² Pilbara gold and lithium tenements. **AMR**



IMDEX staff utilising new smart drilling technology at site.

EXPLORATION ON THE RISE

Exploration drilling has taken off since the COVID-19 pandemic.

A raft of measures by the Federal and state governments to increase mineral exploration, along with the advent of smart technology, have come together to create a conducive environment for increased exploration drilling.

One such company experiencing this wave is mining technology company IMDEX, which develops cloud-connected sensors and drilling products that provide critical information in real-time.

The number of cloud-connected instruments it rents out reached a record high in 2020, specifically its IMDEX HUB IQTM cloud-based technology and software.

IMDEX chief executive Paul House says strong mining fundamentals supported a

return to pre-COVID-19 business levels.

"We are still experiencing record high numbers on rent and record plans by our customers – drillers and resources companies – to keep drilling as much as possible," he said.

"The confidence for drilling and resource companies to navigate any issues around a possible second wave is increasingly clear, and we expect business to continue strongly into 2021 and 2022.

"The positive within this COVID world, if there is one, is that we are seeing an increased demand for innovation and technology in the mining sector.

"This is a trend that has been well underway leading up to COVID and, certainly, COVID has accelerated that."

IMDEX invests about \$25m a year on research and development for technologies and software.

Mineral exploration activity reached a five-year high in WA with figures for July and August 2020 showing a 63% increase on the monthly average, according to data from the WA Department of Mines, Industry Regulation and Safety.

Latest figures by the Australian Bureau of Statistics show that total expenditure for mineral exploration rose 6.1% in the September quarter to reach \$702.1m, with gold exploration accounting for half the total at \$356.1m.

Mineral exploration spending in Victoria reached a record high of \$39.7m in the June 2020 quarter. **AMR**



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SUBTERRANEAN SALT SORTER

The first underground TOMRA sensor-based sorter has started operation at a rock salt mine in Germany.

K+S Minerals and Agriculture, a major salt producer, turned to TOMRA Sorting Mining for a solution for the replacement of the existing sorting system at its mine in Graslleben in Lower Saxony.

The global salt market has been valued at about US\$28b in 2019, and is forecast to exceed US\$32b by 2025.

The industry growth is driven by a rise in the demand for salt applied in the chemical manufacturing industry – especially in chlorine-alkali chemicals production.

At the Graslleben mine, rock salt is extracted from a high-quality underground deposit that stretches across two Federal States. It is processed into a wide range of products, from de-icing salt for winter road services to food-grade table salts and lick stones for livestock and domestic animals.

For K+S, consistently achieving certified and guaranteed high purity, compliant with the strict standards of the food industry, is a priority.

K+S Technische Büro Mechanik Sven Raabe said the sorting of rock salt was complex and demanding due to its crystalline properties, leading to strong fluctuations in the appearance of the material.

TOMRA recommended using COLOR sorting technology.



The revolutionary underground sorter.

TOMRA Mining key account manager Mathilde Robben said that with a customised set-up of the light sources, the difference in transparency of the different particles can be detected, ensuring the high quality of the rock salt.

The team also advised installing the sorter in the underground mine, so that after an initial underground sorting stage, only the coarsely crushed rock salt undergoes further grinding and sieving above ground.

Only the valuable product needs to be transported in the shaft, and the final result is high-quality, pure rock salt products in various grain sizes, which are ideal for this application.

Furthermore, waste rejects can be backfilled underground, avoiding storage and emissions on the surface.

About TOMRA Sorting Mining

TOMRA Sorting Mining designs and manufactures sensor-based sorting

technologies for the global mineral processing and mining industries.

As the world market leader in sensor-based ore sorting, TOMRA is responsible for developing and engineering cutting-edge technology made to withstand harsh mining environments.

TOMRA maintains its rigorous focus on quality and future-oriented thinking with technology tailor-made for mining. **AMR**

OVERHEAD CRANE, UNDERGROUND MINE

A 20t capacity overhead crane and hoist from R&M Materials Handling, sold by Harriman Material Handling (HMH), has been built and installed by CraneWerks 400ft beneath the surface at the US Gypsum Company Shoals Mine in Indiana.

The top running double girder crane, principally chosen based on the short lead time offered by R&M and its Indiana-based distributor, CraneWerks, is being used to assemble and maintain equipment for the mine underground. It spans 35' and travels on a 62'-long runway.

CraneWerks is a Master Distributor for R&M components, which builds cranes that are sold through distributors nationwide. It offers cranes that are pre-engineered, which makes building and shipping them fast.

The Challenge

HMH, a distributor for both R&M Materials Handling and CraneWerks, came to the team with a unique opportunity.

Challenges were encountered both on the surface and below ground.

For instance, the shaft used to get equipment into the mine was much smaller than most of the machinery used below. A 35' bridge beam was too long to go down the shaft in one piece.

HMH and CraneWerks had to find a way to get the crane components and steel underground.

A US Gypsum spokesman said that being underground presented its own challenge.



The height available was an important consideration because the hoist and trolley ride on top of the bridge girders.

"Everything from pouring concrete to lifting the beams is difficult because you don't have access to a lot of the equipment you would normally think of using. It's constant problem-solving," he said

The Solution

CraneWerks designed a bridge that was built in two pieces so it could fit down the narrow mine shaft before it was welded together at the bottom.

The crane provides a lifting solution on a daily basis, raising mobile equipment components, typically weighing about 10t, around the area.

According to US Gypsum, loads are normally large pieces of fabricated steel components of a larger machine.

"We have trained around 10 people on how to use the crane. Four or five of them use it daily," the spokesman said.

A top running crane was chosen because it offered the same hook height as a single girder crane, which would require a higher ceiling. The height available is important because the hoist and trolley ride on top of the bridge girders, rather than being suspended beneath them.

This gives the best hook height of any overhead bridge crane option, giving users the maximum amount of lift (distance that the hook can be raised above the floor below) available.

"We needed a crane capable of moving large pieces around for assembly of equipment in the mine, and the results suggest we found a solution," the spokesman said.

"We could have acquired a few telehandlers that had the necessary weight capacities, but the EOT (electric overhead traveling) crane was the preferred option." **AMR**

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PRIMED FOR INDUSTRY 4.0

UWA's Energy and Resources Digital Interoperability Industry 4.0 TestLabs are a strategic initiative of the Australian Prime Minister's Industry 4.0 Taskforce.

Global technology company ABB has partnered with the University of WA to help develop a digital mine for the future.

ABB has linked with UWA's new Energy and Resources Digital Interoperability Industry 4.0 (ERDi i4.0) TestLab, run by Enterprise Transformation Partners (ETP), to advance open process automation standards for the next industrial revolution (commonly referred to as industry 4.0).

This includes collaboration on AMIRA Global's P1208 Interoperability Enablement for Natural Resources project, which is designed to realise the digital mine.

This project aims to develop and implement interoperability standards for mine planning, mine scheduling and execution so that equipment and applications for mine operations become 'plug and play'.

Interoperability has been described as a state in which all of a company's technology sings in perfect harmony with the rest of the world. It is the backbone or architecture that is essential for realising the dream of much-talked-about digital mines.

Building on UWA's I4.0 ERDi Test Lab, the initiative will enable an offsite test laboratory to evaluate efficacy of interoperability of technology without disrupting ongoing mining activities.

Separate to the AMIRA project, ABB is also working closely with ETP on an integrated systems project at Gold Fields' Granny Smith mine in WA, one of the largest and highest producing gold mine operations in the country.

The project will enhance the ABB Ability™ Operations Management System (OMS) Platform - Fleet Management Software Module to support the latest in reliable messaging and Industry 4.0 interoperability standards: ISA-95 (IEC 62264) via B2MML V7.0. This advancement will enable the mine to connect and coordinate mine operators, workforce, equipment and all mining activities in real-time, from face preparation to crusher.

Gold Fields Australia Technical Service Manager Michael Place said the company launched the Integrated Systems Project in 2019 to increase production throughput of the Granny Smith gold mine.

"To achieve the objective of a fully connected mine, we are working with ABB and ETP to build an integrated business process and system architecture that will enable visibility of operational activities in near real-time via automated information exchange between various mining systems," he said.

"The system architecture has been designed to allow deployment across various operations both open pit and underground.

"This deployment will be the major phase of the technology strategy for the Granny Smith mine and will be a pilot for integrated platforms across Gold Fields Australia, which aims to create one of the most innovative, digitally connected mines in the world. This project and partnership will be key to achieving this."

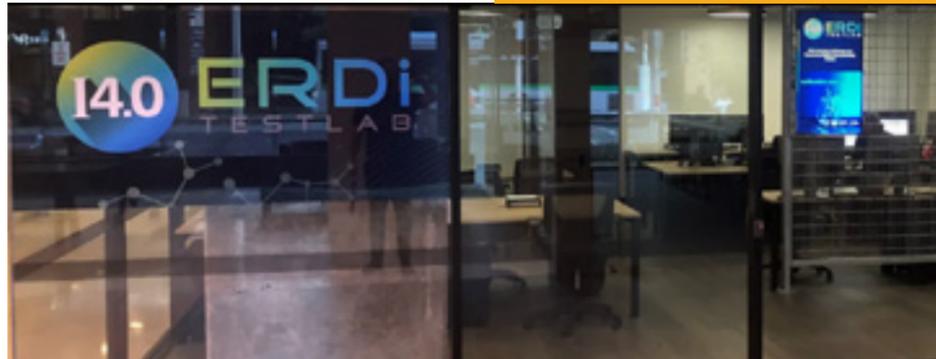
ETP managing director John Kirkman said ABB's investment, both in financial terms as well as time, together with its expertise, was critical for this project to support the re-engineering of products that are often required to deliver a reliable, performant and standards compliant software package.

"The performance requirements of a software package that exchanges and processes granular events with rich information in real-time, when compared to a software package designed for periodical manual entry, are like comparing chalk and cheese and that's where ABB plays a big role," he said.

ABB Australia Head of Industrial Automation Process Industries, Stuart Cowie, said industry 4.0 and digital transformation were huge opportunities for the Australian mining industry with automation, analytics, and artificial intelligence (AI) generating insights and accelerating greater productivity and efficiency.

"This partnership underlines ABB's commitment to ensuring Industry 4.0 concepts influence its product roadmaps into the future, and demonstrates the significant value that can be delivered to customers through interoperability and automation across both processes and systems," he said.

"It will give ABB valuable insights into digital transformation and Industry 4.0 concepts for mining. Through our work with the ERDi TestLab, the OMS platform has become an even more powerful tool with reliable real-time access to operational data through



Pictured at the opening of the ERDi Testlab: Mark Frame from ETP, Richard Marsh from ABB, and Shannon Mc Dearth and Andrew Whibley from Gold Fields.

ISA95 standardised messages."

As part of POC 1, ABB will showcase ABB Ability™ Operations Management System and Fleet Management System software to AMIRA P1208 project sponsors, automatically exchanging information with scheduling and materials tracking software packages via i4.0 standard interfaces.

About ERDi i4.0 TestLab

UWA's Energy and Resources Digital Interoperability Industry 4.0 TestLabs are a strategic initiative of the Australian Prime Minister's Industry 4.0 Taskforce, which was formed in 2016 with the support of the Australian Government.

The Taskforce is also working in close collaboration with the German Labs Network Industrie 4.0, the key organisation driving the development and deployment of Industry 4.0 Testbeds in Germany.

I4.0-aligned architecture and technology components will deliver the next step change in operational performance for the Energy and Resources sectors. I4.0 interoperability standards are critical in unlocking this value.

The ERDi Testlab is a state of the art facility that will enable the rapid realisation of these benefits through research, development, trials, testing and education. **AMR**

REGISTRATION LOOMS FOR DRONES

Mining companies are being urged to make sure they have registered their drone ahead of the January 28 deadline.

Miners using drones to inspect sites or equipment will need to make sure any drone they fly is registered, regardless of how much it weighs, or risk a fine.

More than 800 organisations across the country have already taken advantage of free registration for the drones they use for business before the deadline, with thousands of drones now registered for commercial use in Australia.

As well as being registered, all drones used for business purposes will need to be flown

by a pilot with accreditation or a remote pilot's licence.

Drone registration is valid for 12 months and is quick and easy to do online – simply visit the CASA website and sign into myCASA to begin.

Operators flying unregistered drones for commercial reasons (for work) will risk heavy fines of up to \$11,100.

Commercial operations may include:

- using photos or videos taken from an RPA in the course of your work
- stockpile management
- inspecting industrial equipment, construction sites or infrastructure
- monitoring, surveillance or

security services

- any drone activities on behalf of your employer.

Users do not need an RPA operator accreditation if:

- they hold a remote pilot licence (RePL)
- they only fly the drone for sport or recreation, including model aircraft association members flying at CASA-approved model airfields.

For more information, visit www.casa.gov.au/drones

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WE'VE COME A LONG WAY

BY KATHLEEN SOUTHWAY

With a total of 13 mine fatalities in WA in 1997, nine of which were in underground mining, Alex Atkins knew she was entering dangerous territory in her chosen career.

It was the same year that Ms Atkins started out in underground mining, armed with two engineering degrees and qualified as a geotechnical engineer, mining engineer and mining geologist.

In the five years preceding Ms Atkins going underground, a total of 55% of mining fatalities were due to rockfalls.

The principal of Alex Atkins and Associates – guest speaker at last month's St Barbara's Day Luncheon in Perth, organised by the WA Mining Club – says it was a formative experience for her being in the "line of fire in such a deadly period".

"The number of fatalities in the decade I started were more than double the industry's today and that was with a smaller workforce," she said.

According to statistics from the WA Department of Mines, Industry Regulation and Safety, there was a total of 69 fatalities in the State's mining industry between 1990-2000, while 30 deaths in the same sector were recorded in 2010-2020.

"The reason for this improvement is the move to bulk, mechanised mining and away from selective handheld mining," Ms Atkins said.



Alex Atkins from Alex Atkins and Associates was guest speaker at this year's St Barbara's Festival in Perth.

"Over the next decade we will move towards fully autonomous mining with no man entry and hopefully no more deaths."

Recounting her younger years listening to her father's geologist friend tell stories of his exploration work, Ms Atkins became hooked as a little girl and likened his work to the adventures of Indiana Jones.

After graduating from high school, she lived and breathed mining, eager to enter the same world of rocks, geology and mining the land.

"I immediately fell in love with the romance of gold mining and it has never left me," Ms Atkins said.

"I was the first wave of female engineers who chose underground [and] I will always worship airleg miners for their toughness, initiative and huge hearts."

Even before women were first legally permitted to work underground in WA in 1987, Ms Atkins worked in the Lake View Shaft in Kalgoorlie, WA, in 1986.

Ms Atkins was also the first female mining engineer to work underground at the Porgera mine in Papua New Guinea and became the first female WA District Inspector of Mines.

"I was illegal and taboo," she said. "Women are still not permitted to work underground in PNG till this day."

Paving the way for women came with its set of challenges as Ms Atkins experienced firsthand the deaths of six people she worked closely with in the tragic Emu mine disaster in 1988.

"It created an obsession with preventing mining disasters, which is what I teach at the

University of WA today," she said.

Ms Atkins today runs her own mining risk consultancy focused on conformance (board assurance) and performance (digital transformation).

She is also a non-executive director at both the ASX-listed Perenti Global (based in Perth) and the International Women in Mining (based in London), as well as a former director of The Australian Institute of Mining and Metallurgy (AusIMM).

She was one of 2018's 100 Global Inspirational Women in Mining (WIMUK) and was inducted into the WA Women's Hall of Fame in 2019.

The St Barbara's Day Luncheon is traditionally held on the first Friday of December and celebrates the Feast of St Barbara – the patron saint of miners. **AMR**

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BEST FEET FORWARD

A concept that was born out of concern for footsore miners has become a booming enterprise that has taken its creator around Australia and into Asia to establish a manufacturing base.

The new waterproof boots designed by podiatrist Penny Crawford are starting to gain popularity in the mining sector and other industries where the comfort, snugness and safety of the footwear is valued.

The award-winning Crawford gumboot has a specially designed insert that ensures it fits without any looseness, and is waterproof.

After working in regional NSW for almost 30 years, Penny has treated numerous foot and ankle issues as a result of miners, primarily underground workers, wearing unsupportive boots.

"A typical gumboot just doesn't fit. And the Crawford boot addresses that issue with my WedgeTech system, an insert in different sizes, that sits in the pockets at the front of the boot," Penny said.

"The WedgeTech insert makes your foot more stable and provides a personalised custom-fit within the boot. This means there is no foot slip and no risk of your foot pulling out even in the wettest conditions."

The boot, which has been trialled in mines in NSW, SA and WA, has been given the tick of approval by miners and the industry itself.

The product scooped the NSW Minerals Council's Health Excellence award after an overwhelming response from workers at Whitehaven Coal's Narrabri mine.

The Crawford boot is made using 23 separate pieces of rubber and is built with the miner's needs first and foremost.

Penny For Her Thoughts

Before Crawford Boots there were two footwear options for underground mine workers – gumboots or leather boots – and neither of these provided the best outcome for the worker or mining company in terms of comfort, risk management or value for money.

These UG workers were still wearing the same gumboot that has been worn for the past 150 years.

"Regular gumboots are not made to fit. Whilst they are waterproof, they are loose fitting and as a result the foot and lower limb muscles are constantly overworking to stop the foot from sliding around in the boot," Penny said.

"As a result of this, balance and concentration are affected, and this muscle overuse predisposes the wearer to injuries and safety is compromised."

Leather boots provided the much-needed comfort and support for people working in unstable terrain for long periods of time, however as they are not waterproof they degrade very quickly (due to harsh conditions underground) and become stiff, uncomfortable and unwearable.

"Crawford Boots are the first innovation in terms of waterproof boots – they combine the best features of leather boots (comfort and stability) with the best features of gumboots (waterproofness) and deliver improved comfort, risk management, support and value for money (durability, longevity)," Penny said.

"I saw patients with a variety of short term

and long-term injuries as a result of wearing ill-fitting footwear. Feet are your foundations and like a house, if there are issues with the stability of the foundations, this manifests to issues higher up – in the case of the body – knees, hips, and lower back as well as feet."

Mine Trials

Trials generally run for between six weeks to three months, depending on the mine, workforce and shifts.

"Part of the Crawford Boots difference is that I go to site to help coordinate the trials, and ensure the workers are fitted properly in the right size boots (80% of the population wear the wrong size footwear)," Penny said.

"This also gives me the opportunity to talk to the workers about their footwear, any issues they may have with their feet and offer my 30 years of experience as a podiatrist.

"I also provide all forms of feedback – nothing too onerous for the workers to complete but gives the mining company the opportunity to see how they rate their previous footwear in comparison to Crawford Boots.

"This is real, genuine feedback. The boots should provide value in terms of safety, comfort, fit and durability.

The surveys canvassed opinions on comfort, fit, waterproofness, whether the wearer found the boots more stable, a better fit, and better for their work situation, and how they related to durability compared to previous footwear.

The Whitehaven Trial

"Crawford Boots came about as direct result of me working with Narrabri Coal's Work, Health and Safety department – they were looking for a footwear solution that answered many of the safety, fit and comfort issues associated with the gumboots that were currently available," Penny said.

"The WHS would send workers to my podiatry practice to see if orthotics were required. In more cases than not the causes of the foot and lower limb issues were not a result of lower limb biomechanics, but ill-fitting footwear.

"The boots were developed working closely with their workers and WHS, answering and identifying many of the problems: slips, trips and falls; ankle and soft tissue injuries; looking for footwear that would provide comfort and stability; improved risk management, and a more productive workforce."

A Personal Account

Narrabri Coal Operations underground electrician Georgia Foley is a big fan of the Crawford Boots.

"My job as an electrician is very challenging mentally and physically everyday as I am employed as an operator as well as a tradesperson," she said.

"The dirty, hard and dark environment that I work in everyday can be challenging at times but I always love what I do and the crew that I call my friends makes work all that more enjoyable.

"When I first started working underground and having to wear gumboots everyday, I was in a lot of pain and I was extremely uncomfortable throughout the work day.

"It made the day go very slow and I lost motivation doing what I love and learning new things in my career.

"It made days hard when walking was made



The Crawford Boots combine the best features of leather footwear (comfort and stability) with the best features of gumboots (waterproofness).



The boots have been a godsend for underground electrician Georgia Foley.



Podiatrist Penny Crawford.

so painful and it wasn't necessary. I found I couldn't find a gumboot to fit my foot well enough so that walking underground in the muddy, uneven ground conditions was made easy or "normal".

"I had pains in my feet and legs from no support, I had blisters constantly and I found the boots would come off of my feet easily.

"So I'm so relieved and over the moon that Crawford Boots were invented."

Georgia said that wearing Crawford Boots "improved everything so much".

"I could walk normally like wearing joggers, no blisters and my feet would not slip in and out of the boot every step I took," she said.

"The support that boots give to my ankles and the arch of my foot is a huge area that usually affects me.

"I grew up needing insoles for every shoe I wore so having experienced these boots, I couldn't recommend them more.

"Working underground, I experience uneven ground, lots of mud and water constantly and holes everywhere in roadways.

"Rolling of ankles is a major issue underground and apart from the environment being dark and rough, my ankles have been supported and I have had no issues." AMR

THE CORE OF CREATIVITY

An app to improve the lives of isolated mine workers, turning plastic waste into diesel fuel, a one-handed drone controller and 'twinning' physical assets with digital platforms are just a few of the exciting new concepts initiated by female business founders who are learning how to market and grow their companies in the energy and resources sector.

The projects are among those carried out by seven participants in the CORE Sprint pre-accelerator program who have benefited from connecting with mentors, investors and advisors to take their business to the next level.

The dedicated business growth program is for female founders of resources and energy business who are interested in exploring new opportunities, testing new strategies and creating new pathways to accelerate growth.

The program, CORE Sprint, is run by Australia's first collaboration and innovation hub focussed on the resources industry, CORE Innovation Hub, with support from Plus Eight.

Plus Eight was launched in 2016 by WA's leading technology hub, Spacecubed, as a seed-funded accelerator program helping local startups go global.

Backed by BetterLabs, Hawaiian and other major players, it has invested more than \$1.5m in 20 start-ups.

CORE Innovation National Hub Manager Renee Hakendorf said the program would give women in the resources industry support to take their ideas and innovations to a wider audience, including an opportunity to pitch their plans to an industry panel.

"The women chosen for the first round are being supported to explore new opportunities within the sector, test new strategies and create new pathways to accelerate growth," Ms Hakendorf said.

Erin Bell

WA-based participant Erin Bell, from Camp Connect, is developing an enterprise software and mobile application for remote mining, resources and construction accommodation sites.

It provides access to essential site, accommodation, mental health and wellbeing information, coordination of sports and social events, emergency response, GPS mapping, and travel management to create the ultimate worker experience.

"Mining sites can be very isolating and the industry has some of the highest rates of mental illness and employee turnover. It's an entirely different way of living, which is why building friendships and work connections is so important," Erin said.

"We created Camp Connect to provide a simple solution to the issues of communication, employee engagement, emergency management and mental health awareness.

"This is part of solving the issue of communication between office and 'non-desk' employees on a mine site.

"We are currently focused on locking in a foundation partner to trial our software in a large-scale, on-site environment."

Vanessa Tamms

Vanessa and her business partners have started working with the energy and

resources sector to trial their solution which, compared with current methods, extracts a greater proportion of precious and other metals more quickly and cost-effectively, and is non-toxic.

"The potential positive implications for both extraction efficiency and the environment are substantial," she said.

"We kept seeing amazing innovations coming down the pipeline which we thought had the potential to 'turn the dial' on tackling sustainability, so we decided to roll up our sleeves and play our part in ensuring these come to market."

Vanessa's company also turns other things that are currently considered to be 'waste' into new revenue streams - hence her company name, Trashd.

They produce various fuels such as diesel from plastic waste, which can be generated on-demand and go straight into existing engines. As well, they're turning agriculture crop residue, green waste and coffee residue into compostable products, which can replace single use or short life plastics.

Genene Kleppe

Digital Twinning Australia uses the latest technologies, commonly found in every organisation, to create a synchronised digital twin or operating replica of physical assets.

This type of digital twinning can be applied across the mining, energy, construction, infrastructure and education sectors, or any sector that has critical assets.

"The company began when I realised our Platforms as a Service (PaaS) meaningfully engaged people with their asset data, enabling them to modernise themselves, their assets and their business," Genene said.

"I'm looking forward to pitching to investors. In every meeting with new people - private or public sector - there's a moment when the arms unfold, the shoulders lift, the body moves forward, eyes light up, the face smiles and they say 'I get it!'. This is our measure of success because without this moment, we have nothing."

Annette McClelland

Annette's company Tekuma has developed a one-handed, six-degrees-of-freedom control orb for drones, robots and other devices.

The robust, universal, and intuitive technology reduces the time, cost, personnel, and training to get jobs done.

The technology allows users to intuitively control any device with just two fingers, freeing the other hand to focus on peripherals or control other devices.

"The past four years have been a whirlwind. We've gone from problem to prototype, from patents to paying customers, bootstrapping the whole way," Annette said.

"We've completed our first paid trial with UnderSeaROV with underwater rovers, and we're looking at the accessibility sector to assist people with limited mobility. We're looking forward to digging deep into the mining and energy sector to see how our technology can make an impact with new applications in this space."

Michelle Tappert

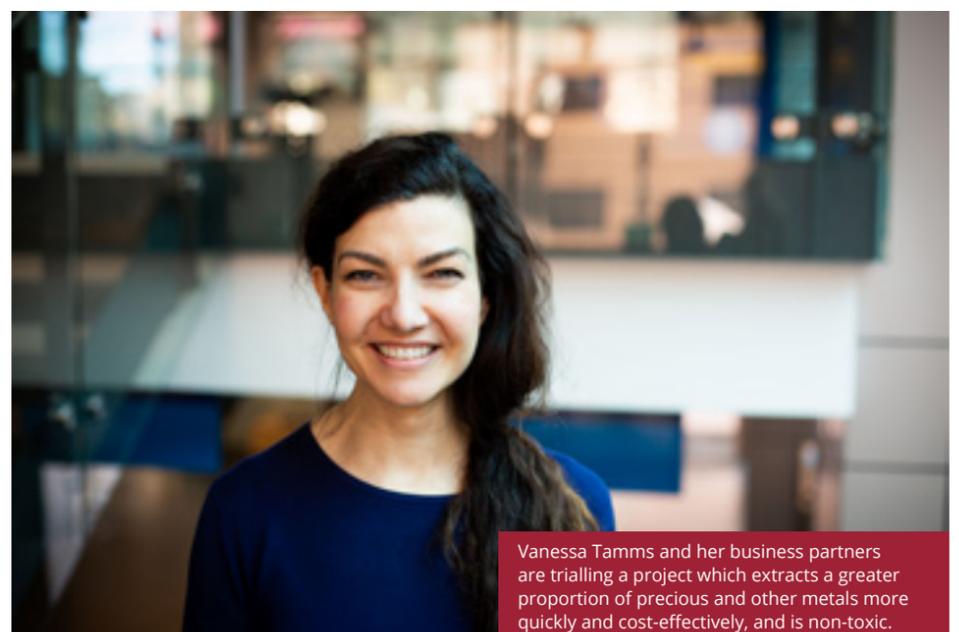
Hyperspectral Intelligence founder Michelle Tappert, who previously lived in Adelaide and had planned to move back before



Annette McClelland's company Tekuma has developed a one-handed, six-degrees-of-freedom control orb for drones, robots and other devices.



Erin Bell is developing an enterprise software and mobile application for remote mining, resources and construction accommodation sites.



Vanessa Tamms and her business partners are trialling a project which extracts a greater proportion of precious and other metals more quickly and cost-effectively, and is non-toxic.

COVID-19 struck, is based in Canada but her company analyses rocks from around the world, with the internet facilitating operations.

Her HII has developed the geoLOGr hyperspectral rock analyser for the natural resources sector, which is a rock identification system that identifies ore and waste rock with unprecedented accuracy and precision.

Hyperspectral data and digital photos collected by the geoLOGr are uploaded to HII's cloud engine where data is processed to identify ore and waste rock, ensuring

customers derive as much value from their project as possible. The geoLOGr is portable, making it straightforward to deploy in remote locations.

"The geoLOGr hardware has been shipped overseas as air freight numerous times, and all training is now being done remotely," Dr Tappert said.

"Because there is a cloud component to the geoLOGr software, working in locations with good internet connectivity is always a treat, but it isn't always necessary." **AMR**

MORE ON ORE NEEDED

Bigger investment in ore body knowledge is needed.

Obtaining comprehensive ore body knowledge should not be seen as a cost, but as an investment that has the potential to avoid company-destroying mistakes.

That's according to mining and minerals processing expert Dr John Steen, who claims the mining industry is struggling to attract new investment capital because it had a history of poor returns to shareholders.

Recent analysis showed that much of this poor performance was attributable to write-downs on capital projects because of inadequate investment in gathering information about the orebody.

While the industry paid a lot of attention to gathering data such as reserve size and grade to prove the business case for a mine, the gathering of geological data as insurance against a large downside risk event was rare. Dr Steen, the Director of the Bradshaw

Research Initiative in Minerals and Mining at The University of British Columbia, and the EY Distinguished Scholar in Metals Futures, discussed the topic during IMDEX's Xploration Tech Symposium, a highly anticipated online conference held this month, featuring a range of international speakers.

The two-day symposium, an annual event usually held in Vancouver, brought together experts at the forefront of innovation in the mining and exploration industries and examined the latest in new technologies, tools, and advanced analytics.

Dr Steen said much of the capital flowing to explorers and miners now was recycled, with investors shifting money around the industry by selling out of companies and projects and into other companies and projects. This was a particular problem in the junior mining sector.

"What the industry needs to meet commodity demand over the next 30, 40 years is new capital; we desperately need new capital," Dr Steen said.

"Across all mined commodities, the places we have to go to and the ore bodies we have to try to find, are getting more and more difficult.

"What that means is that the risks associated with developing both greenfield projects and brownfield projects are escalating. The best way to ensure against some of those big writedown risks is investing more in ore body knowledge."

Dr Steen said the development of ore body technology was one of the fastest growing sectors in mining.

"We've squeezed the productivity lemon as hard as we can," he said. "We've tried

to extract everything from the milling operation, we've automated our haul trucks.

"The big frontier now is for geology. In the past that was something that was always going to be a black box but with the new technology, the analytics and the AI that is coming through we really don't have an excuse to proceed with projects that shouldn't have gone ahead or developing a mine project in the wrong way."

Dr Steen said an analysis of poor returns from companies on the Toronto Stock Exchange showed that most poor returns came from "company destroying" writedowns because project risk had not been managed properly.

New tools were starting to make the job of ore body assessment easier. **AMR**

DIGITAL DISRUPTION

The Mining Equipment, Technology and Services (METS) sector has shown its resilience as the COVID-19 pandemic forced companies to find new ways of working.

Austmine, the leading industry body for the Australian METS sector, said it was pleased to see many examples around the world of its members changing to provide remote services, collaborating to access project opportunities, and delivering a new wave of digital technologies.

In Austmine's Securing Mining's Future Workforce eBook, Membership Manager for New South Wales and South Australia Sheldon Varcoe said mining was in an unprecedented era of digital disruption which is changing the nature of traditional roles, led by rapid technology change from the METS sector.

"A vast array of new technologies, advanced software, and the impact of the Industrial Internet of Things (IIoT) mean that traditional tasks such as maintenance, inspections, testing and operating equipment no longer need to be carried out by on-site technicians," he said.

"This provides an opportunity for the mining industry to reframe the perception of traditional roles, opening up avenues to attract gender, age and skills diversity to perform tasks such as operating remote fleets, undertaking data analysis and managing cross-functional teams."

The eBook featured METS sector leaders Dassault Systèmes, Assetivity and Intov8

exploring the changing workforce demands of the mining industry and what it means for recruitment and retention strategies.

According to Dassault Systèmes Energy and Materials vice president Thomas Grand, the current crisis is accelerating the pace of this evolution, as resources become increasingly inaccessible combined with an even stronger aversion to risk due to increased public and investor scrutiny.

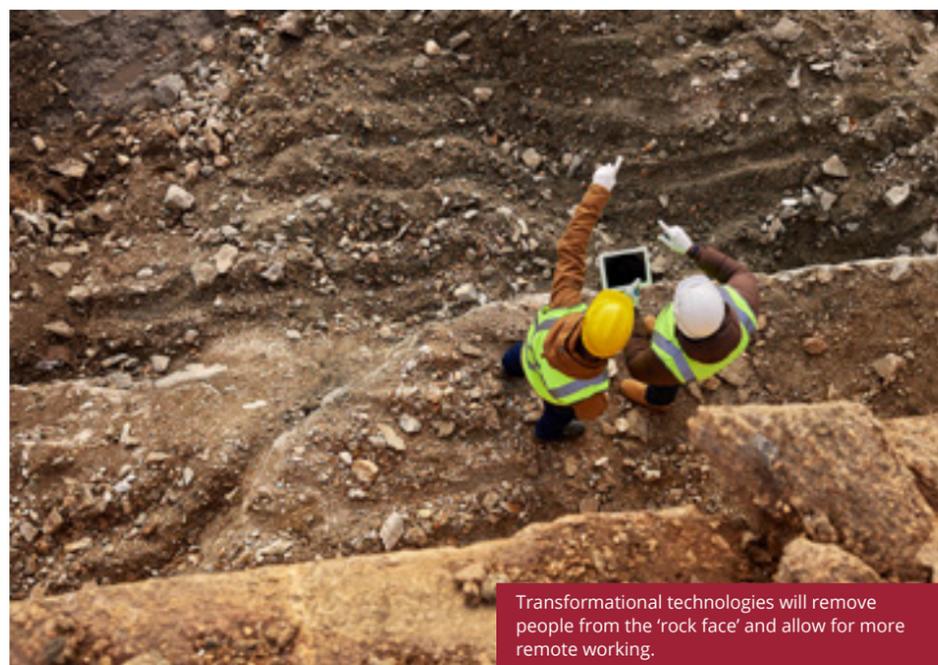
"The mining sector will increasingly need to adopt automation, simulation, and digital twin technologies in order to stay resilient. Tomorrow's successful mining company is a fully model-based enterprise with a digital twin of the organisation, its processes, its assets and its people," he said.

One option for the mining sector to adopt is transformational technology.

Dassault Systèmes Chief Executive Officer, GEOVIA, Michelle Ash said technologies such as augmented reality and virtual reality were perfect to enable remote support and/or training.

"Transformational technologies will remove people from the 'rock face' and allow for more remote working, and collaboration will continue to be increasingly adopted by the mining sector," she said.

Deloitte's recently-released Intelligent Mining in a post-COVID world report found that the future of work will include shifts in the workplace that will accelerate already ongoing remote and virtual working.



Transformational technologies will remove people from the 'rock face' and allow for more remote working.

"The crisis has accelerated and emphasised the importance of the workforce operating safely, while remaining engaged and connected," the report said.

"The enforced transition to remote working by most organisations should provide leaders with increased confidence to accelerate investment in digital capabilities and automation of operations and support processes."

This was exemplified earlier this year with Austmine partnering with the State Government to launch the WA METS Digital Mining Export Hub.

The State Government committed \$400,000 to establish this new initiative, which will enable the State to build export capacity, knowledge and opportunities between regional, remote and metropolitan small and medium sized enterprises.

In a bid to accelerate the adoption of innovative solutions, Austmine partnered with BHP to launch the BHP Austmine Supplier Innovation Program, which provides opportunities for METS companies to partner with BHP to solve some of its business challenges.

"As our industry shifts towards more remote and technologically-enable operations, our ability to find unique and innovative solutions to business challenges will be critical," BHP Group Procurement Office Sundeep Singh said.

"This program is different to our usual approach to sourcing, where we know what we need to buy. Instead, we will go to the market with a question instead of an answer and ask potential vendors how to solve it."

AMR

CULTURE AND VALUE HIGHLIGHTED



Participants from Fortescue's latest cohort of the Leadership and Excellence in Aboriginal People (LEAP) program flank CEO Elizabeth Gaines.

The 2020 Annual General Meeting of Fortescue Metals Group (Fortescue) was held in Perth recently, with shareholders having the option to attend the hybrid meeting in person or virtually.

At the AGM itself, members of Fortescue's Core Leadership and Executive team were joined by 24 participants from the latest cohort of the Leadership and Excellence in Aboriginal People (LEAP) program.

Since its inception in 2015, more than 70 Aboriginal team members have completed the program, resulting in 14% of participants since promoted into a supervisor role and a further 53% promoted or advancing their careers.

Speaking at the AGM, Chief Executive Officer Elizabeth Gaines said the company believed

that Aboriginal leaders were critical to enabling a work culture that truly supports Aboriginal people and ensures they have the opportunity to develop and grow.

"Fortescue is proud to be one of the largest employers of Aboriginal people in Australia and during NAIDOC Week, we are pleased to celebrate the history, culture and achievements of our Aboriginal team mates across all of our operations," she said.

Ms Gaines also highlighted the record performance of the entire Fortescue team during FY20, despite the unprecedented disruptions experienced as a result of the COVID-19 pandemic.

"The Fortescue Values that have guided us for the last 17 years, have shone their brightest during 2020," she said.

"By keeping our values of safety and family at the heart of every decision we made, we kept our team, our families and our communities safe.

"We are especially proud of how the mining sector came together to manage the industry-wide issues as a collective, sharing best practice, caring for our most vulnerable and forming a united front.

"Significantly, we clearly demonstrated that Australia is a reliable supplier of commodities to global markets and we sustained our strong contribution to the West Australian and national economies."

Fortescue's achievements over the FY20 financial year included:

- Record full year shipments of 178.2mt, 6% higher than FY19

- C1 cost of US\$12.94/wmt, including around 22c of COVID-19 related costs
- Revenue of US\$12.8b, 29% higher than FY19
- Dividend payout ratio of 77%, increasing returns to shareholders

"We believe that Aboriginal leaders are critical to enabling a work culture that truly supports Aboriginal people and ensures they have the opportunity to develop and grow," Ms Gaines said.

"Fortescue is proud to be one of the largest employers of Aboriginal people in Australia and during NAIDOC Week, we are pleased to celebrate the history, culture and achievements of our Aboriginal team mates across all of our operations." **AMR**

INDIGENOUS NDT TRAINEESHIP

The NDT traineeship program will provide opportunities for the local Aboriginal and Torres Strait Islander community.

Goal Indigenous Services and Stork Technical Services Australia have joined forces to launch their Aboriginal and Torres Strait Islander NDT (Non-Destructive Testing) Traineeship program in WA.

This program is believed to be the first of its kind, leading the way in Indigenous involvement and development for the NDT industry.

Goal Indigenous Services will recruit, mentor and support the trainees, with Stork providing the technical expertise and mentoring, along with an environment to grow and develop into qualified NDT professionals.

The South Metropolitan TAFE is the assigned training facility providing a bespoke, tailor-made curriculum.

Stork regional director Tony McNulty said Stork was delighted to kick off the program. "We look forward to expanding this initiative throughout our operations," he said.

"Delivering traineeships in the regions we operate in enables us to provide a great opportunity for a long and exciting career in Non-Destructive Testing for local Indigenous people.

"This aligns with our goal to be a socially responsible contributor in the local community and also aides in being a globally sustainable business."

The program is up and running with its first two participants placed at separate Stork



project sites.

Xavier Clarke of MD Goal Indigenous Services said the company's first trainee is working with Stork's delivery team in Kwinana and the second trainee started recently on one of Stork's new NDT and heat treatment contracts.

"We are very excited to see this program take off and provide opportunities for the local Aboriginal and Torres Strait Islander community," he said.

Stork's Kwinana Service Centre will deliver the traineeships and provide everything

the trainees need to make the program and their careers a success.

Upon completion of the program, the trainees will enter the workforce as fully qualified NDT technicians holding a Certificate III in Engineering along with 3 x NDT qualifications.

"The end goal is for the trainees to become fulltime Stork employees following completion of their traineeship and to continue working on site for our clients," Mr McNulty said. "We intend to continue the traineeship program, once the first candidates have completed their studies,

with a second intake."

Stork Technical Services Australia provides inspection, non-destructive testing, heat treatment and corrosion and integrity services including blasting and painting, insulation and cladding, scaffolding, rope access and fireproofing across all of the major industry sectors involving project fabrication, manufacturing and site construction services.

Major sectors include mining, oil and gas, power generation, refining and petrochemical. **AMR**

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UNDERSTANDING TRANSPORT INSURANCE

The wheels never stop turning in the mining industry, which relies on the efficient and safe transportation of goods across Australia and around the clock.

Whether it be the transportation of machinery, building materials, dangerous goods or general freight, trucking companies are vulnerable to a myriad of risks.

This can include damage to goods or heavy equipment worth millions of dollars or to the trucks or trailers themselves if there is a collision or breakdown.

There are also risks for the drivers who have to manage fatigue whilst covering long distances as they traverse the vast continent to reach remote mine sites.

Whether a company is running a small fleet or a larger operation crisscrossing the entire country, it is crucial to have adequate insurance. The types of cover required will depend on what services are being provided and the goods being transported.

Connect Business Insurance specialises in providing insurance cover and risk management to the mining industry and can tailor solutions that are specific to the needs of trucking and transport companies. CBI understands there is never a one-size-fits-all approach, but these are some of the relevant types of insurance it can provide:

Carriers insurance protects transport operators for loss or damage to their customers' goods or equipment while in the operator's conveying vehicle or premises during transit. Goods may include heavy equipment, construction materials, machinery or general supplies for mine sites.

Damage may be the result of a crash, overturning, jack-knifing or derailment of the conveying vehicle or the impact of goods with something outside the vehicle.

Or it could be the result of a fire, explosion, lightning, flood or a malicious act.

Carriers liability insurance covers legal liability relating to compensation for loss or damage to goods while in transit.

Depending on the company's individual needs, cover can be extended to include errors and omissions such as delays and mis-delivery.

Motor fleet insurance is crucial for transport companies as the trucks and trailers are the backbone of the business.

The vehicles themselves are worth a lot of money and if they are damaged or written off, it could be financially devastating to a business without adequate insurance.

Having just one vehicle off the road can cause significant disruption to the operations of both the transport company and the client.

Cover is available for business use of all vehicles including trucks, utes, vans, sedans, forklifts and trailers.

- Full comprehensive insurance covers loss of or damage to the vehicle due to collision and other accidental damage, fire, theft and includes indemnity for legal liability for third party property damage.
- Third party property damage cover only provides protection for any damage to third party vehicles or other property involved in the incident.
- Third party property damage from fire and theft provides cover limited to the vehicle should it be damaged by fire or stolen.

Business interruption (downtime) insurance provides coverage for loss of income while a vehicle is not operational.

This insurance will help keep transport companies on the road as a result of unforeseen circumstances, such as extreme weather events, which could cripple a business in the absence of adequate insurance.

It ensures businesses can cover ongoing costs such as staff wages, supplier invoices, rent or loan repayments during a temporary crisis to ensure its survival.

Workers compensation is always a big-ticket item in the mining industry but for transport companies which rely on drivers to get goods from A to B, it is crucial.

Driving is dangerous at the best of times but when you add long shifts, huge distances, treacherous roads and unpredictable weather into the mix, the risk exposure is compounded.

Drivers who suffer an illness, disability or injury as a result of a crash or other driving duties are entitled to compensation. Workers compensation claims are complex and can be very lengthy and costly so it is important to have the right insurance.

Each year Australian workers file more than 100,000 workers' compensation claims, according to Safe Work Australia. Standard insurance covers employee wages while they are not able to work, medical expenses and rehabilitative services designed to get them back on the road.

It is a legal requirement for every Australian employer to provide workers compensation insurance.

Public liability insurance is another type of cover that is commonly needed in the mining industry. It is triggered in the event the insured company causes accidental property damage or personal injury to a third party.

It will generally pay costs relating to the investigation, defence and settling of claims as well as any compensation a business is found liable to pay.

It can even cover emotional distress or shock that a business causes another person.

While many insurers purport to offer public liability insurance, many exclude any type of mining work.

Therefore, companies may need a specialist insurance policy to ensure it covers mining related transport.

While individual insurance will vary, most small to medium-sized businesses may need a policy that covers the following:

- The cost of injuries to third parties including medical costs
- Costs of damage, destruction or loss of physical property
- The cost of damages stemming from the actions of employees
- Costs of legal settlement or defence
- Damages to buildings or materials

Q&A with TTS WA owner Shane Shingles

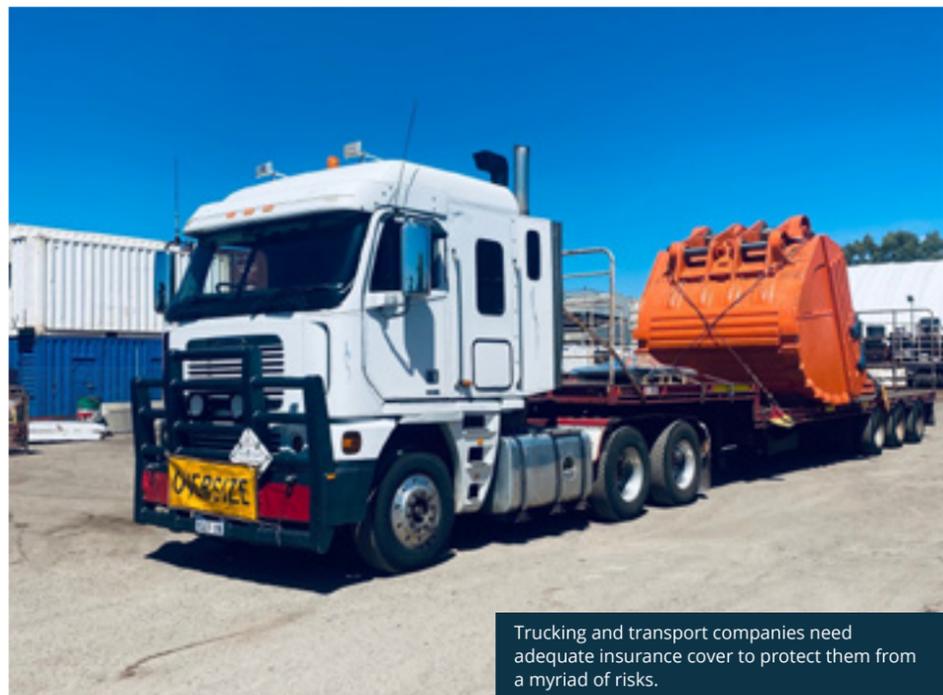
Q: Can you provide a brief overview of TTS WA?

A: We are a family-run business operating a dedicated Australia-wide freight service using triple road trains and B Doubles. We offer a range of transport solutions from single oversize loads to hotshots.

We do a lot of work for the mining and building sector, including BHP and Coates Hire, as well as for the Defence Force and Australia Post. TTS started with just one prime mover transporting panels from Sydney to Perth for Thermal Installations.

The company has thrived and is now operating in WA, Sydney, Melbourne, Brisbane, Adelaide and Darwin with 12 road trains and five B Doubles. The company transports general freight, machinery, building materials and miscellaneous goods to mine sites.

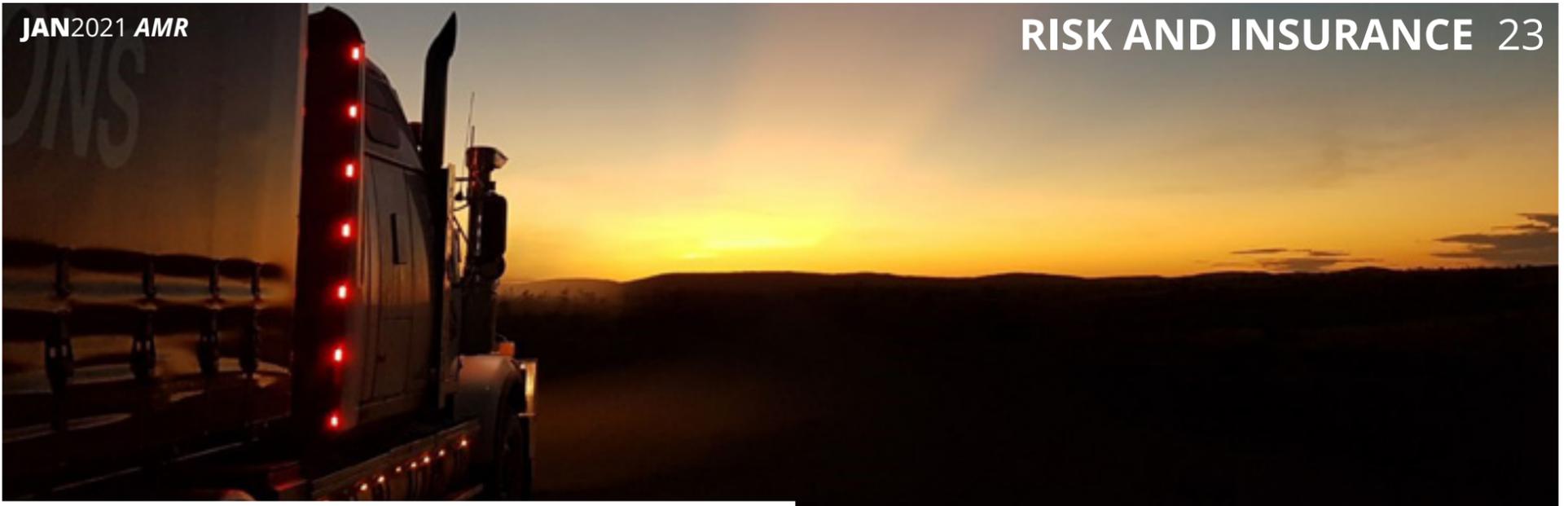
Q: What risks are transport and trucking companies exposed to?



Trucking and transport companies need adequate insurance cover to protect them from a myriad of risks.



Total Transport Solutions (TTS) WA is a family-run business operating a dedicated Australia-wide freight service.



A: When you're driving out into the desert, there's a lot of risks including cattle, other road users, breakdowns and tyre blowouts.

Fatigue can be a major factor for drivers and it must be managed, especially on longer journeys.

There is risk to the drivers, the fleet and to the goods being transported in the event of a crash, collision or breakdown.

Q: How can these risks be mitigated?

A: Ensuring the vehicle and load gets checked at least daily, including tyres, oil and water and making sure you have the right equipment for the job.

If a truck breaks down, the heat can be a risk for the driver so it is essential the truck has adequate supplies including a fire extinguisher, ration packs and satellite phones.

It is important to be on top of servicing and maintenance requirements and to ensure all the drivers are adequately trained in the safe operation of the vehicles and management of fatigue

Q: Why is it so important to have adequate insurance?

A: Each triple road train can be worth up to \$1m. If one of them burns down or is written off in an accident, it can ruin a business if they don't have adequate insurance.

Additionally, the goods and equipment being transported can easily be worth millions. Recently we transported a crate which had \$3m worth of machinery in it; we hot-shotted it from Perth to South Australia.

Loads could include gold samples, 3D laser machines, dump trucks, underground machines, loaders, diggers, excavators, drilling machines, so you are talking about very expensive machinery.

You couldn't operate a transport company in the mining industry without insuring yourself against all that.

Contact Paul Cohalan at Connect Business Insurance on:
Phone: **1300 477 662**
Email: insurance@connectbi.com.au
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TTS WA now operates in WA, Sydney, Melbourne, Brisbane, Adelaide and Darwin.



TTS WA offers a range of transport solutions from single oversize loads to hotshots.

-  mining
-  construction
-  transport
-  engineering



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SOUTHERN STRONGHOLD

The Port of Albany's main exports are grain and woodchips.

BY KATHLEEN SOUTHWAY

Southern Ports services a 400,000km² area in WA – bigger than the land size of Germany.

Created in 2014 through the amalgamation of the three WA ports of Albany, Bunbury and Esperance, Southern Ports looks after all sea trade in the southern and southwest regions of WA.

Main goods traded through the three ports include minerals, grains and wood products. The commencement of the new Executive Leadership Team (ELT) in 2020 saw Southern Ports achieve a very successful FY20, reaching a total trade of 32.2mt, which is a 13% increase from the year before.

Southern Ports chief executive Steve Lewis says the resilience of its customers through COVID-19 played a significant part in the positive outcome for the organisation.

"Trade held up very well and the standouts were Mineral Resources doing better than budgeted in terms of their throughput through Esperance port," he said.

"Alcoa Worsley in Bunbury continued to exceed and maintain their alumina exports.

"Albany has been supporting Grange Resources and their Southdown project through de-risking work, reducing capital costs down and examining what their export profile might look like."

The Port of Albany does not traditionally trade major minerals and, with Southdown planned to come online around 2025, there will be an additional 5mtpa of magnetite concentrate exported through the port.

With a total of 14 berths among the three ports, Southern Ports contributes over \$9b to the economy.

Profit before tax in FY20 was \$55.8m, an increase of 70% from FY19, while total revenue jumped 31% to \$149.5m.

Master Planning

Five pillars drive the strategic direction of Southern Ports: trade development, supply chain, sustainability, port development and innovation.

Master planning for all three ports is underway as part of Southern Ports' port development strategy.

"Port development is important as it's all about keeping up with the future, where technology is going, including the future direction of the shipping industry and sustainability goals," Mr Lewis said. "They're all wrapped up into master planning."

With the newly created General Manager Port Development role, Southern Ports is also recruiting engineering, asset management and project and planning expertise to its port development team.

"This team will add great value in the new year with our input to Infrastructure WA, the delivery of key capital projects and supporting our strategic growth plans," Mr Lewis said.

WA Premier Mark McGowan is the minister responsible for Infrastructure WA, for which one of the government agency's responsibilities includes delivering the State Infrastructure Strategy to address infrastructure needs and priorities for the next 20 years.

"We started master planning in Esperance a few months ago and we're just about to start Bunbury in January 2021, with announcements on Albany starting in early February 2021," Mr Lewis said.

"All the master planning is targeted to be completed by 30 June next year, or even a few weeks after, if necessary, to ensure quality of the outcome.

"It's going to define the development path for each of the ports based on trade projections for the next 20 years and, therefore, the development of our 10-year investment plan."

By this time next year, all three ports will be in good stead with their development plans. Southern Ports is spending \$60m over the next two years to renew assets at all three ports and improve their supply chains.

"The \$60m for all three ports is a big program for us," Mr Lewis said. "We will be improving the drainage and roads in Esperance and improving some of the Berth

8 facilities in Bunbury, including the wharf and road network there, for a more efficient movement of trade."

Supply Chain

In early 2020, Southern Ports rolled out a project using geographic information system (GIS) to look into its supply chain at all three ports, digitally representing where all its customers and trades were.

"We now have a very good understanding of the supply chain and where are some of the investments are outside of the port that we can recommend to government or our customers," Mr Lewis said.

"The use of technology and very up-to-date GIS picturing has been very illuminating for the organisation and provided us deep and detailed insight on our supply chain.

"I think ports do their best work outside their fence and, we have a very good running port, but at the same token it's those supply chains, those rail and road and pipelines that really add to the efficiency of our customers, and we're doing a lot of work in that."

Trade Development

Mr Lewis says trade development is a primary role of ports and the challenge is marketing the capacities of the port more effectively.

"Our work in trade development is making sure we promote the capacities we have, using the WA trade offices in various international locations and building on the synergies we have already," he said.

"We have very good relationships with the WA Department of Jobs, Tourism, Science and Innovation (JTSI) and with our customers."

Southern Ports is working with customers to determine what technology the ports could implement. It currently employs drones, uses augmented reality and is exploring the future and changing face of shipping including international environmental standards for fuel.

"We are getting ourselves in good shape for the future and ensuring our customers can also continue trading through our ports with confidence, knowing that we're working

with them to build trade and opportunity," Mr Lewis said.

Sustainability and Innovation

Sustainability is one of the five pillars. Initiatives at the Port of Albany have to-date reduced waste, weeds, contaminants, heritage and water.

"We aspire to create sustainable ports and in this new year we will build from the bottom up sustainability work our Albany team has successfully undertaken," Mr Lewis said.

"We are very much a port around intergenerational assets, making sure we put the port in good shape for future customers, from environment to heritage and also how we bring technology in to make the ports viable."

Innovation is another focus pillar and includes improvement in processes and systems.

"We build upon the work our Esperance team has done this year in experimenting with thinking smarter about how they go about their work, looking at all technology and expanding this across all of our ports," Mr Lewis said.

Bunbury

Bunbury is WA's second city by population, making the Port of Bunbury significant in terms of the support it provides the State. Goods traded through the Port of Bunbury include alumina, caustic soda, methanol, tugboats, woodchips and bulk materials.

"The port has the largest land holdings of any port in Australia at 474ha and there is a real good opportunity for the port to develop over time to take some of the Perth freight task," Mr Lewis said.

The WA Government endorsed the independent Westport Taskforce's recommendation for a future container port to be built within the Kwinana Industrial Area by 2032 as part of long-term solutions for Perth's future freight needs.

"There's still a lot of opportunity for us to make sure the Port of Bunbury is ready for various trades that might come to Bunbury, particularly some of the bulk trades between Fremantle and Bunbury," Mr Lewis said.



A vessel docked alongside berth four in the Bunbury Inner Harbour.

There are further plans for the Port of Bunbury to support trade coming out of the potential Advanced Manufacturing Hub touted for WA's Southwest region.

Feasibility studies are underway by the WA Government to build a facility within the Bunbury Geopraphe area as part of its efforts to bring more manufacturing back to the State.

The WA Government has also invested \$15.5m in the new Turkey Point Bridge in Bunbury, with the aim of completion by June 2022, marking the first stage in the Port of Bunbury's expansion plans.

The new bridge and road will provide alternative access to the Port's northern berths and will support the future construction of Berth 10 and rail expansion plans.

"There are additional berths at the Port of Bunbury if a customer needs them, the Port is currently running very efficiently and, in terms of development, the capacity can be developed incrementally," Mr Lewis said.

"The scheduling in Berth 8, which is our busiest berth and takes large amounts of minerals, has delivered coordination and significant cost savings to customers of the facility over the last 12 months."

Albany

The Port of Albany is the oldest port in WA, with grain and woodchips being the main goods traded.

"It's a very good port, with a high tourism element, and it is historically tied to the town of Albany," Mr Lewis said.

"This brings a real commitment on Southern Ports' part to develop the Port in a way that is commensurate with the town."

There has been a complete moratorium on cruise shipping since COVID-19 began.

"Berths 1 and 2 have been set up to support cruise shipping and it'll be good to see the return of this industry at the Port of Albany," Mr Lewis said.

"Tourism is an important industry in WA but also the Port of Albany.

"The Port is also ready to support Grange Resources' Southdown magnetite project when it comes online.

"We are currently looking at the land adjacent to Berth 6 in Albany to see whether it can be better configured to support a more efficient supply chain for some of the smaller trades at the Port."

Esperance

The Port of Esperance is a deep-water port that can cater for Cape size vessels up to 200,000t.

A \$54m upgrade in 2002 made it the deepest port in southern Australia and the largest exporter of nickel concentrate in the Southern Hemisphere.

Goods traded through the Port include iron ore, nickel, grain, fuel, fertilisers, sulphur, spodumene, copper and woodchips.

Rail connection to Esperance is important as the Port services mines and facilities up to 700km away including areas such as Yilgarn, Kalgoorlie, Leonora and Koolyanobbing.

"Master planning at the Port of Esperance began a few months ago," Mr Lewis said.

Drainage and roads in Esperance will be improved as part of Southern Ports' \$60m investment over the next two years amongst each of its three ports.

"The Port is also cognizant that it could be quicker for some of the miners in South Australia to look at potentially coming through Esperance," he said.

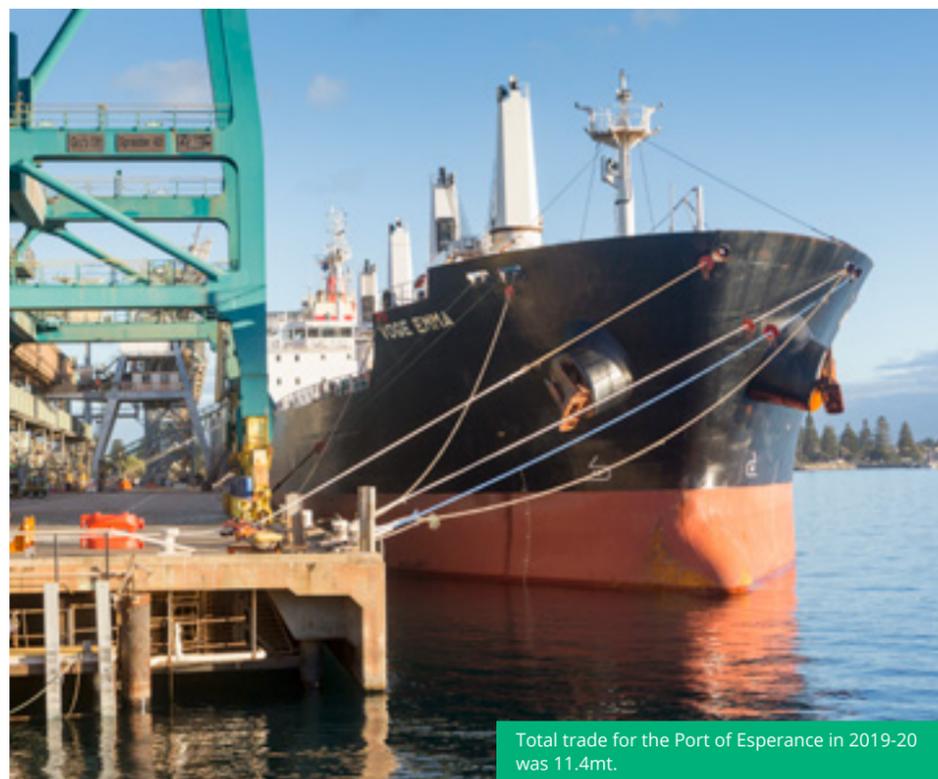
"We take a wide view of expansion, including supporting these mines to get their products out through the Port of Esperance."

Current clients of the Port include CBH and Mineral Resources, which recently achieved a throughput run rate of 11.5mtpa in June 2020.

Today, a total of 200 ships and 11mt of trade passes through the Port of Esperance each year. **AMR**



Alumina exports made up 66.45% of the Port of Bunbury's total trade in 2019-20.



Total trade for the Port of Esperance in 2019-20 was 11.4mt.



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Mediterranean Shipping Company (MSC) is the world's first shipping line to offer customers a complete carbon neutral program. For years, MSC has been investing heavily in low-carbon technology to help meet the targets to decarbonise shipping.

Now Australian exporters and importers can share this vision and take responsibility for their emissions by joining the MSC Carbon Neutral Program, created in partnership with South Pole.

The program complements MSC's strategic approach to sustainability and massive investment in reducing emissions and minimising the environmental impact of its fleet.

Partnering with South Pole

Through the partnership with South Pole, the world's leading developer of emission reduction and renewable energy projects, MSC's customers have access to premium climate action projects.

These projects improve lives, livelihoods, and landscapes for communities around the world.

The MSC Carbon Neutral Program supports projects that deliver measurable benefits aligned with the United Nations Sustainable Development Goals.

Accelerate the Transition

The MSC Carbon Neutral Program enables shipping companies to accelerate their

transition to a carbon-neutral supply chain, taking responsibility for their cargo's environmental impact and compensating through an offsetting program.

The emission reduction projects help fight climate change and bring wider sustainable development in local communities, such as poverty reduction, health improvements and access to clean water.

CO₂ Emissions Compensation

The company's team of experts help calculate the emissions generated by the volume of cargo moved.

Users select one of the projects, part of the MSC Carbon Neutral Program, to compensate the unavoidable emissions of

the marine and inland transportation of goods. Companies may decide to offset all cargo shipments processed by MSC or only a few.

South Pole will provide a "Verified Carbon Units Certificate of Retirement" delivered by the Verified Carbon Standard (VCU) Registry, and a climate action certificate attesting the amount of CO₂ compensated by investing in this program.

Further information on the MSC Carbon Neutral Program can be found at www.msc.com/carbon-neutral

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MAKING A DIFFERENCE

The operation is today made up of an underground block cave mine, a sub-level cave and an ore processing plant which produces copper concentrate for export.

BY KATHLEEN SOUTHWAY

The CMOC-Northparkes mine produces copper and gold from the world's most automated underground mine, about 27km north-west of Parkes in NSW.

An achievement five years in the making, driverless loaders are controlled from the surface, with ore loaded and transported to the underground primary crusher where it is crushed, conveyed and hoisted to the surface.

Today Northparkes is a highly mechanised and efficient block caving and sub-level caving operation, with campaign-based open-pit mining.

A total of 1.168mt of copper and 1.464moz of gold have been produced since operations began in 1994.

In July last year, after 26 years of operations, Northparkes celebrated its 400th shipment milestone.

The mine also executed its biggest shutdown in its almost 30-year history in September last year, with all major activities successfully completed, without serious zero harm incidents.

About Northparkes

Northparkes is a joint venture between China Molybdenum Company (CMOC) (80%) and the Sumitomo Group (20%).

Northparkes was the first mine in Australia to use the highly efficient block cave mining method, now used in several mines throughout the country.

Located on the Macquarie Arc, Australia's foremost gold and copper-gold porphyry belt, the Central West region in NSW is home to other world class mines such as Cadia and Cowal.

Northparkes is celebrated for its high-quality copper deposits and low-cost operations. It is also both a farmer and a miner, owning about 10,314ha of land.

Mining operations occupying 1630ha, while

the remaining area operates as a commercial agricultural and logistics operation.

Northparkes has also contributed more than \$400m to the Central West region through employment, sponsorships, government payments and local businesses over the past five years.

CMOC

CMOC is an international natural resources company with a diverse portfolio of high quality, low cost, long life assets that are focused on mining, processing, smelting, product technology, trade, research and development.

The company has a US\$12b market capitalisation and currently produces molybdenum, tungsten, copper, gold, niobium and phosphate globally.

A streaming agreement between CMOC and Triple Flag will see Northparkes benefit from the long-term commodity purchase contract of its gold and silver by-products.

As part of the agreement, CMOC receives US\$550m upfront and delivers 54% of total gold produced at Northparkes up to 630,000oz, then 27% thereafter, and 80% of total silver produced up to 9moz, then 40% thereafter.

CMOC will also receive a cash payment of 10% of gold and silver spot price for each ounce delivered.

Operations

Northparkes began with open pit mining and later progressed to block cave and sub-level cave mining methods.

The operation is today made up of an underground block cave mine, a sub-level cave and an ore processing plant which produces copper concentrate for export.

Ore is processed onsite to produce a high-grade copper concentrate and transported by road train to the Goonumbla rail siding, about 13km from the mine.

The containers are then transported to Port Kembla by rail, with concentrate shipped to

customers primarily in China and Japan.

Production is currently sourced from the E48 Lift 1 block cave mine, E26 sublevel cave as well as open cut stockpiles.

The conventional flotation plant onsite includes surface crusher, stockpiles, active grinding mills, froth flotation, filtration and thickening.

The comminution process consists of two parallel grinding modules and a single line flotation plant, with SAG, ball and tertiary mills.

First full-scale production began from the E26 Lift 1 block cave in 1997, which mined the orebody at a depth of 480m below surface.

Almost two decades later, the company began construction of a new block cave mine on the E48 copper and gold deposit in 2006, with production officially commencing in September 2010.

In 2015, the mine made history by reaching 100% automation in its E48 block cave mine, removing the need for manpower underground and allowing mine staff to control the loaders from an air-conditioned room on the surface.

That same year, Northparkes was named Prospect Mining Hard Rock Mine of the Year and the Life of Mine Studies and Exploration department at Northparkes was formed to realise the value of its mineral potential.

In 2016, the company began production from the E26 sub-level cave, producing 1mtpa to supplement the lowering grade of the current block cave feed.

Automation, Productivity and Cost Savings

Northparkes is currently seeing production records from its underground mine, with one operator controlling three loaders at the same time.

A total of six autonomous Sandvik LH514 loaders operate 500m below the surface, with ore trammed from the draw bells and

11-12t loads dropped in the ROM bin for crushing.

Operators on the surface assume control only when loading.

Northparkes managing director Hubert Lehman said this breakthrough allows the company to operate continuously, 24/7, without pause.

"We have higher daily production at a significantly reduced cost," he said.

"Importantly, complete automation reduces our risk profile as operators are located on the surface, rather than in the cab, thereby eliminating exposure to hazards such as dust, noise and vibration.

"We are committed to continuous improvement, innovative in our approach and we embrace technology, adapt quickly and find new and smart ways of doing things."

CMOC executive chairman and chief executive Steele Li said complete automation positions Northparkes as an outright industry leader in Australia and globally.

"Northparkes is a benchmark for others in the industry," he said.

"Since acquiring the operation, CMOC has given the automation project our full support and it is wonderful to see it come to fruition."

Expansion Plans

In April 2019, CMOC and Sumitomo announced the final approval of the Expansion Project at Northparkes, with \$72m over two years and works targeted for completion by December 2020.

The Expansion Project included a range of upgrades to the Northparkes underground mining, ore processing and infrastructure facilities to enable an increase in throughput capacity from 6.4mtpa to 7.6mtpa.

CONTINUED ON P28



In 2015, the mine made history by reaching 100% automation in its E48 block cave mine, removing the need for manpower underground and allowing mine staff to control the loaders from an air-conditioned room on the surface.

CONTINUED FROM P27

It also involved the construction of a new secondary and tertiary crushing building, with a hoisting system upgrade expected to be completed by December 2021.

Development has now commenced on the new block cave E26 Lift 1 North with full production expected in mid-2022. An investment of more than \$200m over a three-and-a-half year period will see this new block cave producing about 40mtpa of ore over a 10-year period.

The project, which is expected to employ up to 180 people at the peak of construction, will deliver 11km of underground development, an underground primary crusher, conveying systems and associated infrastructure.

There will be an upgrade to the ventilation system at the new block cave mine and the mine operation will utilise an increased level of automation and digitisation.

Mr Lehman says this is a major investment in the future of Northparkes and he looks forward to continuing contributions to local community for more years to come.

"CMOC's investment in the Expansion Project and the E26 Lift 1 North Project demonstrates our confidence in the sustainability and longevity of our operations, which will enable us to achieve our vision of 'a century of mining together'," he said.

"We know the exploration potential of Northparkes and we believe we will discover more copper and gold deposits to take us even further into the future.

"Northparkes is the world's most automated underground block-cave mine and we are proud of our history and achievements."

Mr Li says CMOC is very excited to see this project come to fruition and to see Northparkes continuing to develop and grow.

"Northparkes plays a pivotal role in our strong and long-term presence in Australia as an internationally renowned mining company," he said.

Northparkes has approved development consent to mine until 2032 and has 125mt of ore reserves and 471mt of resources, as at December 31, 2017.

Community Investment and Partnerships
The local Parkes community is proud of its local mine that has supported the local economy and region for more than 25 years.

The first edition of the monthly enewsletter was launched in July 2020 to communicate with the local community about the mine's operations, people and culture, career opportunities, scholarship programs, upcoming events as well as investment programs and partnerships.

As part of dust mitigation efforts, the mine planted barley into a 79ha area to mitigate dust lift-off for 18-24 months and provide ground cover as well as erosion protection from wind.

Northparkes has two community investment program rounds each year, with \$40,000 awarded to successful applicants each round, totalling \$80,000 in funding.

To-date, more than \$760,000 has been invested in the Parkes and Forbes shires.

"To achieve our vision of 'A century of mining together', we invest in the future of our community through meaningful partnerships," Mr Lehman said.

"The community investment program has

been one of the successful programs we have used to support the sustainability of the Parkes and Forbes shires.

"Despite the COVID-19 health pandemic, we want to ensure we are still able to support our local community through this investment program."

The company supports initiatives that contribute to the local Parkes and Forbes regions in the following categories: economic development, culture and recreation, education and youth, environment and health.

Along with these programs, Northparkes has also committed to a number of long-term community partnerships:

- \$80,000** Parkes Grants Officer and Aboriginal Project Officer
- \$30,000** Parkes Sports Grants
- \$11,150** Parkes Life Education
- \$16,500** Elvis Festival
- \$5000** Parkes Agricultural Show

The company also donates in-kind materials including conveyor belts, power boxes, first aid boxes, and office equipment including desks, chairs and filing cabinets.

Northparkes has set up two committees: the Community Consultative Committee (CCC) and the Wiradjuri Executive Committee (WEC).

The CCC meets twice a year to update members on business operations and receive community feedback.

It is chaired by a neighbouring landholder and includes representatives from Northparkes Mines, community members, local business groups, Parkes Shire Council and Forbes Shire Council.

The WEC meets quarterly to identify

opportunities and develop projects which support Wiradjuri people in the community. The WEC is made up of two members from the Wiradjuri Council of Elders, two from Peak Hill Local Aboriginal Land Council and two senior Northparkes employees.

The Northparkes Source community newsletter is published twice a year and distributed online and via local newspapers. The company has also been conducting Open Days at its operation for more than 20 years to work collaboratively with neighbours.

Northparkes hosts formal onsite meetings with its neighbours twice a year and meets with neighbours individually throughout the year.

From time to time the company offers neighbouring landholders the opportunity to attend workshops on farming operations, as well as holding special tours to view selected projects.

A text message alert system is offered by Northparkes to its neighbours to provide updates regarding the company's dust mitigation activities during windy and dry weather conditions.

The Northparkes Volunteer Leave Program was also created in 2013. To-date, Northparkes employees have donated over 3000 volunteer hours.

The program has been recognised by industry peers as best practice and an industry leading program.

Northparkes won the NSW Minerals Council Environment and Community Excellence Award in August 2014 and the Australian Mining Prospect award for Community Interaction in October 2014. **AMR**





FOREFRONT OF INNOVATION

Forefront Services has opened a new facility in Parkes to fulfil fabrication and installation contracts at Northparkes.

Forefront Services has again shown its commitment to NSW regional development, and to supporting Northparkes Mines, by opening a new facility in Parkes.

The facility will provide the equipment and resources to fulfill the fabrication and installation contracts awarded to Forefront Services for the E26L1 project.

Not only will this new facility help with successful project execution, but it will also create a raft of new job opportunities in the town.

Forefront Services has secured several multi-million-dollar contracts across the E26L1 project, including the supply and installation of civil works and large-scale steel fabrication, and installation for both the crusher and new materials handling system.

The Forefront Services team specialises in project management, civil construction, steel fabrication and installation, and are renowned for their highly skilled workforce.

The company has the people and resources to successfully execute such an important project.

Forefront is continually investing in the upskilling of local labour through a regular intake of apprentices and trainees and partnering with TAFE NSW on employment programs.

The Forefront Services workshop facilities in Parkes are fully equipped with an extensive and varied range of equipment, and is perfectly suited to carry out the large scale fabrication component of the project.

The workshop has a large fabrication area, including overhead cranes, which flows seamlessly into a purpose-built blast room

and then onto a temperature-controlled paint booth.

Forefront is very proud to have secured the E26L1 North contracts and appreciates the faith shown by CMOC to appoint a local fabricator and constructor to carry out the works.

Forefront also works together with Northparkes on improvements and innovations in day-to-day operations such as improving draw point brow protection.

AMR



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Our specialised services include:

- Multidisciplinary construction management and execution.
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- Vertical construction packages including civil and electrical disciplines.
- Specialist heavy lift and crane services.
- Plant commissioning.
- Demolition and remediation works.

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Forefront's team of experienced construction personnel provide multidisciplinary project management and construction services for the industrial and mining sectors. Our experience covers all aspects of civil, structures, mechanical, piping fabrication, equipment set out and installation. Our capabilities in the construction market stretch from greenfield projects through to modifications or expansions to existing process infrastructure.



PAINTING THE GOLDFIELDS RED

Mining activities at the King of the Hills (KOTH) mine.

BY KATHLEEN SOUTHWAY

It's been a solid year for Red 5 Limited, a multi-asset, mid-tier Australian gold producer with two underground operations in the Eastern Goldfields of WA – Darlot and King of the Hills (KOTH).

The Darlot gold mine is about 900km northeast of Perth in the Leonora-Leinster mineral province, with the KOTH mine 80km south of Darlot.

Both mines were acquired by Red 5 in October 2017, with total gold production at about 100,000ozpa, all processed through the Darlot mill.

In FY20, both operations produced a total of 92,779oz of gold, recovered from 943,861t of ore, processed at an average head grade of 3.3g/t Au.

Red 5's target for 2022 is to maintain the two operating mines and to add another processing plant to its list of assets.

KOTH Mine

Situated between the Goldfields Highway to the east, the Goldfields Gas Pipeline to the west, the KOTH mine is about 28km north of the town of Leonora, WA.

Mining is a combination of bulk underground stoping and airleg mining of selective high-grade gold veins, with ore trucked to the nearby Darlot processing plant.

Total historical production for the KOTH mine between 1985-2019 was 2moz gold, with underground mining commencing in 2018.

KOTH currently has an open pit, underground mine, ROM pad, offices, HV workshop and tailings storage facilities.

The company's major exploration program across Leonora-Leinster in WA have resulted in the discovery of an emerging bulk mining opportunity at KOTH.

A final feasibility study was completed in September 2020 for a stand-alone bulk mining and processing operation to be built at KOTH.

KOTH is a major Australian gold deposit with a bulk mineral resource of 4.1moz and ore reserves of 2.4moz of contained gold.

KOTH Project

Capital costs of \$226m will see the construction of a 4mtpa carbon-in-leach (CIL) processing facility and long-term bulk

open pit, underground and satellite pits mining operation at KOTH.

First gold production is scheduled for the June 2022 quarter.

Ore will be fed via a gyratory crusher and processed in a single stage SAG mill. The common CIL extraction method will produce gold doré for sale to the Perth Mint. The mill has been designed to accommodate increased capacity up to 6mtpa.

Over the initial 16yr mine life, KOTH is forecasted to deliver about 146,000ozpa of gold at an AISC of \$1415/oz. The first six years will average 176,000ozpa of gold at a forecast AISC of \$1339/oz.

Further infrastructure onsite will include a 25MW gas-fired power station, sourced directly from the Goldfields gas pipeline, and a modern accommodation village.

Workers will be given priority placements from nearby townships such as Leonora, Leinster and Kalgoorlie, with the remainder flying in and out from Perth.

A total of 450 jobs is expected to be created during the construction phase, filtering down to 300 jobs during operation. Red 5 began scaling down mining at KOTH in the first half of FY21 in advance of the planned start of construction for the expanded operation.

Approval Received

In December last year, the company received final permit approval for the construction of the processing plant.

Red 5 managing director Mark Williams said the approval of the mining proposal and the mobilisation of the EPC contractor had seen a major increase in activity on-site.

"With final approval for the commencement of construction of the processing plant now in place, we have a hive of activity underway at King of the Hills, with bulk earthworks progressing and installation of the village well underway," he said.

"Major components of the mill are being manufactured or undergoing refurbishment and upgrade, putting all of our workstreams on-track for the achievement of first gold production from the 4mtpa KOTH bulk mining operation in the June quarter of 2022."

KOTH is expected to contribute more than \$600m in taxes and royalties once operational.

Regional exploration programs are also underway to identify additional oxide open pit material to provide early mill feed and cash flow for the proposed 4mtpa CIL processing plant.

Darlot

Situated in one of the richest gold systems in the world, the Darlot underground mine has been in continuous production for about 32 years.

The mine has produced 2.8moz of gold since November 1988.

Darlot is on track to meet its FY21 production guidance of 90,000-98,000oz, with the September 2020 quarter producing 20,238oz of gold.

There is a 0.83mtpa carbon-in-pulp (CIP) and CIL gold processing plant onsite, currently operating at a throughput rate of 1mtpa.

The Darlot Mining Hub strategy includes exploration and resource development, with Red 5 acquiring several highly prospective tenements in FY20 that lie within economic trucking distance to the mine.

Transitional Production Strategy

The new Great Western satellite pit has been included in the FY21 Darlot Mining Hub mine plan as part of Red 5's transitional production strategy.

There are further plans to access the underground orebody via a portal at the base of the Great Western pit.

Red 5 chairman Kevin Dundo says the strategy maps out a clear direction for the

company over the next 18-24 months as it moves towards targeted construction at KOTH.

"Red 5 is working to expand the Darlot underground mining activity and introduce satellite feed to underpin a long-term, stand-alone processing operation with no ongoing contribution from KOTH," he said.

"The first step in this transition will be the start of open pit mining at the nearby Great Western deposit, which Red 5 acquired in April 2020, where we are expecting first ore to the Darlot mill in the December 2020 quarter."

Underground ore production at KOTH was progressively scaled down in the first half of FY21 to coincide with the planned start of construction of its stand-alone bulk mining operation and processing operation.

Production Profile

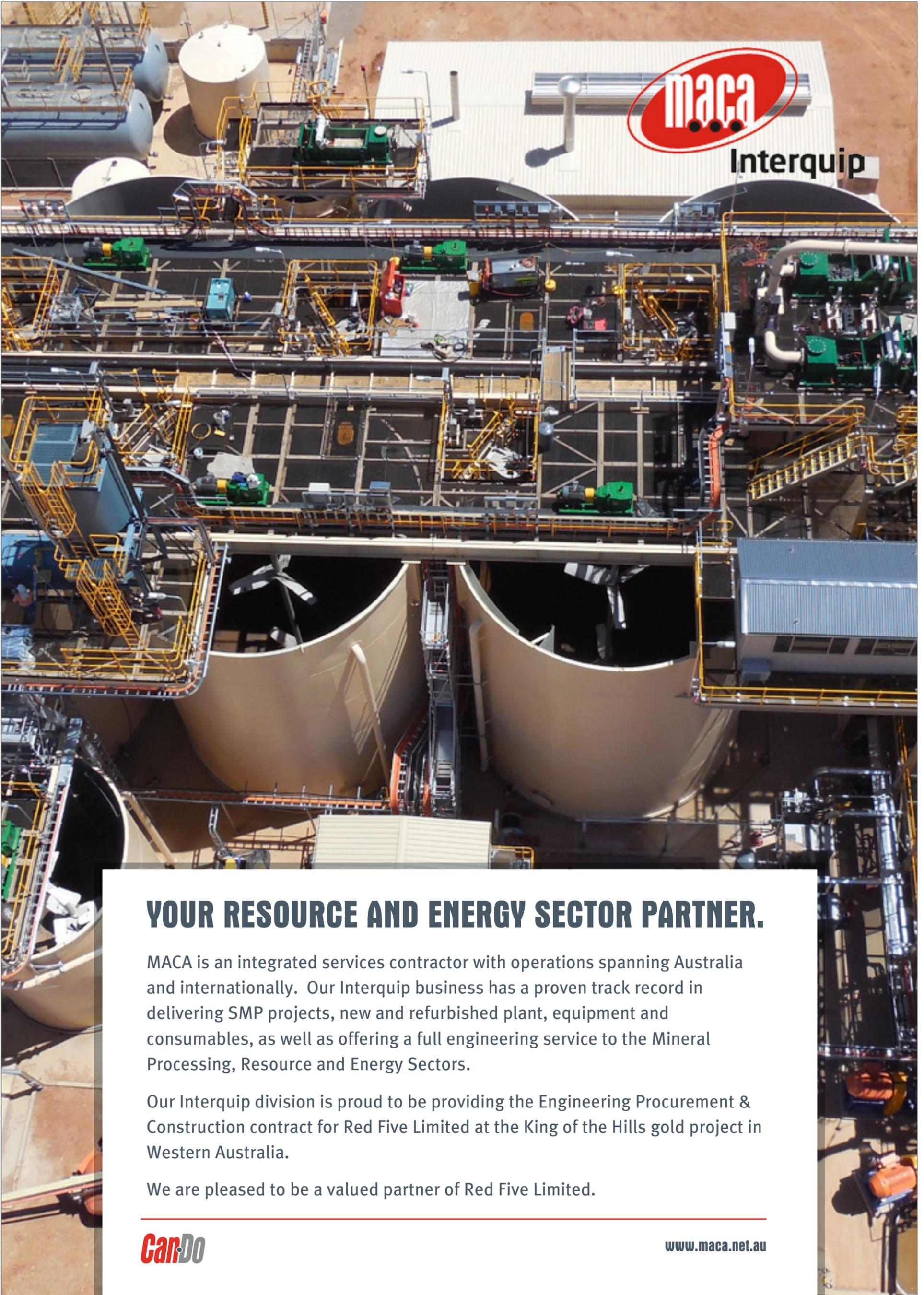
The company's vision is to be a successful multi-operational mineral resource company through responsible and sustainable industry practices. Its long-term strategy is to grow a well-established and respected mid-tier Australian gold producer with multiple options to expand and develop.

The global production profile of Red 5 will be more than 250,000ozpa of gold once the KOTH project comes online in 2022.

The Darlot production hub will continue producing 90,000-100,000ozpa while the KOTH project will produce 150,000ozpa from mid-2022 onwards. **AMR**



An underground miner at the Darlot mine.



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MACA is an integrated services contractor with operations spanning Australia and internationally. Our Interquip business has a proven track record in delivering SMP projects, new and refurbished plant, equipment and consumables, as well as offering a full engineering service to the Mineral Processing, Resource and Energy Sectors.

Our Interquip division is proud to be providing the Engineering Procurement & Construction contract for Red Five Limited at the King of the Hills gold project in Western Australia.

We are pleased to be a valued partner of Red Five Limited.



CJD ON THE MOVE

A fleet of Volvo A45G articulated haulers boosting productivity on underground mine for Red 5 Limited.

Founded in 1974, CJD Equipment is a privately-owned Australian company and leading provider of world-class equipment and trucks.

Partnering with international manufactures, CJD Equipment offers a diverse range of superior products from iconic brands such as Volvo Construction Equipment, SDLG Construction Equipment, Kenworth and DAF trucks.

On an underground gold mine 900km northeast of Perth, a fleet of A45G Volvo Construction Equipment articulated haulers are boosting productivity and slashing fuel consumption for Australian gold producer Red 5 Limited.

With a rated load capacity of 41,000 kg, the 41t-rated A45G hauler is designed for higher productivity while reducing overall fuel consumption, so customers can move more for less.

Technology on the machines include the optional on-board weighing system, which boosts fuel efficiency and reduces machine wear by guaranteeing an optimal load every cycle.

With the on-board weighing system, average payloads are sitting at around 97.5%.

Other features include the Volvo drivetrain, automatic traction control, all-terrain bogie and hydro-mechanical steering.

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With fully equipped parts warehouses in every capital city and dealers throughout

major regional towns, CJD Equipment has the support network in place to ensure clients are well supported, no matter where their offices or machines are located.

Big Enough to Trust, Small Enough to Care - CJD strongly believes the only way to do great work is to love what it does and be passionate about supporting customers for the long haul.

For more information about CJD Equipment's range of products and services, visit www.cjd.com.au or call the team on 1300 139 804

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NEXT LEVEL CONSULTANCY

Rapallo is a high performing consultancy group focused on the delivery of innovative, practical and reliable solutions to the mining, public infrastructure, oil and gas and heavy industrial sectors.

Established in 1987, Rapallo offers services which include engineering and project management, asset integrity and inspections, non-destructive testing, and environmental consulting.

Rapallo works in both greenfields sites and with brownfields operations and restarts.

The company's expertise covers environmental surveys and support for works approval through to engineering design and compliance of major fixed and mobile plant and structures.

Rapallo operates in a niche market, supporting small and large organisations in multiple industries including mining, mineral resources, oil and gas, and support infrastructure such as water and structures.

Services to the mining industry include engineering and project management, plant and machinery inspection and environmental consulting services.

Rapallo is primarily focussed on WA; however it has completed projects interstate as well, with current projects in Tasmania and South Australia.

Rapallo is highly detail-oriented and willing to go the extra mile to get its clients the answers they need.



Rapallo's project managers work with companies to achieve industry-best results.

The team is multi-disciplinary in nature and is highly experienced and skilled at managing brownfield projects.

Rapallo does not carry the overheads of larger engineering companies, preferring to use high quality people to get more done with less.

The independently owned company was formed by mechanical engineer Andy George, who has more than 40 years' experience in mining-related engineering

consulting and contracting.

Mr George honed his skills during a 20-year career with Western Mining Corporation through the maintenance, design and construction of gold, nickel and copper hydro and pyro-metallurgical plants.

He worked his way up to become the engineering manager for WMC before starting Rapallo, and with the help of his highly skilled team, has turned the company into the high performing business that

it is today.

Rapallo has outlasted many boom and bust cycles by adapting to its clients' needs over time.

Rapallo prides itself on being easy to work with, qualified, multi-skilled and practical.

With a strong depth and breadth of experience, the team can ramp up or down rapidly in response to project requirements.

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Innovative, Practical and Reliable Solutions

Rapallo has been a leading consulting group servicing the mining industry for more than 30 years.

Services include Engineering and Project Management, Plant and Machinery Inspection, and Environmental Consulting services.





The granting of mining leases has paved the way for construction to start on the Olive Downs Coking Coal Project.

PEMBROKE POISED FOR PRODUCTION

BY KATE CHRISTIAN

The Queensland Government has given the green light to what will become one of the world's largest steelmaking coal mines.

The granting of mining leases for the Olive Downs Coking Coal Project on September 29 was the last of the major approvals required to allow construction to start at the Bowen Basin mine.

The Pembroke Resources project will create up to 500 jobs during construction and more than 1000 new jobs in the region as it is developed to produce about 15mtpa of saleable coal over its 79-year mine life.

Pembroke CEO Barry Tudor told The Australian Mining Review the mine would provide a much-needed stimulus during the COVID-19 recovery, while generating about \$5.5b in royalties for the Queensland Government.

"Taking an asset of this scale and significance from exploration through to a fully approved mine has had its challenges, but it is extremely satisfying to have reached this milestone in just four years," Mr Tudor said.

"When in fully ramped up production, Olive Downs will be one of the world's largest steel making coal mines."

The project would commence production at 6mtpa (ROM) before expanding over the next decade to 20mtpa.

The mine will produce coking coal and has open-cut JORC reserves of more than 500mt, making it one of the largest metallurgical coal reserves in Queensland and the world.

Shovel-ready

Pembroke has hit the ground running, having already committed considerable resources in the development of many essential aspects of the project.

"This has included detailed engineering and construction plans for the processing plant, rail, water pipeline and electricity supply," Mr Tudor said.

"The company has also secured port and rail capacity at Dalrymple Bay coal Terminal for the first 10 years of production.

"In 2018, Pembroke purchased more than 40,000ha of land to cover the first stage of production as well as critical environmental offset wildlife sanctuaries."

Construction can now commence on-site with the \$184m coal handling and processing plant (CHPP) construction contract having already been awarded to Sedgman and CPB Contractors.

The final stages of the tender process would soon be underway for mining services, rail-loop construction and haulage.

Pembroke is currently finalising the finance for the project, in addition to capital from shareholders.

Once this process is complete, on-site construction — expected to take 18 months — will start.

Stage one construction would cost about \$500m on top of what has already been spent and would include the rail loop, powerline, water pipeline, access roads, CHPP and supporting infrastructure.

Each major capital work component is subject to a tender process and a mining services contractor would be appointed for the production phase for at least five years.

Mr Tudor said Pembroke is committed to using local suppliers wherever possible in the development and operation of Olive Downs.

"In addition to mining, the overall project will create opportunities across a range of support and ancillary operations and businesses including local suppliers, future workforce, local businesses, and community organisations," he said.

"Pembroke has engaged extensively with key stakeholders to maximise the employment opportunities with local workers including the ability of workers to relocate to nearby regional towns."

Workers would be encouraged to become a part of the local community around Moranbah.

Community Engagement

Pembroke was established by Mr Tudor to focus on the acquisition and development of high-quality steelmaking coal projects.

Pembroke was formally established in 2014 when Denham Capital, a global energy and resources private equity firm, committed to providing financial backing for the steelmaking coal strategy.

Although Olive Downs was the number one target of the Pembroke team, it was not initially for sale.

It was not until 2016 that it was successfully acquired, along with the mining domain of Willunga, from Peabody Energy.

Mr Tudor said Pembroke has adopted a "stakeholder centric strategy" in the development of Olive Downs over the last three years.

The strategy had focused on local, State and Federal Governments, Indigenous owners, the regional community and landholders.

"Effective liaison, interaction and negotiation with all stakeholders has been a key success factor for the project so far and it is considered a critical component to obtaining and maintaining the project's 'Social Licence to Operate'."

Wildlife Protection

Mr Tudor said Pembroke had taken seriously the responsibility of protecting wildlife and minimising habitat disturbance at Olive Downs.

"Pembroke has developed strong environmental outcomes to support this responsibility and which are backed by robust environmental approvals at a State and Federal level," he said.

A number of changes have been made to the mine plan to reduce the impacts to the habitat of the koala and greater glider, including the protection of the riparian

corridor along the Isaac River.

"Additionally, areas identified as supporting koalas and greater gliders across the mining lease will be protected from activities," Mr Tudor said.

"These areas will be actively managed to not only maintain but improve the quality of the habitat.

"For example, an area four times greater than the area used for mining will be provided for koala habitat as a wildlife sanctuary forever."

Koala and greater glider exclusion fencing would be used on the mine site to direct both species to the protected zones away from active mining areas.

Other initiatives include speed limits to reduce the risk of vehicle strikes, radio tracking of the animals, a nest box program and opportunities for research programs with universities and conservation groups including the potential for a translocation program.

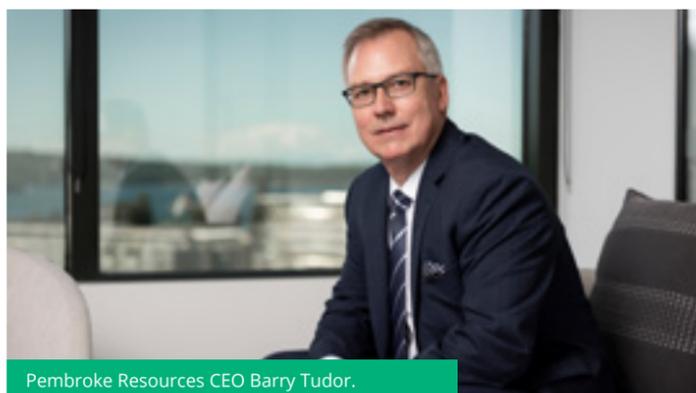
Pembroke has secured about 34,000ha, which will be legally secured in perpetuity, for the wildlife sanctuary.

"The development of Olive Downs is a unique opportunity," Mr Tudor said.

"Projects of this quality, scale and lifespan, situated in a well-established coking coal area with access to existing infrastructure for power, water and rail, are extremely rare.

"As a world class tier one project, Pembroke is conscious that it must deliver the highest of standards in relation to the environment, the local community and local jobs.

"Our aim has been to anticipate and exceed requirements. The result is that Olive Downs will be a 21st century mine with a 21st century approach, generating much needed steelmaking coal from the best coking region in the world." **AMR**



Pembroke Resources CEO Barry Tudor.



Olive Downs is set to create up to 500 jobs during construction.

A KEY DELIVERY PARTNER FOR OLIVE DOWNS

OVER the past four years, Phronis has partnered with Pembroke Resources to deliver its infrastructure vision for the Olive Downs coking coal project.

Starting from the mining development lease stage, Phronis formed an infrastructure strategy that was based on lean operational concepts and tight budget control, while ensuring stakeholder needs and requirements were kept front of mind.

When completed, the open cut mining project will deliver up to 20mtpa of run-of-mine coal, with resulting product coal of up to 15mtpa at the peak.

An operation of this scale has required the full depth of Phronis's domestic and international mining experience. Phronis focused on the formation of an infrastructure strategy that walks the fine line between simplicity, project economics and operational efficiency.

Phronis provided a full range of engineering services required to deliver the infrastructure and coal process facilities through concept, prefeasibility and bankable feasibility studies, EIS approval, utility approvals, stakeholder approvals, tendering and final design definition.

The infrastructure component of the Bankable Feasibility Study document was a key deliverable by the Phronis team.

During the project definition process, Phronis also contributed to the completion of the infrastructure elements of the EIS

documentation. Over the four years Phronis provide a range of project management services, engineering designs, estimating and scheduling, establishing capital budgets and procurement of infrastructure contract packages.

Throughout the project definition and approvals phase, Phronis has remained committed to defining and documenting Pembroke's infrastructure vision for the development of the project; providing a basis for detailed design and construction of the infrastructure; and most importantly providing Pembroke, with a high degree of confidence, that the project can be constructed in a technically sound and cost-effective manner.

The key Innovations of the project include maintaining good working relationships with local government and private sector stakeholders; innovative and adaptive engineering processes and solutions to cater for constraints to allow timely approvals processes; a multi-stage EPC contracting methodology to provide flexibility on delivery timing; and a cell based dry tailings disposal system.

The project infrastructure to be created for the Olive Downs coking coal mine comprises of industrial facilities at Olive Downs South and Willunga mining areas; three coal handling and preparation plants ranging in capacity from between 800 and 1100 tph of ROM coal, designed to achieve high levels of metallurgical efficiency at nameplate capacity across the full size and yield envelopes of the life of mine; a 20km



More information on Phronis can be found at phronis.com.au/about-us

rail spur, loop and train loader connecting to the Norwich Park Branch Railway; a 29km water supply pipeline connecting to the Eungella pipeline network; a 44km power supply transmission line and substation; water management structures, dams and levees; mobile and data communication system; and mine access roads including a

new Isaac River bridge crossing.

With three approved mining leases and federal and state environmental approvals in place, Phronis is currently preparing to move to the delivery and operational phases of the project life cycle.

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MINING INFRASTRUCTURE DELIVERY PARTNER



Phronis provides the project management and engineering support required to deliver mining infrastructure projects globally.

During all phases of the mining project life cycle, Phronis has delivered the vision of mine infrastructure projects through:

- project management services;
- Infrastructure definition services for EIS documentation;
- multi-disciplined engineering;
- estimating, scheduling, budgeting and project controls;
- infrastructure contract procurement services;
- construction management; and
- mine rehabilitation and closure services.

Phronis adds value to mining operations by focusing on:

- the support and delivery of the clients vision for the project;
- providing the basis for detailed design and construction of the infrastructure;
- how the project can be constructed and operated in a technically sound and cost-effective manner;
- how to reduce waste and deliver in a sustainable manner; and
- effective communication between all parties to achieve successful outcomes.

Phronis delivers infrastructure such as:

- mine industrial facilities;
- coal and minerals processing facilities;
- rail infrastructure;
- water management and water supply infrastructure;
- communications, power supply and power distribution infrastructure; and
- roads and bridges.

LET'S CONNECT!

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MORE, MORE, MORE

BY KATHLEEN SOUTHWAY

A start-up mining company that achieves nameplate capacity in just the second month of operation is something the industry doesn't hear of too often.

Nestled in the Perth Basin in WA, amongst key players such as Iluka Resources and Tronox, is a newcomer to the mineral sands mining operations, Image Resources.

In December 2018, Image Resources moved from advanced explorer to active mining company, becoming profitable within three months of operations and, subsequently, cashflow positive in the second quarter of 2019.

Two years on, Image Resources is now an established, profitable mining company producing heavy mineral concentrate (HMC), with 270,000t achieved in 2019. It completed the sale of 12 bulk shipments of HMC during the year, for a total of \$146m.

Operational highlights

On October 30, 2020, the market capitalisation of Image Resources was \$186m.

Image Resources managing director Patrick Mutz says the company's success in its first year of production was a testament to the quality of the deposit it mines from as well as the team of people that make up the company.

"In 2019, our inaugural production year, we exceeded our expectations," he said. "We started out by achieving nameplate capacity in the second month of operation, which is very unusual," he said.

Image Resources raised market guidance twice during the year and the company met both guidances.

"With COVID-19 striking in March and April in 2020, most companies in our sector lowered or dropped their guidance completely," Mr Mutz said. "We maintained that guidance and we are on track now to meet that guidance at the end of December."

Mr Mutz is expecting even higher production and sales in 2020 and 2021, with Image Resources' production guidance for both years at 300,000-330,000tpa HMC.

No stranger to transitioning companies from exploration to production, Mr Mutz – who has 30 years of international mining experience – led Murray Zircon from developmental to operational status during the company's pivotal transition period in 2012 to become South Australia's newest mineral sands company at the time.

Boonanarring

The Boonanarring mine is 80km north of Perth and 16km north of Gingin in the Perth Basin, an onshore and offshore sedimentary basin extending about 1300km along the southwest of Australia.

With high-grade ore, zircon-rich sediments and high recovery rates on its side, Mr Mutz calls the Boonanarring deposit a "strong asset" and a "very valuable mineral matrix". "We used a very simple business model involving open cut mining and making a concentrate, which is less complicated and less costly," he said.

Image Resources implemented a simple business model consisting of classic dry, open-cut mining, utilising a standard truck and shovel fleet; a 3.7mtpa conventional wet concentrate plant (WCP) to produce

high-quality HMC that is trucked to the Port of Bunbury; and bulk shipments to China under a life-of-mine off-take contracts based on market prices.

Construction was completed on time, within six months, and on budget, at a capital cost of \$52m.

"We had very low capital costs because when Image Resources and Murray Zircon came together in 2016, Image brought with it the vast majority of the capital equipment required to start up the project," Mr Mutz said.

Boonanarring has a six-year mine life from December 2019, after which the Atlas project is expected to commence. Atlas is a shallow, high-grade open pit mine about

90km north of Boonanarring, with a mine life of three years.

Key infrastructure including the existing WCP will be relocated from Boonanarring to Atlas to continue producing high quality HMC to be exported through Bunbury.

Project 'MORE'

Image Resources has formalised its efforts to convert more ore reserves by creating Project 'MORE', which aims to increase ore reserves within economic pumping or hauling distance to their relocatable processing plant.

"Project 'MORE' is a name that means more ore reserves," Mr Mutz said.

"We formalised our focus and made it clear to our shareholders that we are aware our

mine life is somewhat limited.

"We look for ore within the economic pumping distance, and in the case of Boonanarring, because the grades are relatively high, the distance could be 10km or more for pumping, and possibly up to 20km if we could truck it economically, depending on the grade."

Solar farm

Boonanarring has a 2.3MW solar farm adjacent to the processing plant, built and operated by Sunrise Energy Group, providing some of the electricity requirements for its mining and processing operations.



The Boonanarring mineral sands operation in the Perth Basin, 80km north of Perth and 16km north of Gingin.



A road train is being loaded at the Boonanarring mineral sands operation.

CONTINUED ON P38

POWERING A GREENER FUTURE

Sunrise Energy Group is helping Image Resources transition to a low carbon future after successfully installing a 3MW direct current solar farm next to its Boonanarring mineral sands project.

The behind-the-meter farm is seen as a pioneer project in WA, where the adoption of large-scale distributed renewable electricity generation by the commercial and industrial sector has been limited to date.

Located 20km north of Gingin, the farm is capable of delivering up to 2.5 MW of alternating current to the mine — about 25% of the electrical requirements — using single axis tracking technology from NEXtracker.

On sunny days, full solar output is achieved 90 minutes after sunrise until about 90 minutes before sunset through the use of Longi Monocrystalline PERC panels, which are connected to a single 2.5 mega volt amp (MVA) central inverter/transformer from SMA.

The solution is majority owned by Sunrise Energy's financing partner for the project, Climate Capital.

A heads-of-agreement for the supply and construction of the farm was signed between Image Resources and Sunrise Energy Group in April 2018.

Financing terms were agreed to in December 2018 following completion of a range of development activities and the signing of key documents in September 2019.

A major milestone was reached on September 23 when the first power was produced from the farm, which is behind-the-meter, allowing it to reduce electricity costs in several ways.

Additionally, it has generated economic activity and ongoing investment in the local community.

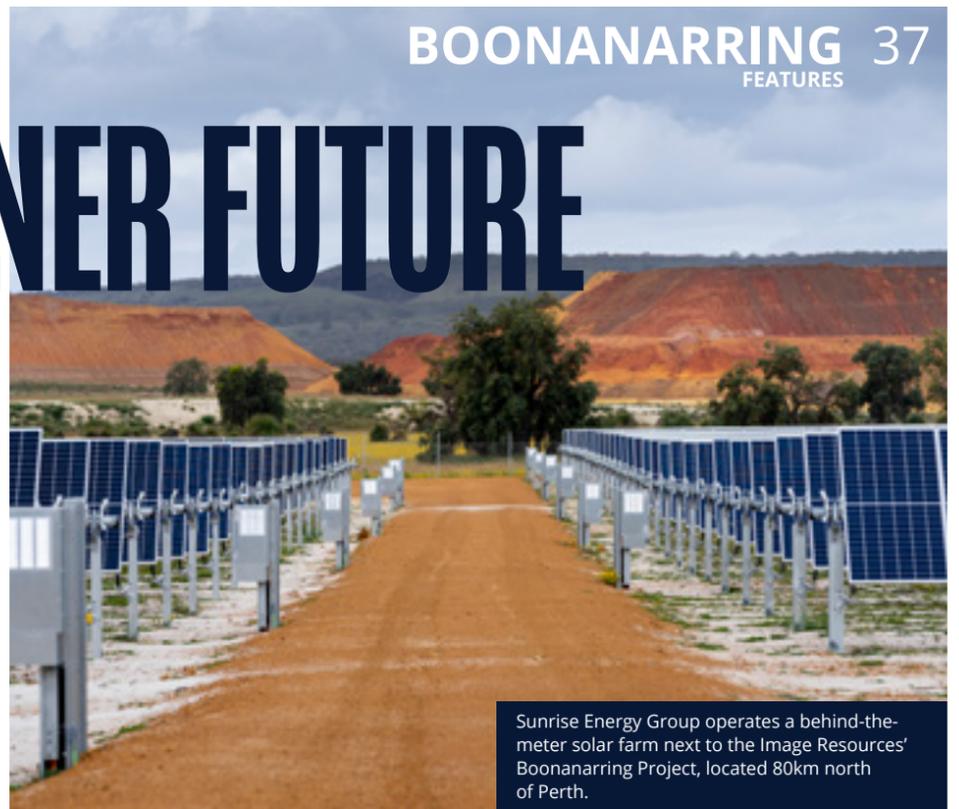
Sunrise Energy Group managing director Neil Canby said the company had to overcome several challenges to successfully install the solar farm as the choice of locations was limited due to it being behind-the-meter.

The need to squeeze in between gas pipelines and an overhead powerline required high level problem solving and the negotiation of separate entrance points with Main Roads.

"There were a number of unknowns when we started the project, with the main one being how we would meet all of Western Power's technical requirements," he said. "These have now been solved and a known solution now exists for other similar projects."

Mr Canby said the project would not have been possible without the support of Image Resources' executive team and Climate Capital.

"Our delivery partners are also critical to our project success, in particular Avora Energy and Jarrah Solutions," he said.



Sunrise Energy Group operates a behind-the-meter solar farm next to the Image Resources' Boonanarring Project, located 80km north of Perth.

The plan is to "bed in" the solar farm over the next six to 12 months to ensure it is operating efficiently and meeting performance expectations.

"Then we will assess what the next step is for Image Resources to further transition to a low carbon economy," Mr Canby said.

"We are busy talking with other grid connected mines around the opportunities for them to have locally generated solar power on or near their mining lease, generating both economic and environmental outcomes for them."

Sunrise Energy Group develops projects from concept through to operations and takes the chosen solution through design and construction, either as a project the client will own or as a service solution with

Sunrise's finance partners.

"Once constructed and commissioned, we operate the asset for you or our financiers," Mr Canby said.

"We don't do this alone; we have built a highly capable and experienced delivery model with WA-based specialist businesses and supported by international tier 1 product manufacturers.

"We take a consultative approach to working with our clients with no two projects the same.

"Our solutions though are driven by our core beliefs of renewables first; generation located next to consumption; and both being economically and environmentally sustainable." **AMR**

Your trusted partner
in your transition to a low carbon mining and processing environment

Sunrise Energy Group is an established renewable energy company which develops projects from concept through to operations. We have the knowledge and capability to work through the solution options that will deliver on both economic and environmental outcomes.

Our experience

- Behind the meter solar farms for grid connected mines
- Embedded networks/ microgrids for industrial parks including behind the meter solar and battery storage
- Off-grid high renewable content solar/battery/diesel solutions
- Behind the meter solar and wind, with 330 KV network extension for a large green hydrogen plant

Contact Neil Canby

- ☎ 0400 023 172
- ✉ info@sunriseenergygroup.com.au
- 🌐 sunriseenergygroup.com.au



CONTINUED FROM P36

"I believe that the Boonanarring project is the only mineral sands project now that is powered at least 25% of its electricity requirements from renewable energy, solar farm," Mr Mutz said.

The title of being the most environmentally-friendly mineral sands miner in Australia came at zero capital cost to Image Resources. "A deal was struck for the solar power company to build the project at their cost and for Image to guarantee taking that electricity as the supply into our mining operations," Mr Mutz said.

"We were already connected to the grid and had all the power we required but this was about exemplifying to the market in a broader sense that solar power can today compete with grid power and that there are in fact people willing to capitalise this in order to lower a company's carbon footprint."

Future focus

Mr Mutz says the primary focus in the short term is the drilling programs and additional exploration to add ore reserves. Priority exploration areas under Project 'MORE' include the Boonanarring Northern Extension Area, Boonanarring North-western Extension Area, Boonanarring West (including Trandos Blue Lake) and Gingin North.

"In the short term, over the next six to 12 months, our key focus is adding more ore reserves and bolstering the remaining mine life," Mr Mutz said.

"We've got five to six years of ore reserves now and we'd like to bolster that to eight to 10 years.

"In the medium term, our goal in the next three to four years is developing a second mining operation, parallel to the one we're running now at Boonanarring.

"This could come from our own portfolio of projects but we also have an eye out for other opportunities outside of our portfolio." Zircon accounts for about 80% of the Image Resources' revenue, while titanium dioxide makes up the other 20%. Some applications of zircon include ceramics (tiles and sanitary ware), foundry sands (metal castings) and refractories (furnace linings).

Titanium dioxide is made from rutile and ilmenite and processed into titanium-based products, primarily ultra-white pigment used in paint, paper and plastics, as well as welding rods (flux coating) and applications in aircraft, spacecraft, motor vehicles and medical implants.

Mr Mutz is bullish on the market despite COVID-19 and believes it will likely improve further, with no new producers coming online soon.

"Titanium dioxide and zircon are considered strategic minerals and metals in a number of countries including Australia, Europe and the US," he said.

"They are in high demand and they will continue to experience high demand. These products can consist of rare earth elements as well, which are typically on the list of critical minerals for most countries.

"We're still Australia's newest producer and have been running now for two years. Even today, titanium prices are continuing to rise due to a bit of shortage, so I'm very optimistic that the prices will stay strong in the next year to year-and-a-half and beyond that." **AMR**



The Boonanarring mine has a solar farm adjacent to its processing plant, which powers 25% of the mine's electricity requirements.



Truck-loading at the Boonanarring mine.



Quality integrated solutions to get your product from mine to market.

Qube is proud to have assisted in the successful delivery of the Boonanarring project from mine to market.

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ENGINEERING ON DEMAND

DMM Engineering has been operating since 1987, providing the mining industry with a range of capabilities including, design, fabrication, machining and engineering maintenance services.

The team has extensive experience with in-situ machining, capability to do on-site or workshop-based machining, and a fabrication division that can tackle all jobs big and small from site repair, installation to erections.

"DMMeng has and continues to travel to WA and QLD mine sites to do in-situ machining as required," DMMeng director Brendan Pyle said.

"Our team have also travelled to Indonesia to perform in-situ machining. No site is too far for us, we're ready to deliver."

Some of the company's other services included on-site robotic welding, line boring, and the complete overhaul of large items of plant and machinery involving safety, engineering, mechanical, structural, hydraulic and cosmetic aspects of refurbishment.

"Our team have more than 100 years of trade experience," Mr Pyle said.

"The expertise attained over this period includes plant maintenance, engineering services, fitting, machining, structural fabrication, heavy mechanical, in-situ machining, plant installation and onsite services."



These skills are embedded through comprehensive on the job training for both tradesmen and apprentices alike.

"The very fact that many of the original apprentices are still employed with us some six years after completing their training is testimony to the special culture of our

company," Mr Pyle said.

All of DMMeng's work comes fully warranted for further peace of mind and is completed to certification standards such as SAFETY AS 4801, OHSAS 18001, QUALITY ISO 9001 and ENVIRONMENTAL ISO 14001. **AMR**

More information can be found at: www.dmmeng.com.au or by calling (03) 5625 3183

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- Site Repairs, Installation and Erection
- Engineering Design
- On-Site and In-Situ Line Boring



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The state-of-the-art testing and workshop facility in Perth.

GEARING UP FOR THE FUTURE

One of the biggest names in industrial drivetrain services, Flender, has opened its new state-of-the-art testing and workshop facility at the Tonkin Highway Industrial Estate in the Perth, WA, suburb of Bayswater.

The 3500m² facility enables Flender to combine sales, project delivery, engineering and training in one location in a first of its kind for Flender in Australia. It will also enable the company to expand its operations in WA.

The facility is one of only a few in the world capable of servicing all makes and types of gearboxes and drive train components and

is the only OEM facility on the west coast with a 1.5MW load test bench capable of testing complete drive systems up to a voltage of 6.6KV.

Flender, a leading global supplier of mechanical drives, continues to grow in the region to meet increasing customer demand, especially in the wind energy and mining sectors.

Flender Australia CEO and managing director Kareem Emara said that the new facility enables Flender to centralise operations and offer more to customers in WA.

"It is also a vote of confidence in the WA

economy," he said.

"Our recent growth in WA has been great and a testament to the quality of our products, service and technical know-how.

"As we continue to grow, we want to reinvest in this key market and be where our customers are to offer them the combined brains trust of over 50 facilities worldwide through this new state-of-the-art centre."

Flender has the largest installed base of industrial drives in WA. Some installations have been in operation since the 1970s and are still in service today in various mine and port locations across the Pilbara

and other regions of WA.

The facility will also be designed to cater for projected growth in 'geared' wind turbines over the coming decades.

"Having been in WA for over 40 years, our view is and always has been long-term," Mr Emara said.

"Whilst COVID-19 has presented challenges to the economy, we have taken a long-term view and are confident in our expansion plans to help set up the right support structure for the nation's critical energy infrastructure and industries.

"We are supporting critical industries such as mining now and are preparing for future growth in other industries."

This announcement follows the \$5m investment into the company's Rockhampton service centre in 2017. **AMR**

SAFER AND STRONGER

Andromeda Industries has established itself as an innovator in the wire rope industry in Australia, and the only manufacturer of 12-strand plaited wire rope in Australia and possibly world-wide.

The company's specialty is the design and manufacture of plaited and woven steel cables as well as terminal fittings for these cables to be used in the lifting and rigging industry.

It has a range of both aluminium and steel fittings for the manufacture of industry-leading slings.

Andromeda has been designing and manufacturing Superflex Cable at its base in Moonbi, NSW since the 1970s.

The base products were manufactured for specific needs, but as the popularity of the products grew and different uses realised, the range and size of cables manufactured also increased.

The first orbital plaiting machine was built in 1975 to allow the Superflex to be mechanically produced and it has been producing cable ever since.

In the past 12 months, Andromeda added a 4200t Talurit Press, a 300t test machine and a new horizontal plaiting machine, which enables the manufacture of Twenty-Four-0 (96mm diameter) Superflex cable and slings. Andromeda now has the capability to manufacture and test Superflex slings ranging from 10mm to 96mm in diameter.

The addition of the new products will allow

Andromeda to continue to manufacture and supply a broader range of high quality products for the rigging industry.

The products have always been well received by the market as they minimise risk to construction workers' lives and last longer compared to other products. Andromeda business development manager Scott Taylor said those factors alone "outweighed the added cost for quality".

All slings, whether they are Superflex or Flat Woven steel, are manufactured, tested and individually tagged according to the relevant Australian standards.

The standard tags are made from 1mm steel, and permanently fixed by means of steel cord swaged into the ferrule.

The following information is provided on each tag:

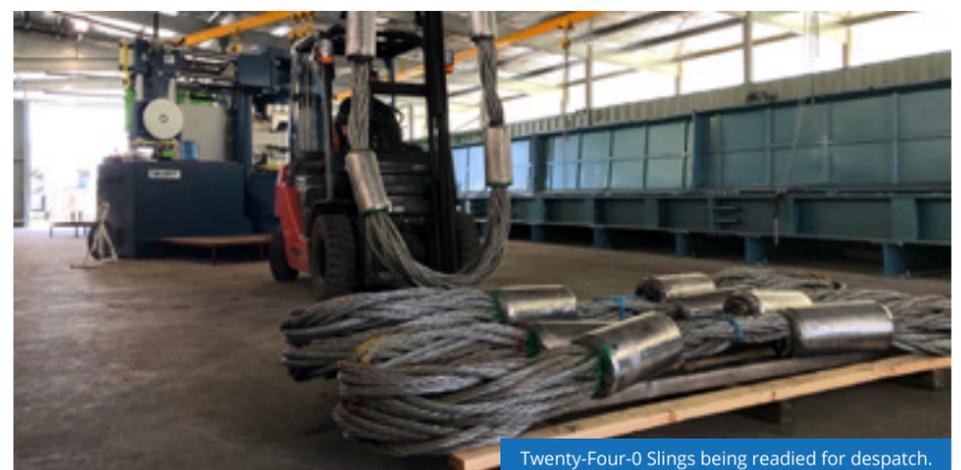
- a) Manufacturer's name (Andromeda)
- b) Size and type of the sling
- c) Working Load Limit (WLL) in various applications
- d) Test number and the date of test

Andromeda is both National Association of Testing Authorities (NATA) and Lifting Equipment Engineers Association (LEEA) accredited for the manufacture and testing of wire rope slings.

Superflex slings and cables are exported internationally to New Zealand, Norway, Russia and the Czech Republic, as well as being used widely in the mining, construction and offshore Industries in WA and some of the major infrastructure projects in



A flat woven steel sling.



Twenty-Four-0 Slings being readied for dispatch.

NSW and Victoria.

Andromeda continues to be proud of how its products contribute to the added safety of lifting projects both in Australia and abroad.

This also contributes high benchmark standards in the rigging industry to ensure lower quality and less safe products are not considered by companies doing the work onsite.

"As rigging work is very repetitive with riggers using the slings up to several hundred times a day depending upon the job, they are sensitive to the way the slings perform," Mr Taylor said.

"Our products are easily handled, leading to higher safety and efficiency of their work."

For more information on Superflex cables, visit andromedaindustries.com.au

LEVERLINK MAKES IMPACT

An idea by Leverlink founder Richard Sharp early in 1991 led to the production of the first “dynamic” impact bed for troughed conveyor belts in Australia, forming the foundation for Leverlink’s current leading-edge technology.

Mr Sharp had the idea to develop a better and more reliable product; one that would dissipate kinetic energy and provide the benefits of long service life, as well as assisting in reducing maintenance costs in terms of consumables and labour.

The design for the dynamic impact bed – using rubber torsion springs as suspension – was radically different from the static impact beds that were dominating the Australian marketplace at the time.

Load Zones and Transfer Points

Most belt damage occurs at conveyor load zones (e.g. under crushers) and transfer points. The reasons for this are many and varied.

Impact Bed or Belt Support Cradle?

Many so-called impact beds are nothing more than belt support cradles with limited design capacity to dissipate impact energy and provide belt damage protection.

Design and Engineering

Leverlink’s experience, engineering skills, and continuous improvement program through research and development and infield monitoring has made the company leaders in the design and application of dynamic impact beds in Australia.

All Leverlink dynamic impact beds are custom-built to suit the application, and in areas where installation space and access are restricted, the design can be such that the individual parts can be broken down and reassembled on the conveyor frame in manageable parts with minimum effort.

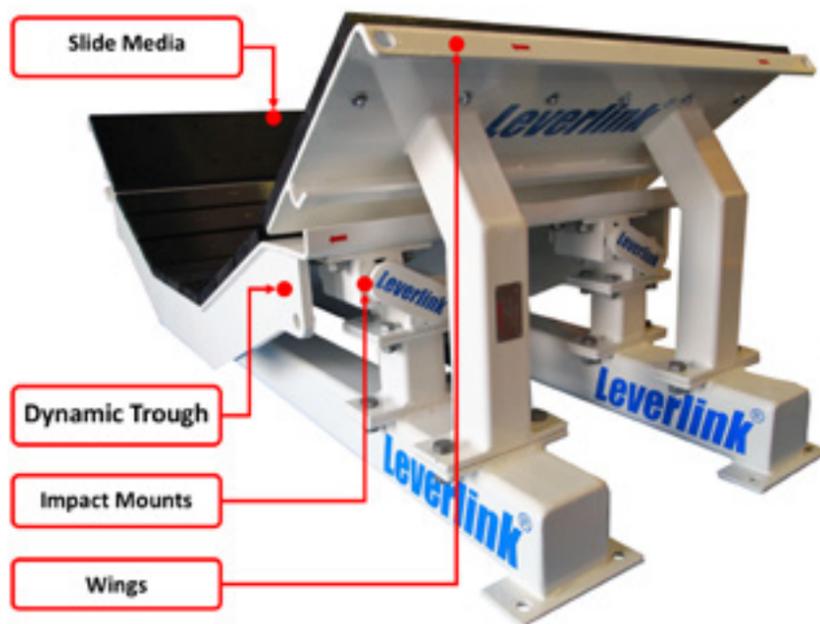
Rubber Torsion Springs - Impact/Vibration Attenuation

Leverlink has developed rubber torsion springs that provide a unique method of absorbing impact with the added benefit of vibration attenuation.

Rubber torsion springs are used extensively in its designs for various applications.

Leverlink is the largest manufacturer of rubber torsion springs in Australia, and also manufactures some of the biggest rubber torsion springs in the world.

With a proven track record, the company uses in-house engineering and design combined with extensive infield representation and has years of experience in mining, quarrying, and material handling problems.



- No rollers to replace
- Reduced downtime
- Reduced maintenance costs
- Protects conveyor structure from impact damage

- Supports belt profile at load zone
- Long service life
- Cost effective
- Cost saving
- Easy to retrofit

Spillage Control

Spillage can be controlled by effective skirting and inner wear plate design and the added use of belt support systems.

Case Study One

Leverlink was contacted by a large mining operation who were continually experiencing failure of its impact roller frames.

The conveyor belt was 2000mm wide with a 45-degree trough angle, and the belt was running at 1.5 m/sec, the feed material was -500mm with a free fall height of 2500mm, and the production rate was 1800 tph.

With the functional specifications supplied, Leverlink then visited the site to determine what additional information could be

gained that would assist in the engineering and design of a Dynamic Impact Bed to minimise the damage to the conveyor belt and supporting structure.

The Dynamic Impact Bed was built and installed.

The goal was achieved, and the client completely satisfied, they then purchased a second unit for an identical load zone.

This was 26 years ago. In this time the slider bars have been replaced three times and the impact mounts twice, but it is expected the Dynamic Impact Beds will last another 10 years.

Case Study Two

An offshore copper mine commissioned Leverlink to provide a solution for extremely high costs due to belt damage at a conveyor load zone.

The conveyor belt was 2400mm wide, 23 degrees trough angle, and running at 3.35m/sec.

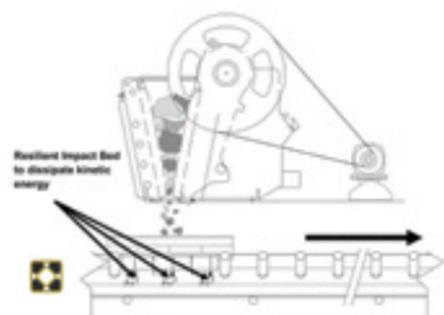
The material was hard rock/copper ore at -250mm with a free fall height of 6000mm. The peak capacity was 10,000 tph.

Engineering calculations determined a multi-trough Dynamic Impact Bed was required for the application.

This was designed, manufactured and exported to the client. When installed and commissioned it resolved the belt damage problem to the customer’s satisfaction.

One year later the mine ordered a second unit for a similar conveyor belt.

Leverlink has been at the cutting edge of rubber torsion springs and dynamic impact beds for about 30 years, and can provide fully customised impact beds, and many more products and services. **AMR**



Load Zone Design

The design of an effective conveyor load zone can often be a complex issue.

Functional specifications such as belt speed, width, type of belt, product size, free fall heights, and product moisture content are all major design considerations.

More information:

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Western States: (08) 6165 8892
Email: sales@leverlink.com.au
Website: www.leverlink.com.au

BRINGING WATER TO REMOTE SITES

Mounting reel solutions on a truck from Crusader Hose has emerged as the only viable solution for water delivery where distance and safety became issues.

High-pressure layflat hose available up to 500m.

In a quest to source more gold ore, many mining companies are prospecting in remote areas of the country where water is scarce and the terrain challenging.

These two factors can be a major cause of operational and safety issues.

In order for the expensive diamond-tipped drills to work optimally, they need to be cooled with water.

Getting the water to the drill site in a safe manner in areas where there are no roads, however, can give rise to increased safety concerns.

One of Australia's largest mining giants found themselves in this situation. The drill rig was located a significant distance from the water source in the rugged mountain ranges of WA.

The drilling project commenced by sending multiple trucks up and down a narrow track

to transport and pump up the water.

This solution proved to be time-consuming, costly and dangerous.

Crusader Hose engineering manager Emeric Kovassy said the necessity for water required full-time drivers to make the run up to the drill rig every three to four hours. "This caused a safety concern at narrow track crossings," he said.

Two trucks sometimes ran into each other from the opposite direction, prompting one to reverse half a kilometre along the treacherous road to let the other pass.

A permanent pipeline of poly pipe was considered but that solution was too expensive as the drill rig was relocated to a new position half a kilometre away every week during core drilling phases.

The entire length from the water tank to the drill rig was more than 10km along

temporary lanes and unsealed roads.

"They needed a flexible, quick and safe hose system to pump up the water and cool the diamond head," Mr Kovassy said.

"Our truck-mounted hose reeling system gave the mining company the ability to have one person deploy a layflat water hose up the hills so that the drill rig could keep operating efficiently."

The Crusader Hose reel system allows a mining operator to work in a safe, hands-off fashion, while staying in touch with the driver.

The purpose-built hose reel system comes with an arm extension that splays out to keep the layflat hose off the driving lane, plus a handheld remote that gives the operator full control of the hose deployment and reeling speed.

The extended arm increases efficiency by

removing the need to have another person pushing the hose off to the side of the road behind the truck. The hose reel system eliminates all extra handling.

Once a drilling operation is complete, the reel system retrieves the layflat hose.

The hose reel system can then re-deploy up to five kilometres of layflat in less than a day while the drill rig is relocated to the next site.

Crusader Hose works closely with end users or resellers to better understand their water needs and help them to achieve their pumping and transport goals.

"Crusader Hose is happy to develop a reeling system for any mining company that needs a layflat hose and understands its advantages," Mr Kovassy said.

"We really strive to serve our Australian customers." **AMR**



A skid-based reel system.



Hose reel system ready for deployment.



SELF-BUNDED OIL TANKS

Client Background

Whitehaven Coal is the emerging force in the Australian coal mining industry.

As the leading coal producer in NSW's Gunnedah Basin, their vision is to be Australia's leading independent coal company. Whitehaven Coal is mainly involved with exploration, project evaluation, project development and coal mining activities in the New South Wales' Gunnedah Basin.

The Group currently operates four open

cut mines and they are delivering plans to double their production.

Client Requirement

Whitehaven Coal needed a storage solution for oils and coolants at their workshop. However due to the fact that the mine would be in construction phase for some years, they needed a solution that was Self Bunded and yet easily relocatable. Traditional concrete bunding does not allow for flexibility with location and is not able to be moved easily.

Solution Provided

Polymaster assisted Whitehaven Coal (via 3rd party contractor) by supplying 8 x 10,000L ChemMaster Self Bunded Tanks complete with cabinets. The cabinets included hose reel, integrated air-operated pump, flow meter, level control (mechanical and electrical) and dust proof vent. The tanks have already been moved onsite at least once from their original landing place, proving the cost savings and efficiency the mine is benefiting from the ChemMaster Self Bunded Tank. **AMR**

Client Testimonial

"...proving the cost savings and efficiency the mine is already benefitting from the ChemMaster self bunded tanks."

Scope of Work

-  Product Design
-  Engineering
-  Product Manufacture
-  Delivery



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SETTING THE STANDARDS

Since its establishment in 1984, QMW has built its reputation on setting the standard when it comes to safety in the mining, construction, transport, earthmoving and forestry sectors.

Founder and managing director Jeff Samuels' ambition was to build a business which set the highest industry standards for quality and service.

It is a reputation that still holds true today, even in the face of fierce competition.

Samuels is an active member on the board of the International Organisation for Standardisation (ISO) committee and on the Standards Australia committee.

Therefore, QMW can guarantee that its products meet the rigorous safety demands of current and future market and legislative requirements.

QMW has more than 36 years of experience in the design and destructive testing of its products at its National Association of Testing Authorities (NATA)-accredited testing facility, as well as in the manufacture of rollover protective structures (ROPS) and falling objects protective structures (FOPS).

With this wealth of expertise, QMW provides the ultimate protection for operators and business owners around the globe.

With its world-class management team focusing on continual improvement, investment into research and development and the use of the latest technology, QMW's



QMW designs a range of innovative products, including tyre handlers, for the mining and quarrying industries.

products are truly innovative.

More importantly, QMW places its customers at the centre of all business activity, ensuring their needs are met competitively and creatively, using a "right first time" philosophy.

As global leaders in the aftermarket ROPS and FOPS industry, its team guarantees products that meet local and international legislative requirements.

Complementing its core ROPS and FOPS business, additional world-class products and services offered are cabin design, testing at its state-of-the-art NATA certified facility, and high-quality engineering services.

Tyre Handlers/Grabs

QMW's tyre handler grab attachments are mainly used in the mining sector and have been at the forefront of reducing risks and time associated with changing out large wheels on heavy equipment.

Its range of engineered dual-arm tyre handlers are designed to suit a variety of machines used in the mining and quarry industries, for both underground and open cut applications.

QMW can provide an option to suit any tyre size, from small trucks to ultra-class mine haul trucks.

QMW's product range meets international

and local safety standards.

Other products include:

- ROPS and FOPS
- Cabins
- Mining
- Certified work platforms
- Water tanks
- Attachments

Services include:

- Engineering services
- Design and testing
- Manufacturing services
- Cabin refurbishment
- Crane repairs

AMR

Tyre Handlers designed for heavy lifting

QMW Industries has a range of tyre handler grab attachments to suit a variety of heavy equipment in the mining and quarry industries for both underground and open cut applications.



Our dual-arm tyre handler range is suitable for use on LHD, front end and wheel loaders, underground and articulated mine trucks.

FEATURES

- Hydraulic arms
- 90° swivel pad function
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📍 53 Success St, Acacia Ridge, Qld



Big Tyre is a proud service provider to Australia's mining industry.

NEW LIFE FOR TYRES

It is not uncommon for mine sites to be holding hundreds or even thousands of used tyres, which represents a serious environmental concern as most of them are not recycled.

Indeed, the virtually indestructible masses of rubber and steel remain a thorn in the side of mining giants around the world. Big Tyre CEO Dan Loudon is certainly not alone in wanting to see some changes to how these tyres are managed.

"If the average person knew how many mining tyres are buried every year, there'd probably be protests across the country," Mr Loudon said.

However, according to Mr Loudon, disposal and even recycling aren't necessarily the best answers.

Big Tyre has been repairing and re-treading tyres for 65 years and has been re-treading large OTR tyres for mining since 2005.

"Whether it's about being environmentally responsible or reducing costs, re-treading OTR tyres is well worth it," Mr Loudon said.

Big Tyre can re-tread mining truck and loader tyres to extend their life by 70% to 80%, significantly reducing the number

of tyres going to landfill or needing to be recycled each year.

Long haul cycles and hot conditions are no problem. In fact, Big Tyre's retreads have been used in Queensland in haul cycles of up to 23km, achieving 94% tread utilisation.

The company's success in re-treading is due to its method of manufacture and the use of high-quality rubber compounds to provide the heat or cut resistance required.

All Big Tyre's OTR retreads are guaranteed with a two-year warranty.

Tyre Repairs

When it comes to tyre repairs, the Toowoomba-based company is recognised as being one of the best in the industry.

Its specialist and unique tyre repair technique is the result of in-house development by a structural engineer more than 20 years ago.

That development process significantly improved on the strength of the commonly used repair methods, making it a key to the company's OTR tyre repairing success.

Big Tyre regularly repairs OTR tyres for local mine sites, at times even repairing tyres others have rejected. All its repairs are

guaranteed with a 12-month warranty.

Solid Wheels To Solve Problems

Big Tyre's core service to the mining industry is the design and manufacture of solid wheels.

The company offers tailored solutions which are ideal for any heavy-duty application that has high loads, limited space requirements and a slow vehicle speed.

"Most of our solid wheels are used for underground coal mining but their applications certainly don't stop there," Mr Loudon said.

Although the majority of Big Tyre's work is building standard-sized wheels for LHDs and trailers, it also specialises in the design and manufacture of wheels for highly customised applications.

One unique job Big Tyre did a few months ago was for a mining customer who needed low-ground pressure, solid wheels to suit a remote-controlled underground vehicle.

Currently, Big Tyre is manufacturing a set of low clearance wheels so a copper mine can take its new truck underground without disassembling and reassembling the vehicle.

This will not only save them considerable time and cost in its delivery, but every time major maintenance is due.

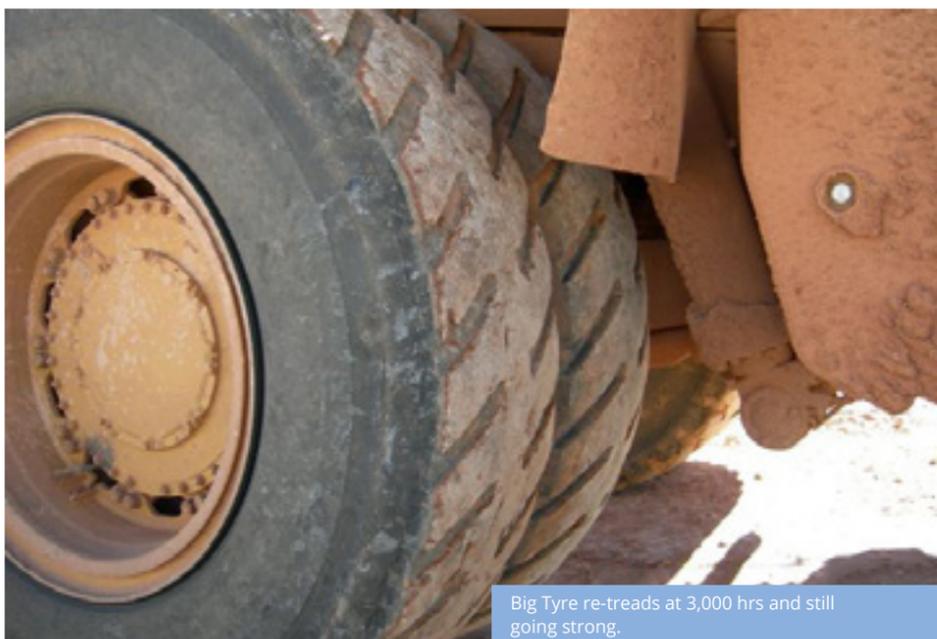
"The low-clearance wheels will be fitted to the truck to achieve the necessary clearance from the roof of the mine shaft and the standard tyres will be re-installed once the machine is underground," Mr Loudon said.

"We design the wheels to suit an application, we do the steel fabrication, and then we complete them with high quality rubber or polyurethane as required so it is a start-to-finish process."

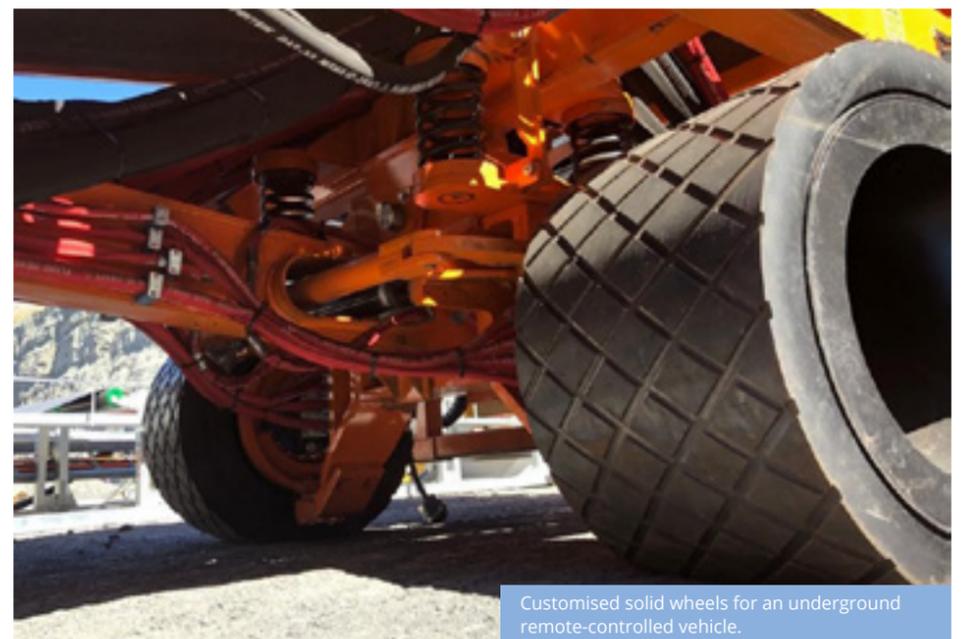
When the wheels eventually wear out, Big Tyre rebuilds them at a significant saving compared to buying new. For the common wheel sizes, it also offers service exchange to minimise the turn-around time.

Big Tyre's solid wheels are sold around the world with products in more than 50 countries.

As the preferred supplier to multiple original equipment manufacturers, Big Tyre's product is one that can be counted on, whether that is to solve a unique problem or to count on, day in and day out. **AMR**



Big Tyre re-treads at 3,000 hrs and still going strong.



Customised solid wheels for an underground remote-controlled vehicle.

PREVENTATIVE REPAIR SPECIALIST



Tyre Doctor works in partnership with site tyre maintenance teams.

Tyre Doctor specialises in Off-The-Road (OTR) tyres for the mining and earthmoving sector, with a strong presence in open-cut and underground mining operations across Eastern Australia. They specialise in preventative maintenance and repairs, playing a pivotal role in saving five-figure mining tyres from the scrap heap.

The company works in partnership with site tyre maintenance teams, performing regular preventative maintenance inspections in person to catch injuries before they develop into structural damage, preventing costly tyre failures and interruptions to production operations.

The mining trucks of today are running faster, their tyres are expected to endure longer running times and operators are under more pressure to meet key performance indicators by transporting bigger loads to maximise output.

This not only increases the risk of injury to the tyre, which can reduce their life expectancy, loading capacity and haul performance, but also creates safety hazards for the truck driver and other personnel at mine sites.

This can be avoided with a preventative repair program to reduce tyre failures to give them a longer life and ultimately

improve mine productivity.

Tyre Doctor has purpose built its OTR repair facility and has invested in custom solutions to deliver first-class repairs.

For example, its repair hoists are the product of an in-house engineering design process and feature automatic functions for elevation, rotation and the setting down of ultra-class tyres weighing up to 6.5t.

Senior personnel personally supervise each individual tyre repair job including extensive preventative maintenance repairs on 57" & 63" ultra-class tyres for major mining fleets.

A company-owned fleet of specialised rigs for transporting ultra-class tyres, and a number of onsite fitting trucks handling up to 63" tyre and wheel assemblies, allow Tyre Doctor to provide a complete gate-to-gate service and retain full control of service response and lead-times.

Tyre Doctor operates across NSW, Queensland, South Australia and Victoria, servicing major mining operations in the Hunter Valley, Bowen Basin, Central Western NSW, and outback SA from workshops in Leeton, Singleton and Mackay. **AMR**

TYRE + RIM REPAIR SOLUTIONS FOR MINING. WITH SHORT, RELIABLE TURNAROUND.



GATE-TO-GATE SERVICE

RIM TESTING + CERT.

RIM + WHEEL REPAIRS

SPECIALIST TYRE REPAIRS

REPAIR WORKSHOPS IN HUNTER VALLEY, BOWEN BASIN + WESTERN NSW.

KLINGE KINGS OFF THE ROAD

Off the Road (OTR) tyre and rim management has been an aspect of mining that has seen more than its fair share of headlines over the years, sometimes for all the wrong reasons.

Safety performance, operational cost, contractor management, tyre shortages, performance issues and recycling are all topics which have been discussed in the boardroom of mining companies worldwide.

Executing all elements of tyre management to a high standard is a real challenge and when it comes to how, it is not always a case of one-size-fits-all.

In many parts of the world over the last decade, the OTR tyre management landscape has changed significantly, fuelled by a cost-driven 'race to the bottom' for service providers.

Some service providers have been directly compared to labour hire organisations, and argue this has been at the expense of quality, safety, and overall unit costs for tyres.

For people working in the tyre industry, it is common for them to have shaken their heads and thought: 'We are not on the same page, this just isn't working' or: 'Safety performance is not where it needs to be'.

Or to have heard: 'We just can't find any more tyre fitters'.

Sometimes it may simply be a matter of poor performance, ineffective management

or that the existing model is just not right for an operation.

How does one determine what is right for their operation?

KLINGE managing director Al Klinge said the best way to determine the health of a current OTR tyre management "situation" is to implement a specialised audit.

"Our tyre management content experts have extensive operational OTR experience at mines globally and our audit tool—TyreARM™— is designed for transparent, repeatable and benchmarked audits," he said.

"Once the audit is complete, the job is not done.

"We've found that an audit in isolation is not always effective; for KLINGE it's about coaching, mentoring and walking with our clients to implement the solutions deemed appropriate for their business".

KLINGE, using its well-known experience in OTR tyre management, provides clients with not only world-leading Tyre Management Software but fiduciary Tyre Management Content Expert services to mines in Australia and the world to improve safety, productivity, downtime and more.

KLINGE has recently assisted clients specifically with:

- Understanding the health of OTR tyre management at their operation
- Identifying 'low hanging fruit' and



With more than 40 years of experience, KLINGE is a proven industry leader in quality tyre management control systems and services.

- alternative approaches
- Full risk assessment, costing, and feasibility of preferred alternative approaches
- Development and implementation of strategy, HR, tooling and equipment

In a recent project, there was a shift away from the OTR service provider model to conducting OTR tyre management in-house. Today KLINGE is still partnering with this client, who has reported that performance in safety, downtime and cost have all met or exceeded expectations.

KLINGE can assist with large-scale OTR Tyre Management challenges such as greenfields planning, mine expansion considerations, tender development, or even a wholesale shift in how clients manage their OTR tyres.

On the other hand, KLINGE can also assist with smaller, specific, and targeted challenges within an existing operation such as tyre performance analysis, forecasting, supervisor coaching and systems training.

AMR

KLINGE Tyre Management Software and Services

Tyre Management Software to suit Underground, Open-Cut and Quarries

- Smartphone and Tablet Designed
- Record Data Quick and Report Instantly
- Easy Performance and Scrap Reports
- Simple Rim Tracking Compliance

Tyre Management Content Experts to attend Mines Open-Cut or Underground

- OTR Safety and Efficiency Audits
- Measured with Australian and Industry Standards
- Continuous Improvement initiatives
- Tyre Management Plan review and advice



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KLINGE™
Tyre Software by Tyre People

PROUDLY AUSTRALIAN-OWNED

Business Base Australia is best described as the Home Base for Business. Home Base is a highly recognised brand across Australia.

The Home Base concept is "first to mind" for anyone thinking about buying or renovating any domestic property.

At Home Base, Australians expect to view, at a single location, displays of the largest product designs, colours, furnishings, appliances, and ancillaries available in the domestic building marketplace.

Similarly, Business Base is a single location where business people thinking of starting, expanding or refurbishing a business of any kind can view the latest products.

They can also obtain advice on the full range of business furniture, fittings and furnishings – office furniture and fit-outs, shelving and racking, shop fittings and fit-outs, café furniture, business machines, indoor plants, and business signage.

Formerly known as Mclernons, the business has been reconstructed to operate on a national level, emerging as Business Base.

Mclernons was established in 2000 and is still running to this day through Auction Perth providing online auctions, direct second-hand sales, valuations, and onsite auctions.

Peter Mclernon has been involved in the commercial and industrial business supply chain industry through the importation,

manufacturing and distribution of all business furniture in WA for more than 20 years.

Business Base proudly offers locally manufactured furniture and with its own cabinet shop, it manufactures in-house office furniture and glass showcases.

It also offers locally manufactured chairs – ergonomic, visitor, crib room, and boardroom.

Business Base can also organise locally manufactured metal bases for desks, workstations, and tables, ensuring the quality of Australian-Made to its finest.

The mining industry is a large part of its client base, providing products and services to companies like Rio Tinto, Maca Mining and Byrnegut Offshore, while just finalising

a contract with BHP and Monadelphous.

Corporate Division

From small office fit-outs to complete city building commercial fit-outs, Business Base corporate division specialises in commercial office fit-outs and office refurbishments.

The highly-skilled commercial fit-out team offers the total professional package customised to a company's needs.

This includes, but is not limited to, the design, manufacture, supply, delivery, and installation of all fit-out components.

With a client's choice of an end-to-end service or combination, Business Base will work to suit the client and operates Australia wide including Melbourne, Sydney, Brisbane, Perth and Adelaide.

From small office fit-outs to complete city building commercial fit-outs, Business Base corporate division specialises in commercial office fit-outs and office refurbishments.

Completing fit-outs nationally is a key part of the successful business. Having a contract with Advance Personal Management has proven that Business Base can service all parts of Australia from North Queensland to Tasmania.

Having completed more than 200 sites and touching base in every State over a period of two years, there is nothing Business Base will say no to.

Innovation is the key to success within Business Base Australia.

Its driving force, passion, extensive knowledge, and experience in the commercial and industrial business supply chain industry will ensure the dream of a Business Base branch in every state of Australia and New Zealand will become a reality. **AMR**

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TRUSTED, CABLE AND CABINET SOLUTIONS

Cable Source Pty Ltd was established in 2005 to supply products and services for the discerning electrical, data, communication and security service contractor.

The company manufactures and supplies a large selection of cables for many industries, which include data cables, coaxial, fibre optic, security, communication, instrumentation, flexible signal, automotive, rubber, heat resistant silicone flex, flexible control cables, single core flex, building wires, fire cables, underground cables and many more.

Cable Source manager Craig Turner said the company offered a superior service in the design of cable management solutions as well as installation and ongoing maintenance programs.

"We've also expanded our offerings into communication cabinets and racks to safely house all your cables and equipment; a favoured option for mining operations located in harsh environments," he said.

Stainless Steel Enclosure

One of these cabinet solutions includes a Stainless Steel Enclosure (FCD10014040SS) that can be floor-mounted or pad-mounted on site.

"It is mainly used in security and transportation signalling fields to install power, electronic control and fibre optical equipment," Mr Turner said.

"The cabinet can be used to install panel-mounted power, optical transceiver and



AgileHub™ Outdoor Micro Data Center

Fully integrated with outdoor type cabinet, UPS/DC power, battery, cooling, monitoring, security, and fire systems.

Available with 1 to 3 cabinets all in one solution. Customization is acceptable.



AgileCub™ Container Micro Data Center

Fully integrated with ISO container, cabinet, UPS/DC power, battery, cooling, monitoring, security, and fire systems.

Available with 10f, 20f and 40f all in one solution. Customization is acceptable.



A stainless steel enclosure cabinet.

other panel or DIN rail mounted equipment, such as ADSL modem, streetlight controllers. "A cooling fan is fitted on the top right hand side of the cabinet too."

The cabinet is deployed under telecom towers, roof of buildings, road side and is designed for applications where the enclosure has a high level of exposure to solar radiation.

"The fitted sunshades maximise air circulation to ensure natural temperature regulation of internal equipment," Mr Turner said.

Aircon Enclosure Cabinet

Another one of its popular products includes

an aircon enclosure cabinet, that is mainly used in wireless communication projects and used to install power, battery, BBU and other 19 inch equipment.

This cabinet is deployed under telecommunication towers, roofs of buildings and road sides.

"However, it also can be deployed in an FTTB application, can be used to install and protect DSLAM, optical transmission equipment, and more," Mr Turner said.

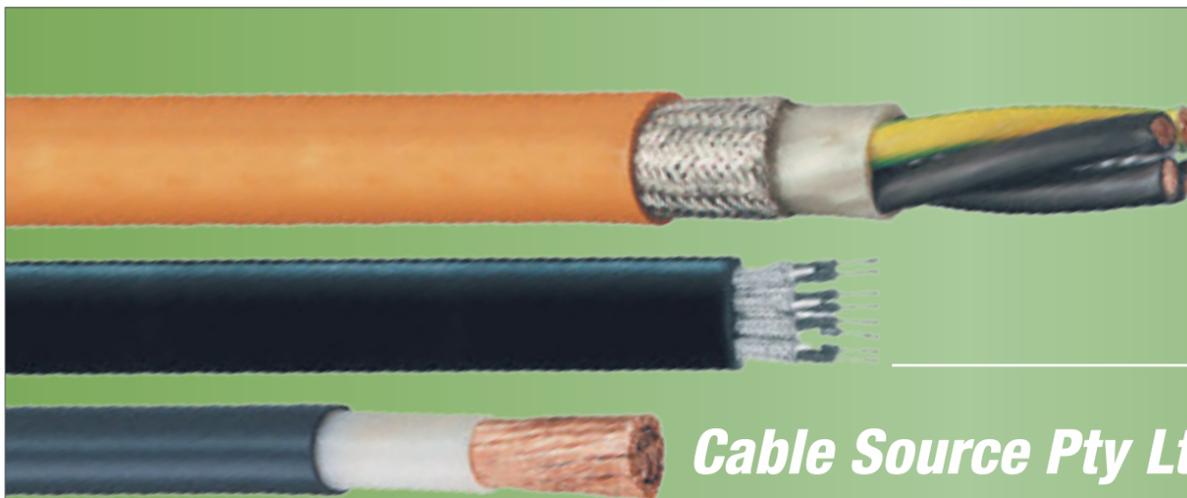
"What's really unique about this cabinet, is an air-con is fitted to it, supplying 600W - 1500W cooling capacity for the customer's option.

"It can exemplify the flexible wire distribution management functions, meeting the customer's need."

Its features include mild steel, static powder coating, insulation to sides and doors, waterproof design for harsh environments, cable glands to prevent moisture and insects from entering and reliable earthing.

More information on Cable Sources' solutions can be found at www.cablesource.com.au

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Cable Source Pty Ltd

Cable Source Pty Ltd

Cable Source is a manufacturer and distributor of Heavy Duty Flexible Rubber and Control Cables, EMC Cables, SWA Instrumentation, HDPE Underground Cables, Fire Rated, LSZH and Fibre Optic Cables.

If any special cables are required to be manufactured, we can offer low minimum quantities and extremely fast production times.

Cable Source Pty Ltd

Cable Source now has a range of outdoor cabinets to house sophisticated electronic equipment, such as computers and servers, fibre optic devices, routers, switches, UPS units and surveillance devices.

In an ever changing technological world, this range of cabinets ensures any sensitive equipment is safeguarded from the harshest conditions.





ENGINEERED FOR MINING

A range of products from Znergy.

Znergy Cable, a division of Aryam Australia Group, is a global electrical manufacturer of low voltage to high voltage specialist cables for the infrastructure and resources industry.

Boasting advanced capabilities in technology and global partnerships, the group manufactures cables up to 512KV, which meet Australia's stringent guidelines and standards.

The group has invested into cutting-edge

technology for all its LV, Solar (TUV), Mining, TBM, MV and HV Cables and obtained National Laboratory testing certification for all cables.

This includes Type Testing and SAA certification for all LV and MV cables, AS/NZS5000.1 and AS/NZS1429.1; AS1802 and 2802 cables for Mining and Reeling; Tunnel Boring Machine cable (TBM); WS52W Fire Rated cables via Warrington Fire Labs; and TUV Rhineland certification for XLPO Solar Cables.

The Znergy brand is a leader in quality products that include electrical cable, switchgear MCCB and RCBO, LED lights, solar panels, inverters and electrical components. The brand also prides itself in quality assurance with proven Australian innovation and high standards.

Znergy Australia has supplied to many notable projects and is currently in the process of acquiring Energex approval for utility cables in Australia.

Some of its clients include MMG, BHP, Glencore, CSA Mines, Rio Tinto, Downer EDI, Kestral Mines, to list a few, and the company is also proud to be supplying cables to Cross River rail project in Brisbane and NorthConnex in Sydney.

The Znergy Cable team can be contacted at sales@znergycable.com or 1300-347-922

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Contact Us
1300-347-922
sales@znergycable.com
www.znergycable.com

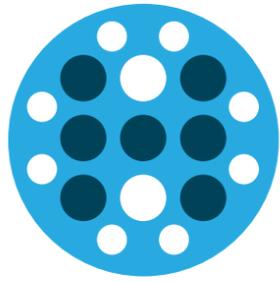
Cutting-edge Cable Solutions

We work with many tier one Australian miners including Rio Tinto, FMG, Glencore and more.

Znergy Cable is an electrical component, electrical cable, solar & renewable energy component manufacturer based in Brisbane. We're proudly a part of the Aryam Australia Group offering state-of-the-art solutions to mining companies globally.

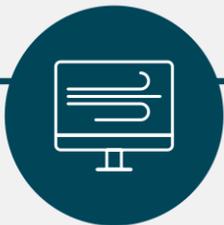
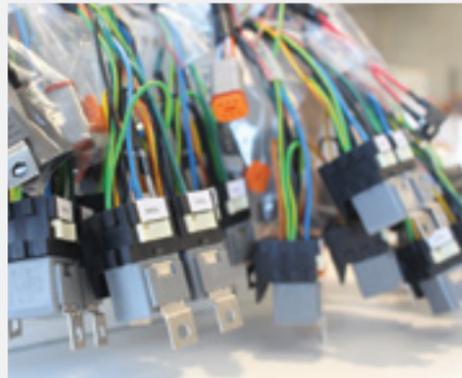
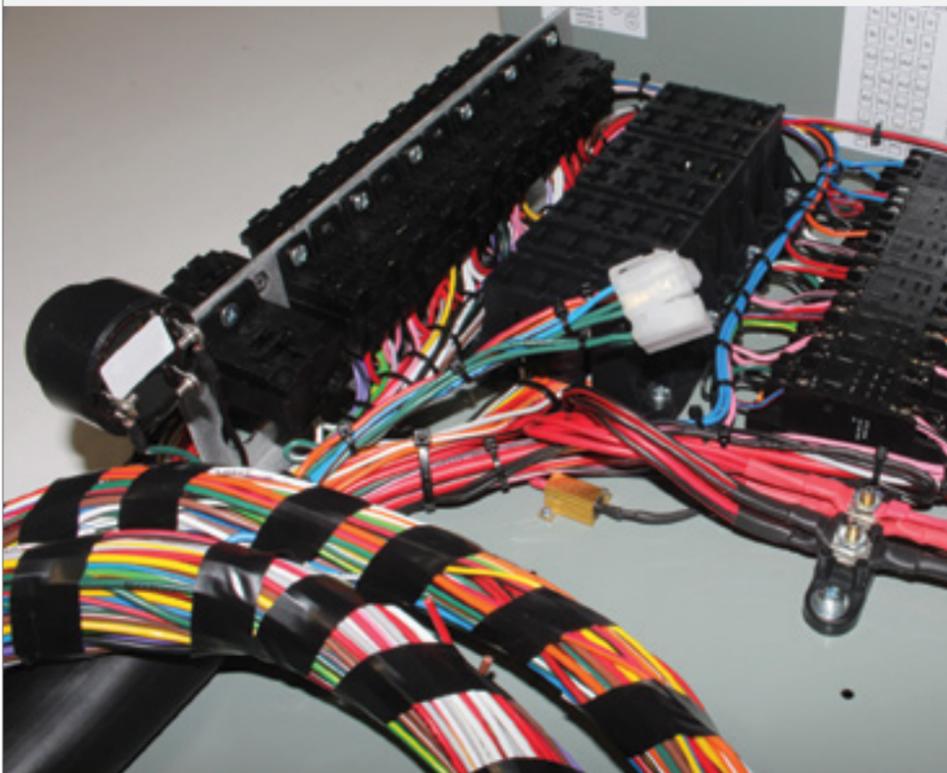
- Engineering, Design & Manufacture
- Fully Certified to Australian & International Standards
- Australian Mining High Voltage Cables
- Tunnel Boring Machines (TBM)
- Glands & Lugs
- Electrical Equipment





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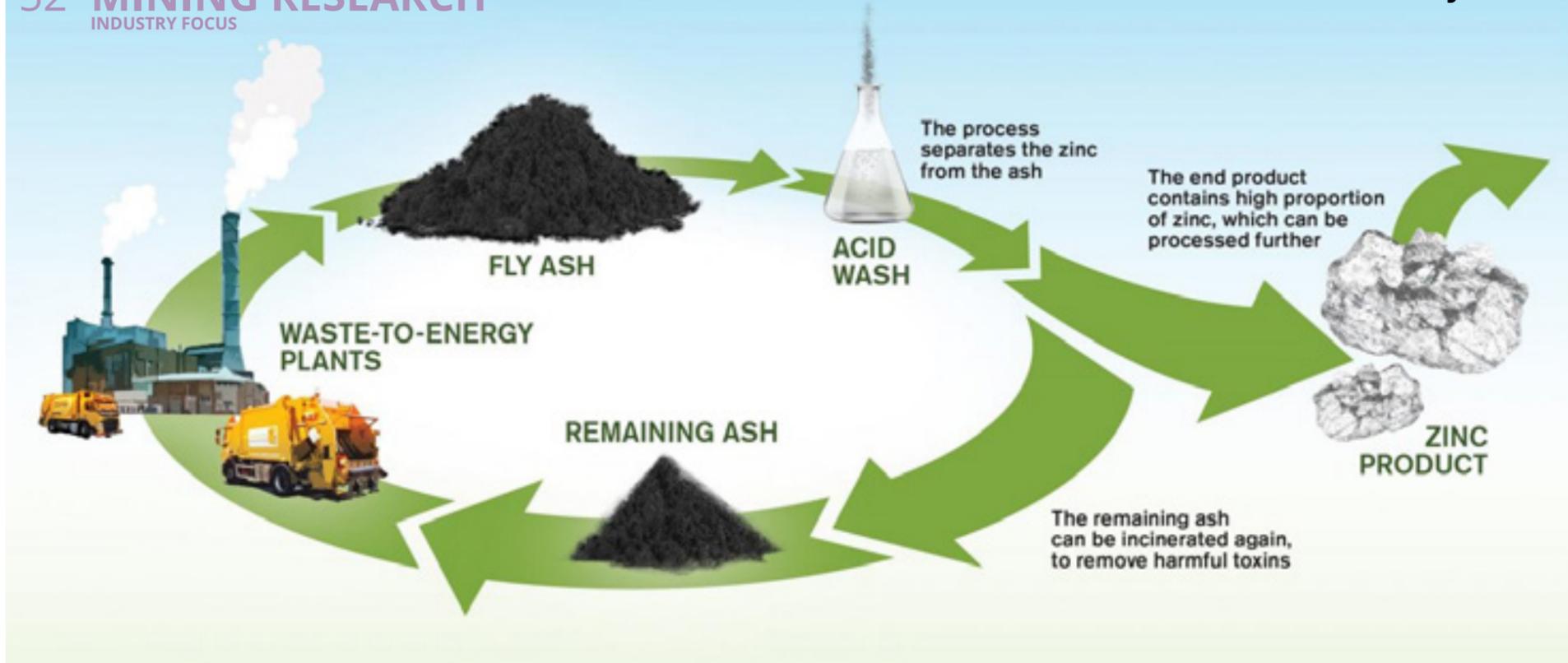
Trusted by some of the biggest mining, rail and construction brands.

Harnex manufactures and supplies to some of the biggest mining, rail and construction brands domestically and internationally, providing services and support from concept and design through to production. They have worked on various projects in this field, including systems for locomotives, mining equipment, cranes and construction equipment.



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ASHES TO ZINC

Incineration of solid waste produces millions of tonnes of waste fly ash in Europe each year, that most commonly ends up in landfill.

But this ash often contains significant amounts of precious metals, such as zinc.

A unique method developed by researchers at Chalmers University of Technology, Sweden, can now help extract these precious metals, potentially leading to reductions in environmental pollution, landfill and transport.

During waste incineration, the released flue gases are purified and the small particles present are separated, leading to the formation of fly ash.

This fly ash contains toxic substances, such as dioxins, and so is normally classified as hazardous waste and landfilled.

But it also contains valuable metals, such as zinc, which are thereby lost.

Now a new method from Chalmers University of Technology, tested at pilot scale and detailed over several years of research, involves treating this waste with an acid wash, also separated from the flue gases, to separate the zinc from the fly ash. The zinc can then be extracted, washed and processed into raw material.

According to Karin Karlfeldt Fedje, Associate Professor at Chalmers University of Technology, and researcher at the recycling and waste management company Renova AB, the pilot study found that 70pc of the zinc present in fly ash can be recycled or turned into useful material.

"The zinc is not extracted as a pure metal, which would be a much more intensive process, but instead as a zinc-rich product, which can be sold to the metal industry and processed further in currently existing industry production lines."

In further refinement to the method, the researchers have been able to significantly reduce the level of toxicity.

"After extraction, we incinerate the residual ash again to break down the dioxins. Ninety percent of this is then turned into bottom ash, which can be used as a construction material, for example," Professor Karlfeldt Fedje said.

Internationally, the prevalence of waste

incineration is varied, but the need to handle large amounts of ash after the process is widespread.

In Sweden, incineration of household waste in waste-to-energy plants is common, and results in around 250,000t of fly ash every year that could potentially be treated in this way.

The rest of Europe accounts for around ten times that amount.

Although it is hard to estimate how many tonnes of zinc are currently lost through landfill in Sweden and beyond, the method developed by the Chalmers researchers can be of great interest to all waste management actors.

It offers great potential for recovering these metals in a relatively simple way and could have a significant impact on the profitability of waste incineration, as well as its role in the circular economy.

Adjunct Professor at Chalmers and R&D Manager at flue gas cleaning supplier Babcock & Wilcox Vølund AB, Sven Andersson, said the technology for extracting zinc from fly ash could have several positive effects, such as reducing the need for mining virgin zinc raw material, lower levels of toxicity in the ash, and greatly

reduced landfill contributions.

"It can be a vital contribution to society's efforts towards a more circular economy," he said.

Applied in full scale

Dividing her time between Chalmers and Renova, Professor Karlfeldt Fedje has spent many years developing the methodology, in collaboration with several external actors.

Together with Mr Andersson, they have been able to design a full-scale process.

Their research has led to Renova AB and B&W Vølund now building an ash washing facility with zinc recycling in Gothenburg, Sweden, an investment that is estimated to save hundreds of thousands of euro every year for the municipally owned waste management company.

More about the method

The method was originally pioneered at Karlsruhe Institute of Technology in Germany in the 1990s.

There are currently some established plants for extracting zinc and other substances from fly ash in Europe, and in one plant pure zinc metal is produced in a complex process. The method developed at Chalmers does not extract pure zinc metal, but instead

a simpler process is used where the end product contains a very high proportion of zinc.

This can be processed in existing production lines in the metal industry.

The method involves using an acid wash which releases zinc and other metal ions from the ash.

The zinc is recovered from the leachate as zinc hydroxide using chemical precipitation, which can then be further refined using metal industry processes to generate high purity zinc metal.

The leached fly ash can be re-incinerated in order to destroy toxic dioxins.

During the pilot study, 75–150kg an hour of fly ash from a Swedish Waste-to-Energy plant was mixed with scrubber liquids from the same flue gas treatment system in a continuously stirred vessel.

The resulting slurry was dewatered in a vacuum belt filter. Hydroxide precipitation of the resulting leachate, followed by filtration of the formed crystals in a membrane filter press, produced a filter cake with up to 80% weight zinc hydroxide. **AMR**



Associate Professor Karin Karlfeldt Fedje.

Reliable, Efficient, Safe and Flexible

Odyssey Marine is an industry-leading vessel owner, operator and supplier of inshore vessel services to 'Tier 1' resources companies and port authorities.

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Our expert **Odyssey Marine Team** is ready to provide a complete range of vessel services to your operation via our Port Hedland facility.

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- Cargo transfers
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- Vessel hire and vessel charter
- Vessel manning
- Dive vessels and dive support
- Chase boats
- Hydrographic and environmental survey craft
- Port security and maintenance
- Shore-side support (lay-down logistics and transportation)
- Marine asset management

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TRUST IN DEPENDABLE DURST

Durst Industries is the leading Australian manufacturer of automotive electrical charging and diagnostic equipment.

Established in 1918 by its founder John Durst and held in the family for three generations, the business was purchased last year by a group of Australian investors.

Durst General Manager Alf De La Harpe extends a welcome invitation to all customers past and present to visit their new and modern warehouse office and showroom facility in Castle Hill, NSW.

As the Australian automotive industry modernises, so does the range of Durst products, which are used in transport, mining, education, logistics and even by the military.

Fuel-driven engines are now transforming into hybrid and electric powered vehicles. Durst provides for all electrical systems with its range of products for all terrains and types of uses.

As technology advances, industry and consumers' access to electric vehicles expands and becomes more affordable.

In fact, users don't need to look very far for real-life examples with electric vehicles now in operation with local governments and state transits in Sydney.

"We are now living at a time which has moved far beyond the basic wipers, lighting and engine starts as part of a vehicle's electrical systems," Mr De La Harpe said.

"Modern vehicles now have many elements which are mostly computer controlled; with an ever-increasing list of driver and comfort aids that all operate electrically.

"Durst Industries is focused on supporting the mining industry and understands that mining operations always need to be kept running.

"Equipment breakdowns are costly and result in lost production and possible shutdowns on the frontline."

A common problem with mining equipment is battery failure, with the typical machine operating in harsh environments that are extremely dusty and hot.

If a machine cannot be started it quickly becomes highly problematic and costly.

The range of Durst jump start units are able to re-start the machine quickly and resume operations.

The units are available in a wide variety of configurations and are able to start vehicles up to the CAT 793 haul truck.

Durst HYPA START Jump Pack

A recent addition to the traditional battery style jump-start units is the Durst HYPA START, which uses the latest technology in supercapacitors to store the energy.

The industry-leading HYPA START X2500MS provides excellent starting power with the added advantage of a substantial weight saving over a comparable battery based unit.

It is the lightest and most powerful jump pack available.

The HYPA START is not only HYPA powerful, but HYPA safe, to use in sub-terrain environments.



Durst has unveiled the industry-leading HYPA START Jump Pack, which uses the latest technology in supercapacitors to store energy.



The HYPA START X2500MS is the lightest and most powerful jump pack available.

Its safety features are superior, with no risk of gassing, fire or explosion during charging or operation of the device.

The DURST HYPA START jump pack features 3000A CCA in 12V mode and 1500A CCA in 24V mode.

The X2500MS features HYPA Charging which means it can be charged up in a matter of minutes from various sources.

This Jump Pack can even operate without prior charging by simply connecting jumper leads to the vehicle battery.

The HYPA START features the classic DURST yellow metal enclosure, finished with a carbon fibre front instrument panel and 12/24V switch and capacity meter with Anderson Plug connections with both jump and charge functions.

Weighing in at about 12kg and with the near infinite life of the supercapacitors, this product is not only the lightest in its class but the most powerful, dependable and long-lasting Jump Pack available.

It is available in February 2021 but with interest in this product already running high, call Durst to secure stock.

DURST Powers Mines

Durst has been supplying the mining industry for over 60 years and understands the sector in great detail and how equipment uptime is crucial to sustained operations.

The Durst industrial test benches allow auto electrical mechanics to rebuild and test large alternators and starter motors in a known environment.

Large industrial machines are challenging to maintain and lost productivity through fitting potentially faulty parts is frustrating and time-consuming.

The Durst test benches provide a known operating environment that mimics the actual operating environment.

Thorough testing of new and rebuilt alternators and starter motors, which may be re-fitted to the equipment, provides assurances time is used in the most efficient way possible.

Battery life expectancy is greatly reduced in harsh environments which are commonly found throughout mine sites in Australia and other parts of the world. Durst has an extensive range of industrial battery chargers and battery load testers to ensure batteries are kept in good condition while potentially extending their life, an advantage to both the operation and finance divisions.

A common use for the Durst industrial battery charger is to re-charge batteries during their servicing.

Batteries allowed to run flat are common, usually from lighting and radio systems left operational when not in use.

This significantly reduces their service life.

The use of the Durst battery charging and battery load testing provides the fleet management group the tools to keep the mining equipment operational.

Durst products are designed and manufactured in Australia to meet the needs of local and international markets.

Their new modern facilities in Castle Hill include a purpose-built workshop and testing area which has provided plenty of room to grow their production capacity and expand their repairs testing and calibration services.

Durst can also custom-build to most requirements depending on the application and looks forward to finding new collaborative business opportunities.

The range of Durst products include:

- Heavy duty jump starters
- Smart battery chargers
- Industrial battery chargers
- Carbon pile battery tester
- Smart personal jump starter
- Automotive test benches
- Test and measurement equipment
- Bio-remediating parts washer
- Renewal energy solutions
- Repair and Calibration Services

Durst Industries Pty Ltd is an Australian manufacturer operating since 1918.

Call Durst on 02 9660 1755 or view the range at www.durst.com.au

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Charging and test diagnostic equipment for all industrial and automotive applications.

Solar Cases Portable Power



Test Benches



Battery Chargers



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Batteries



Durst Industries is the leading Australian manufacturer of Automotive Electrical Charging and Diagnostic equipment. Our range addresses many markets including transportation, mining, education, logistics and military.

Shop online at durst.com.au

02 9660 1755



BUILT FOR THE TOUGHEST CONDITIONS

Retractable Tarps is Australia's leading manufacturer and supplier of truck tarping systems and components, helping mine sites improve productivity, and cover their load.

The business, which has been operating since 1990, has a large selection of load coverage products in its range, which can aid in the safe transportation of ore from pit to port.

But it is the Roll Over Arm Systems with hydraulic operation, and brand-new right angle drive arms, that are sought-after with mining clients, for their ability to perform in heavy-duty, harsh environments.

Roll Over Arm Systems

Retractable Tarps' Roll Over Arm Systems, and the dual arm Hydraulic (hydraulock) system, are perfect for mining and they are as heavy duty as it gets when it comes to tarping.

"Like all of our tarping systems, we use the best quality materials and are proud of the workmanship that goes into our manufacturing process," Retractable Tarps technical sales director Chris Vitnell said.

"Quality is very important to us. Systems we manufacture include manual wind-out hood tarps, electric automated hood tarp systems, various Roll over Arm systems from single to dual arms including hydraulic and electric setups.

"It is recommended to use the hydraulic dual arm roll over tarp system for side



Retractable Tarp's Dual Arm Hydraulic system.

tipper applications."

For electric systems, Retractable Tarps is also able to supply complete electric kits including remote controls and standalone battery boxes.

This gives every truck in your fleet the ability to hook up and use any trailer with a Retractable Tarps system on it by simply using a power source.

Right Angle Drive Arms

In addition, the 90° right angle drive arm system has been designed and tested for maximum durability in the toughest environments for side and end tippers.

It is the company's latest addition to its range, helping operations run smoothly by keeping tarps tight and reliable.

"The Right Angle Drive Arms provides a package that is up to 68% tighter against your tipper's headboard, compared to other single-arm setups," Mr Vitnell said.

The system is available in both hydraulic and electric drive with a wide range of control options for every situation, and both styles of arm supply an industry-leading torque of up to 330Nm.

During testing, the Right Drive arm was loaded to cut off more than 58,000 times,

proving the durability for this new player in the market.

The system can also be hardwired or with wireless remote control.

"Retractable Tarps is proudly Australian-made and owned. Everything in our range is built Australian-tough," Mr Vitnell said.

More information on Retractable Tarps products and components can be found at www.retractabletarps.com.au

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RETRACTABLE TARP PL
TARPING SYSTEMS & COMPONENTS

INNOVATIVE TARPING SOLUTIONS FOR EVERY NEED

Roll Rite Hydraulic Dual Arm Systems

- Powerful hydraulic system for side-tippers
- Rugged hydraulic power for serious operations
- The ultimate in reliability and performance
- Widely used in the mining sector



Roll-Rite Electric Dual Arm Systems

- Powerful electric system for side-tippers
- Ultimate lockdown and wind protection
- Synchronised arms work together
- Standalone wireless electrics available



Roll Over Tarps & Components

- Complete roll over systems available
- Reinforced PVC & Mesh tarps, Flap Style & Pelmet Style
- Components manufactured in-house using CNC machinery
- Flexbows available & are ideal support



Roll-Rite Electric Front Arm Systems

- Powerful electric system for end-tippers
- Ideal for grain & fertiliser cartage and for walking floors
- High presentation aluminum arms
- Direct drive motor for maximum torque



Manual Steel Arm Systems

- Single arm ideal for walking floors
- Dual arm and single arm for side tippers
- Arm helps stabilise and control system
- Middle knuckle assembly design to clear bulky loads



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Platinum Logistics WA PTY LTD



THE PLATINUM EXPERIENCE

People you can trust...

Platinum Logistics WA offers a boutique transport and logistics alternative to organisations that have project-specific freight requirements for regional and remote locations within WA's resources, construction and power generation sectors.

The company was established in 2013 to cater for emerging niche markets which has since developed a reputation for provision of exemplary services and focus on safety, within a highly competitive industry.

Platinum's owned and operated vehicles and equipment is complemented by a

network of suppliers to cater for projects involving Australia-wide and heavy haulage components.

Individuals within the supply chain organisations will benefit from Platinum's dedicated team of multi-skilled industry professionals who are adept at solving complex costing scenarios.

Platinum Logistics WA is a capable all-rounder that has been involved with major projects and is a prime choice to partner with for turn-key operatives.

Platinum Logistics WA invites interested parties that have direct responsibilities for procurement and logistics, to make enquiries about how they can benefit from tailored transport solutions.

Management will discuss the specific needs of each project and devise plans to meet the service requirements wherever possible. For further information, please see contact details below:

(08) 9274 0225
enquiries@platinumlogisticswa.com
www.platinumlogisticswa.com.au

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...Equipment you can rely on



PERSONALISED SERVICE

Bruce Avery started his transport business in 1994 with one Kenworth-W Model truck and a can-do attitude.

Fast forward almost three decades and he now has 65 employees and a large fleet of 45 trucks and 200 pieces of trailing equipment.

Mr Avery has never lost sight of the business' humble beginnings and his original commitment to provide a personalised service to every single client. He even managed to track down that original Kenworth truck, which he plans to restore in recognition of the key role it played in the business' success story.

Bruce Avery Transport is now one of the most respected and experienced transport service providers in the WA and NT region. With depots in Perth, Newman and Darwin, the company can do full supply runs into mine sites covering everything from dangerous goods to construction materials to underground supplies.

Other services to the mining industry include general freight, oversized loads, remote location transport, extendable loads, machinery transport, controlled waste transport, hot shots and a refrigerated tautliner service.

The company is split into four divisions:

1. Mine site runs
2. General freight into Darwin and Newman
3. Transporting construction materials into mine sites in the Pilbara and Goldfields
4. Ammonium nitrate subcontract work for Toll.



Bruce Avery Transport has grown into one of the most respected and experienced transport service providers in the WA and NT region.

With a large and versatile fleet including 42 prime movers, 90 flat top trailers, 17 drop deck trailers, 15 tautliners, 20 extendables, 10 Haulier Subcontractors and 90 dollies to connect into road trains.

The company also recently purchased refrigerated trailers from Vawdrey Australia to cart produce from Perth to Darwin for a large retailer.

"We began as a small company and we are now a medium-sized one, but we still have that same can-do attitude as we did when we started out," Mr Avery said.

"We offer a personalised service but we are well resourced enough to handle

the big contracts.

"We are solutions-focused and we make things happen.

"We are prepared to put the time into training people, we have lots of young people working for us who tend to stay with us long term because of the workplace culture we have.

"It has taken a real team effort to get to where we are today and we couldn't have done it without all the excellent staff we have."

Mr Avery's sons Thomas and Jack also play an integral role in the family business.

Bruce Avery Transport is primarily based in WA and the Northern Territory but it does have alliances with other companies to coordinate projects with its clients Australia-wide.

Routes:

- Once a week service from Perth-Darwin
- Darwin Express for urgent freight needs
- Perth-Goldfields for mine site runs
- Perth-Pilbara: Daily service for bulk and general cartage to mine sites
- Australia wide: Using alliances with other companies and an extensive fleet.

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WHERE OTHERS SEE OBSTACLES, WE SEE AND PROVIDE THE SOLUTIONS

As transport specialists we handle all types of requests and provide a range of options and transport services to the civil, construction and mining industries.

- Dangerous goods transport
- Scheduled general freight services
- Oversized loads
- Remote location transport
- Extendable loads
- Machinery transport
- Controlled waste transport
- Hot shots (available 24/7)
- Security risk substance
- Refrigerated tautliner service

Perth Depot: (08) 9250 2755
Operations: 0429 193 214
3 Kalamunda Rd, South Guildford 6055

Newman Depot: 0477 177 280
Operations: 0477 177 280
17 Shovelanna St, Newman 6753

Darwin Depot: (08) 8931 4200
Operations: 0477 944 447
22 McKinnon Rd, Pinelands 0829

FIRST CLASS FROM FREIGHT LINES

Freight Lines Group has earned a reputation as "The Can-Do Company" that has provided transport, warehousing, and logistics solutions to clients for more than 50 years.

Freight Lines Group (FLG) is a WA regional transport specialist providing road transport, warehousing and logistics solutions to its customers with first class levels of safety, reliability and cost-effectiveness.

FLG is one of the largest privately owned transport and logistics companies in WA where it has been servicing industry in WA for more than 50 years.

While FLG is large enough to cater to any customer requirements, the family-owned business is small enough to care.

Since its establishment in the 1960s, FLG has earned its reputation as "The Can Do Company" that delivers proven reliability and excellence in customer service.

The company runs a modern fleet of more than 140 trucks and 450 pieces of trailering equipment while employing around 200 staff.

With depots in Esperance, Ravensthorpe, Kalgoorlie, Albany, Perth and Geraldton, FLG has the whole state covered.

Services to the mining industry include general, chilled and frozen freight,

warehousing, storage, local pickups and deliveries, hotshots, oversize loads, unpacking containers and bulk transport.

FLG owner Michael Harding said the company is committed to improving road safety throughout the network it operates in.

"We invest heavily in a safety culture across the entire organisation where we are committed to providing a safe and healthy work environment for all our people and customers," Mr Harding said.

"We service a large and diverse customer base which includes customers in the agricultural sector, mining industry, industrial producers, supermarkets, fast moving consumer goods (FMCG) retailers and freight and logistics services to the businesses in regional towns where we operate."

FLG runs the latest fully integrated transport management systems to cater for online bookings and automated uploads as well as full track-and-trace for all freight.

Each customer is given access to an online portal for bookings, freight tracking and proof of delivery (POD) information.



The customer can also allow their supplier to access the system through unique logins to arrange freight bookings.

The system is designed to eliminate errors caused by manual systems and allows the customer to have 24/7 access.

FLG can also provide system-based tracking of pick-up and delivery times to facilitate KPI reporting on the services provided, with loading and unloading available seven days a week.

Mr Harding said FLG approaches each job

with flexibility to make deliveries based on the customer's unique needs.

"FLG operations staff are available around the clock and we allocate a 24/7 mobile number for mining clients in WA to contact FLG for any logistical requirements," he said. "FLG also supplies dedicated account managers to mining clients."

The majority of FLG's clients are in WA's Midwest, Goldfields, South West and Great Southern, however FLG does provide some specialised bulk and general freight services to the Pilbara region. **AMR**



The "can do" company

A family-owned WA regional transport specialist willing to go the extra mile with depots in Esperance, Ravensthorpe, Kalgoorlie, Albany, Perth and Geraldton.

Freight Lines Group has been providing first-class road transport, warehousing and logistics solutions to mining customers for over 20 years.

- General, chilled and frozen freight
- Warehousing
- Local pickups and deliveries
- Oversize loads
- Bulk Transport
- Storage
- Hotshots
- Full online track and trace

freightlinesgroup.com.au | 08 9334 5111 | quotes@freightlinesgroup.com.au



AUTOMATED MILL RELINING

RME's automated mill relining technologies deliver relining performed outside the grinding mill.

Reliability through new, automated technology is assured through the RME brand promise and through multiple levels of machine redundancy.

All RUSSELL Mill Relining Machines possess various levels of operational redundancy. A RUSSELL Model U *AutoMotion* Mill Relining Machine maintains full operational capability even in the event of software or hardware disruption.

THUNDERBOLT SKYWAY is RME's semi-automated THUNDERBOLT Hammer guidance and suspension system that has been in development with RME product managers and engineers since 2016, with two installations now commissioned on SAG mills in Central America and South East Asia.

INSIDEOUT Technology is the name given to a suite of advanced technology processes that complement RUSSELL Model U *AutoMotion* Mill Relining Machines and SKYWAY, facilitating relining to be performed from outside the grinding mill.

RME's Executive Chairman John Russell said: "Our advanced technology RME Mill Relining System customers are leading the world by recognising that by performing relining from outside the mill, they remove the risks for personnel who are typically surrounded by suspended loads during traditional relining activities."

"Our customers at Northern Star Resources are using INSIDEOUT Technology at their Kanowna Belle site after a number of INSIDEOUT trials, providing relining productivity and safety improvements," he added.

"Other customers who prioritise safety are on this same optimisation journey with us." THUNDERBOLT SKYWAY is a purpose-built structure external to the grinding mill to support and position THUNDERBOLT Recoilless Hammers and elevating operator work platforms. It consists of both fixed and mobile plant.

Fixed plant, which includes SKYWAY's structural towers and rails, is permanently installed according to a predesigned installation schedule.

Mobile plant elements include the SKYWAY elevating work platforms and THUNDERBOLT Hammer modules.

These modules are designed to be shared between a site's large grinding mills and, between relines, are stored in specially designed storage frames adjacent to the mill.

Both module types are easily transported by overhead crane and are designed for ease of transfer.

While relining external to the mill can be achieved independently of SKYWAY investment by using INSIDEOUT Technology, Mr Russell said the company has fully automated the mill relining process.

"A highly progressive brownfield site has implemented RME's full advanced technology suite in one project, installing SKYWAY, INSIDEOUT Technology and a RUSSELL 7 Mill Relining Machine equipped with *AutoMotion*," he said.

"This machine is the world's first robotic Mill Relining Machine and it's been developed, designed and manufactured completely by RME.



Factory commissioning of RME's first automated mill relining system THUNDERBOLT SKYWAY project.



The world's first automated Mill Relining Machine.

"These advanced technologies provide significant productivity benefits and the automated RUSSELL 7 is operated by personnel outside the grinding mill, delivering a relining safety world first."

Mr Russell said the company's research indicated SKYWAY will be favoured by larger miners with significant anticipated mine life. "High altitude sites, in particular, will benefit due to the personnel fatigue management that SKYWAY affords," he said.

"Importantly, RUSSELL *AutoMotion* MRMs are equipped with full operational redundancy and we anticipate these 'super machines' will become the industry standard for large SAG, AG and ball mills."

Fast and safe relines are the result of RME's history of engineering innovation in the minerals processing industry.

Customers of this 35-year-old, family-owned Original Equipment Manufacturer

(OEM) have an entire suite of machines, technologies, and products at their disposal through the development of RME's Mill Relining System.

The system includes Feed Chute Transporters, the renowned RUSSELL 2000-8000kg Liner Placement Mill Relining Machine range and RUSSELL 500-2000kg Liner Suspension Mill Liner Handler range as well as THUNDERBOLT Recoilless Hammer products.

These same customers enjoy the security of knowing their RME Mill Relining System assets are assured through 24/7 SERVICE; RME's renowned asset support platform is delivered through a range of methods from the company's five regional service centres, including on-site support, 24-hour helplines and through augmented reality platforms.

The platforms provide access to authorised OEM technicians and to all RME personnel for both equipment training and use,

optimisation or trouble shooting and repair/service support.

Grinding mill relining is typically on the critical path for maximising throughput of the concentrator plant. RME understands this environment and the critical role that optimised liner exchange, and liner design, plays in the profitable operation of the mineral concentrator.

By addressing grinding mill maintenance holistically through RME's range of mill relining optimisation technologies and services, the company of more than 450 personnel globally helps to deliver high utilisation rates.

As a result of RME's dedication to optimising the mill relining niche, many occupational safety hazards have been reduced, while reline duration has halved and in some environments, quartered. **AMR**



RUSSELL
MINERAL EQUIPMENT

- | Australian owned
- | Award winning exporter
- | Customers in 60 countries



"INSIDEOUT Technology allows sites to access reline-by-reline safety uplift and with RUSSELL AutoMotion Mill Relining Machines, relining is performed with no people inside the mill."

JOHN RUSSELL & PETER RUBIE

rmeGlobal.com





BREATHE EASY

CleanSpace Respirators exceeds minimum requirement for Queensland Code of Practice on silica dust exposure.

CleanSpace Respirators meet and exceed Qld's new minimum requirements, removing 99.95% of airborne contaminants.

With the new Queensland workplace exposure standard on crystalline silica exposure in effect since July 1, 2020, many workplaces are looking at implementing several control measures including improved respiratory protection.

The workplace exposure standard has been halved from an eight-hour time-weighted average airborne concentration of 0.1mg/m³ to 0.05 mg/m³.

Most people would have heard about the dangers of respirable crystalline silica exposure and its potential to cause silicosis, a debilitating lung condition that can lead to death. While the recent talk has been centred around the dangers to stonemasons, it's nothing new to the mining industry.

The industry has acknowledged silicosis as one of the primary diseases to affect miners since the industrialisation of drilling operations in the 20th century.

Respirable crystalline silica also causes lung cancer, chronic obstructive pulmonary disease (COPD) and kidney disease. Silica dust is harmful when inhaled into your lungs. As it is 100 times smaller than a grain of sand, workers can be breathing it in without knowing.

Silica is one of the most abundant minerals found in the earth's crust and is used in many products across a variety of industries and workplaces. Crystalline silica is most dangerous to health when dust is generated, becomes airborne and is then inhaled by a worker.

While there are many industrial activities where people are exposed to respirable crystalline silica, the most notable are stonemasonry, mining, excavation, construction, tunnelling and abrasive blasting.

There are several areas that need to be addressed to effectively reduce exposure to silica dust.

They are:

- Wet cutting
- Ventilation and other engineering controls
- Isolation
- Substitution
- Health monitoring
- Respiratory Protective Equipment

With regards to respiratory protection, PAPRs (Powered Air Purifying Systems) with at least a P2 filter, are the new benchmark across most industries.

CleanSpace Respirators meet and exceed these minimum requirements offering a P3 filter that removes 99.95% of airborne contaminants.

CleanSpace Respirators are a revolution in the area of respiratory protection because while they provide all the protection of a PAPR: they are free from belts, battery packs and hoses.

Even when used in hot and humid conditions, CleanSpace Respirators provide cool, clean air to the user and eliminate fogging and moisture.

CleanSpace Respirators are light, easy to put on, reliably safe and comfortable. The clear silicon mask is comfortable and allows for easy communication. CleanSpace Respirators are operated using a simple one-button smart system. These features combined mean workers are more likely to wear them for a full shift.

Compared to disposable masks, CleanSpace Respirators offer more protection and are more economical as the cost of replacing disposables stacks up. Disposable masks are well-known for causing fogging and discomfort, leading to low compliance.

CleanSpace Respirators have four models depending on the requirements of the industry.

- CleanSpace EX is intrinsically safe, so that it can be worn in potentially explosive environments such as mining.
- CleanSpace Ultra is IP rated 66, making it water tolerant, perfect for stonemasons carrying out wet-cutting.
- CleanSpace 2 can be used in a variety of industrial applications where water tolerance or intrinsic safety is not required.
- CleanSpace HALO is designed specifically for the Healthcare, Pharmaceutical and Laboratory sectors.

An Australian company based in Sydney, CleanSpace Technology assists in product training, fit testing and instructions on maintenance and care with attentive customer support.

For more information on CleanSpace Respirators, visit:
www.cleanspacetechnology.com

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CleanSpace EX respiratory protection.



CleanSpace Technology's CS2, ULTRA and EX respirators.

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THE AUSTRALIAN
MINING REVIEW

POWER AND THE PASSION



When a crucial machine or equipment breaks down on-site, the potential impact is worth millions of dollars in revenue to a well-run mining operation. The sudden, unexpected halting of production puts the mine site team on the critical path to getting repairs or replacements done in as short a time as possible. Downtime equals loss.

Reliability, durability and safety are paramount. In the most remote, high-risk and harshest environments in Australia, all machinery and equipment at mine sites must perform 100% of the time. Power and lighting are vital to these 24/7 operations.

The *Australian Mining Review* spoke to PowerLink Australia Sales Director, Sidney Ji, and Lighting Tower Product Manager, John Mikic, to learn how the company's range of gensets and lighting towers solve the issues of reliability and robustness for mine site power and lighting generation.

PowerLink Australia

PowerLink, founded in 2001, is a global manufacturer and supplier of reliable and high-performing power equipment, with research and development centres across the world. In 2010, PowerLink Australia was established, serving Australia, New Zealand, Papua New Guinea and the Pacific Islands.

The parent group, PowerLink, first supplied diesel generators to clients in Australia in

2006, prior to PowerLink Australia being established. Local clients recognised the quality and value of PowerLink power equipment, with the company importing the products into Australia well before 2010.

Today, with the head office located in Sydney, more than 8,000 pieces of PowerLink Australia power equipment are used throughout the Oceania and South Pacific region, of which nearly 7,000 pieces are used throughout Australia.

Design and Engineering

PowerLink Australia Sales Director, Sidney Ji, says the company has focused on designing and engineering products suitable for Australian remote and harsh environments for the past 15 years.

"Our generators are reliable, very robust, easy to operate and most of all safe to work with, complying with Australian local safety

standards such as the basic requirements of AS3000 and AS3010," he said.

Committed to supporting clients' business growth, PowerLink Australia prides itself on reliable products that exceed Australian Standards and are operationally-safe.

"As a standard, our gensets come with four-pole circuit breakers. We also upgrade products to relevant minespecs and use only proven parts and components, including reputable diesel engines such as Cummins, Perkins and Kubota," Sidney said.

High-Performing Gensets

Able to withstand temperatures up to 50°C, highly wear resistant, anti-corrosive with galvanised steel canopy and a rigid chassis, PowerLink Australia gensets can be used on remote land or even by the sea. Multiple genset sizes are available and can be synchronised to deliver higher output.

Gensets canopy boxes are galvanised and can withstand harsh elements in the Australian outback.

There could be a 30kVA generator providing backup power for an onsite pump, or there could be multiple of 500kVA generators synchronized together to power up a mining camp.

Sidney says all the clients have to do is put diesel into the engines to get started. "Generators are the core and heart of energy source and that's why we only use world-renowned and reputable engines. Cummins is one of the world's number one diesel engine manufacturers that has proven engines and the company invests heavily in improving technology, translating to better fuel efficiency and more robust engines for clients," he said.

All PowerLink Australia gensets are powered by world-renowned diesel engines such as Cummins, Kubota and Perkins. They are supplied complete with four-pole ABB circuit breakers, smart controllers, lockable access



An example of synchronisation of gensets at a remote area for higher output.



Two gensets powering an on-site project.

doors and other features suitable for daily heavy-duty needs.

Reliability

The mining environment in Australia is dusty and polluted. Products that work overseas may not be suitable for local applications and conditions. Potential issues around variable load and the clogging of systems due to pollutants could create a mining operation disaster.

“Reliability isn’t just about engineering and design, products must be able to withstand the harsh and difficult environments of remote mine sites. When products fail, this leads to big losses at the clients’ operations worth millions of dollars. We work towards the final end-use of the product in everything we do,” Sidney said.

A European product that works well in cooler and cleaner air environments may be unsuitable for mine sites in Australia where temperatures regularly push over 50°C.

“Reliability is an absolute focus for PowerLink Australia. We do not believe in cutting corners or finding cheaper substitutions for genuine, quality products. It only takes one part to fail for the whole machine to turn down. Our chosen products are tough, reliable and high-performing, proven through our years of operation in Australia,” Sidney said.

PowerLink Prime Range

The PowerLink Prime range is the company’s premium range developed for all types of the heavy-duty applications. Featuring an auto-transfer switch, the smart technology embedded in these range of gensets determines when power is out and automatically powers up the generator for continuous power supply.

This premium range is suitable for high-volt applications in harsh environments such as mining in remote areas, power stations and telecom projects. The option of housing the larger gensets in shipping containers presents a cost-saving to clients with transport and shipping.

The PowerLink QSV range, on the other hand, was developed for the standby market application, including, commercial, agriculture or industrial backup applications. Both ranges come with canopy boxes which reduce sound, while also supporting the genset in a rigid, sturdy frame.

Exceptional Service

The two supply centres in NSW and WA ensure fast delivery of power equipment and minimal downtime for clients. Dedicated technical service teams at these two locations and a nationwide service network deliver exceptional after sales support and service.

PowerLink Australia also has unparalleled domain expertise, with 15 key distributors that are highly experienced in diesel generators and 24 service depots throughout the country. A variety of stock is always on-hand, leading to minimal downtime for clients. Rest assured knowing that access to expert product knowledge and technical expertise at PowerLink Australia is only a phone call away.

Backed up by strong CRM systems, critical information such as parts availability, technical specifications, maintenance schedules and technical drawings are always at hand. “That’s our commitment to local Australian customers,” Sidney said.

“We supply a product, but we also supply the service, support and training. All feedback we receive from clients goes back into further research and development and the manufacturing process. Product improvement is a continuous journey for PowerLink Australia and we take pride in product quality and efficiency for the end user.”

Lighting Towers

PowerLink Australia Lighting Tower Product Manager, John Mikic, says the central topics around lighting towers are fuel efficiency and reliability for the end users. With mines operating around-the-clock, visibility and good lighting conditions 24/7 are paramount in ensuring non-stop production.

Lighting tower equipment must perform in harsh environments, alongside the elements of wind, rain, dust; along with having a simple, continuous operation, the equipment must be robust, unequivocally stable on unlevel surfaces and be transportable across bumpy terrain. A huge ask of a small machine.

ALT2000

No challenge is too tough for the ALT2000 mobile light tower, a heavy-duty, off-road diesel equipment made for the mining industry. The most powerful among PowerLink Australia’s four flagship lighting towers, this machine weighs in at nearly 2t, with the other three machines weighing about 1t each.

This MDG15/41 minespec lighting tower, suitable for open-cut mining and used in NSW coal mines, uses high quality, high output LED light fixtures at 500W per unit. Featuring a reliable two-cylinder Kubota Z482-E4B-ACP-1 engine and an LCD panel built into its powder-coated canopy, this lighting tower allows for precise electronic control of light output, height and tilting through its inbuilt control system.

The PLC-810 microprocessor controller allows for easy operation and maintenance.



MINE POWER GENERATION 65
TECHNICAL TALK

The ALT2000 lighting tower is built according to minespec MDG15/41.



PowerLink Australia gensets come in heavy-duty, lockable and fully self-contained shipping containers for ease of shipping.

It also comes with a 12V/120AH sealed-for-life and maintenance-free battery, allowing the lighting tower to be powered when not connected to grid or in the absence of fuel. The DC/VF alternator PMG-DC-18-4 directly charges the battery.

With four 500W metal LED lamps, hydraulic power driving the lamp post, an emergency stop switch, an Anderson jump start socket, lockable battery isolator switch and programmable alarm functions, the ALT2000 lighting tower is a power-packed machine adopting a mobile trailer design and four supporting legs to install the lighting tower.

Having a rating of IP65 makes the entire machine highly resistant to external elements. IP or Ingress Protection, also known as International Protection, is a two-digit grading system applied to the enclosure of mechanical or electrical items. It grades the level of protection for the user, the degree of protection from elements and the resistance to moisture.

Fully-extended, the lighting tower dimensions are 4237mm x 2936mm x 8418mm with up to a 90° tilting of the lights. The quality and build of the ALT2000 is unparalleled with its world-leading design, engineering and quality using only the best proprietary LED technology.

Fuel Efficiency

When performance requirements are high and cost input is low, diesel run lighting towers provide the most robust and economic option for mine sites. Factors including application, size, colour, temperature, glare, noise, light spill, energy and fuel efficiency, IP rating and regulations all contribute to the type of lighting towers chosen by end-users.

The ALT2000 has a 200L tank capacity with fuel consumption at 50Hz. The running of four lamps uses just 0.76l of fuel per hour. Reducing the usage down to two lamps further drops fuel consumptions to just 0.48l per hour. The output of the generator is determined by the load, with diesel generators consuming less fuel overall.

Lighting Efficiency

With the progression of lighting technology over the last decade, the use of metal halide lamps was slowly replaced by more efficient, more resilient and longer-life LED lights. The LED light fixtures on the ALT2000 are 500W per unit and have separate control gear and a large heat sink which help to keep the LED at optimum performance.

Lumens per watt play a huge role in the efficiency of lighting towers. The higher the lumen per watt, the more output is provided for less power. John believes lighting

efficiency can only improve from here on, with more lumens producing per watt and reducing energy draw.

Battery Efficiency

Lithium batteries are currently used in lighting towers and are expected to be replaced by solid state batteries in the next few years. These new technology batteries are made up of solid material, electrodes and electrolytes, instead of the liquid or gel ones found in lithium batteries.

“The introduction of solid state batteries will solve the issue of efficiency and reliability. These new technology batteries will be about half the size of the current lithium ones and will provide about five times as much power output,” John said.

“Current compact batteries that power standard lighting towers can run about seven days straight on a 90L diesel tank. The mine spec lighting towers such as the ALT2000 have a much bigger tank at 200L and can run up to 152hrs, or just under 13 days at 12 hours per session.”

John said roadwork tunnels in Sydney currently employ battery-powered lighting towers, with the option of running power cables and connecting these towers to externally located generators to combat air and noise pollution within the tunnels.

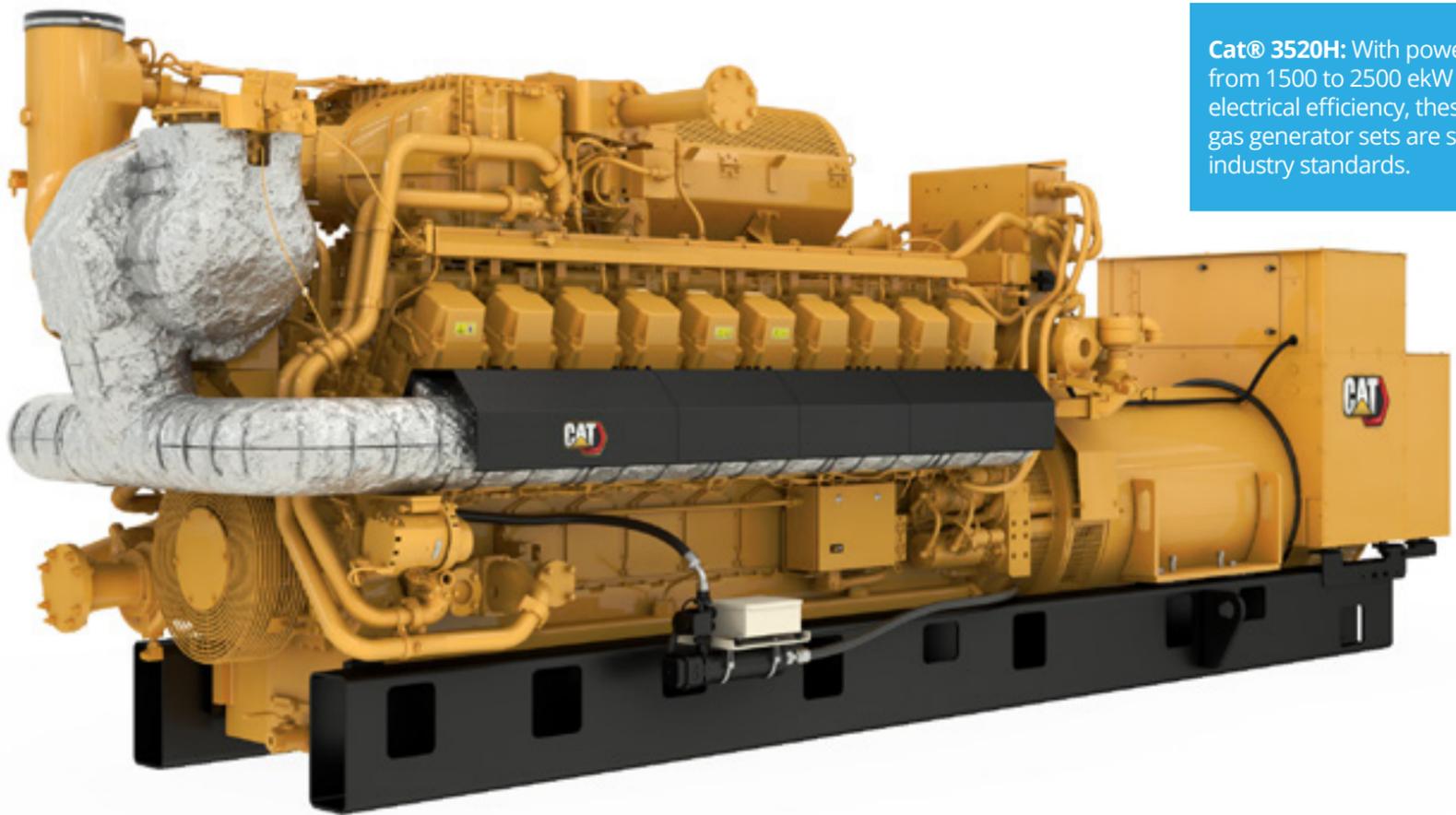
“With the advent of solid state batteries, we are hopeful this will provide a solution for end-users who prefer hybrid lighting towers in terms of performance, longevity and cost-savings for near-daylight illumination,” he said.

Other models

The other three flagship models of diesel lighting towers offered by PowerLink Australia, all weighing in about 1t each, are:

- **MS1800-KDC:** adopting a trailer design, this lighting tower features a cover over the individual lighting fixtures that create soft lighting for the end user.
- **MS2000-KDC:** similar in body design to the MS1800-KDC, this lighting tower features conventional LED lighting.
- **FS2000-KDC:** this lighting tower has a fixed, stable base but the body, mast and lighting fixtures have the same design and functionality as the MS2000.

AMR



Cat® 3520H: With power output from 1500 to 2500 kW and top tier electrical efficiency, these innovative gas generator sets are setting new industry standards.

ECO-FRIENDLY ENERGY

Caterpillar has partnered with Energy Power Systems Australia (EPSA) to deliver innovative hybrid energy solutions that deliver more efficient, reliable and cost-effective power to mine sites.

Expanding into the renewable energy sector, Caterpillar has developed purpose-built, fully integrated hybrid products: Cat® Battery Energy Storage Systems (BESS) and the Cat® Microgrid Master Controller (MMC).

EPSA has harnessed this technology to integrate renewable systems —solar, wind or hydro — with traditional gas and diesel power generation across Australia.

EPSA Strategic Initiative Manager Darren Nankivell plays a pivotal role in delivering the complete hybrid solution, including generator sets, BESS and controllers.

“Caterpillar’s hybrid solution allows our customers to lower their Total Cost of Ownership (TCO) and Levelised Cost Of Energy (LCOE), reducing their fuel burn, improving generator efficiency and extending the life of current energy assets,” he said.

Improving Efficiencies

Hybrid energy solutions can be applied to existing thermal plants to achieve better efficiencies.

The technology maximises existing thermal power generation, allowing plants to operate at a higher load factor, whilst reducing overall operating costs.

This is achieved by reducing reliance on reciprocating spin reserve, which is more energy intensive because it involves switching on more than one generator.

The use of the high-transient BESS unit offsets reciprocating spin reserve with virtual spin reserve, eliminating the need for extra generators; the suitably-sized battery delivers the full energy requirements until another generator comes online.

By not needing to run generators unnecessarily, their service time is extended, improving the life of a plant.

Additionally, the hybrid technology improves the fuel efficiency of the generator by maximising its performance.

As generators are designed to operate at a 100% load, fuel efficiency drops off if they are operating at a lower load factor. Like a high-performance car, the new generator systems have advanced fuel chain and delivery systems to achieve higher efficiencies.

“The battery units allow the generators to achieve the higher efficiencies, maximising their output to the level they are designed for,” Darren said.

“The payback is faster because there is more fuel efficiency running at 100%, so you get a better bang for your buck all-round.”

For example, running the Cat® 3520H generator at 95% load instead of 50% is equivalent to saving 5.9% of fuel burn per unit every year, or \$5000 per megawatt a year.

“The BESS units provide the confidence to operate the plant reliably while improving efficiencies,” Darren said. Another major benefit is the cost saving through reducing downtime and lost production.

“Many operators run multiple gensets—more than they need—because if a plant goes down, it could cost \$800,000 an hour. Operators can now run their plants ensuring reliable power through this new battery technology.

“It is sometimes hard to quantify how much reliability costs.

There is a capital outlay for the batteries but they pay themselves off very quickly by extending service intervals and increasing fuel efficiency and reliability,” explains Darren.

New Frontier

There are many advantages of hybrid energy solutions when compared to traditional power generation.

These include extremely fast ramp rates available in inverter technologies, which



The Cat® BDP1000 (Bi-directional Power) energy storage inverter stabilises a microgrid against transient events caused by step loads and renewable power sources.

can control kilowatts and the volt-ampere reactive (VAR) independently of each other.

With traditional power generation, operators have to buy a certain size generator to produce a certain number of kilowatts and VARs; (a unit of measurement of reactive power).

Battery or inverter technology is far more adaptable and can be tailored specifically to the solution required.

“Because of the nature of extremely fast ramp rates from zero to full power in ten milliseconds, the Cat® BESS unit can be used

ENERGY POWER SYSTEMS AUSTRALIA

HOW IS THIS MADE POSSIBLE? - THIS IS ONLY POSSIBLE WITH CAT BESS SOLUTION

MUST HAVE FEATURES

- Patented Cat® non-linear droop control system - Ultra-fast, blinkless transient response (sub-cycle)
- Virtual Spinning Reserve (VSR) - Generates efficiency optimization and growth off "island" modes
- Seamless Mode Transfer - Interruption free power flow reversal Voltage Source for both Grid Follow & Grid Forming modes
- Power Factor Correction (up to full 4 quadrant PF control) 200% Overload / 2 Per Unit Fault Current capability

150% FOR 10 SEC

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CAT

Cat® BDP 250 ramps from zero to full power in 10 milliseconds.

Gold Mine Hybrid Power

2x Hydro Dams 25-100MW Seasonally variable

100% Renewable power flow

Mine Load

Mine Shaft & Under Load 7.5MW Power @ 230V, generator set

Cat Hybrid Energy Solution

Cat Management Controller

The Cat® hybrid energy solution wheel.

HYBRID ENERGY SOLUTIONS

TECHNOLOGY & SOLUTIONS

RELIABLE POWER SOURCES

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CONTROLS

ENERGY STORAGE

SOLAR SOLUTIONS

GENSETS

- Fully Integrated
- Modular
- Plug and Play
- Cat Warranty

An example of a gold mine using Cat® hybrid power.

Cat Hybrid Energy Solution

- Intelligent Microgrid Controller Algorithms designed by generator set engineers
- Integrated Inverter Controller for ultra-fast response to all transients
- Patented Cat® ESS non-linear droop algorithm for improved power quality
- Seamless integration with baseload power assets
- Virtual Spinning Reserve (VSR) optimises cost savings & reduce run hours
- Seamless Mode Transfer
- Remote Asset Management
- Remote Commissioning

Hybrid & Gensets Only (ESS Off) | Hybrid, Gensets & Cat ESS

1.5% Ripple | 0.5% Ripple

1.4% Ripple | 0.4% Ripple

Gold mine - Cat® hybrid power profile with energy storage systems switched off compared with on.

to fully provide fault contribution and static VAR compensation to existing renewable sources of power generation at 0-pF or 0kW output," Darren said.

The **Cat® BP Inverter** operates as a voltage source, continuously controlling voltage and frequency at its terminals locally, this is defined as Grid Forming.

Using the patented non-linear droop, the inverter consumes or produces kilowatts and VARs to maintain the frequency and voltage within tight dead bands.

System stability requires detection of a disturbance, response and correction to occur instantaneously.

Similarly, the unit needs to be able to settle just as fast to ensure there is no over shoot.

"We're not just simply talking about Frequency Control Ancillary Services (FCAS), we are talking about physically controlling the frequency and voltage at the point of connection of the BESS unit, providing Synthetic inertia," Darren said.

Synthetic inertia is defined as the controlled contribution of electrical torque from a unit that is proportional to the RoCoF (Rate of change of Frequency) at the terminals of the unit.

He said there are several unique opportunities arising from having a Cat® BESS unit with these capabilities:

- Grid and microgrid stabilisation
- Large motor starting
- Transformer and cable energisation
- VAR compensation/voltage control
- Black starting
- Uninterruptible Power Supply (UPS)
- Virtual spin reserve
- Regenerative braking
- Blinkless transfer to island mode
- Synthetic inertia

Cat® BESS allows for an increased PV penetration

Utilising grid-forming algorithms the Cat® BESS allows for the continual provision of constant kW/VAR support at its terminals to the full kVA name plate rating for both importing and exporting.

Through this technology, the BESS can be used to locally control the system voltage by consuming VARs and providing virtual spin reserve in the event of a drop in solar production. This innovation allows for an increased PV penetration.

"The BESS uses its onboard control algorithms to adjust V and Hz locally. Additionally to this, it can be commanded to an output set point from central control," Darren said.

Distributing the BESS across the network would enable the control and production of VARs where they are consumed, minimising their transportation and therefore increasing line capacity.

The BESS units would be linked to the utility/power plant control system for dispatch, if required.

However, due to the innovative technology and the extremely fast ramp rates, the BESS will correct and return to normal any deviation in V and Hz before the system control has responded.

"We have seen mine sites, which utilise traditional power (diesel and gas) as their backbone for power generation, now considering a move to renewable power generation. This is a process of transition and we've got the solution," Darren said.

Operators do not have to use just solar to achieve hybrid energy power generation and decarbonisation.

It can be BESS and generator only.

Advancements in Cat® BESS technology is allowing BESS units to be used in traditional power generation situations or scenarios not previously thought possible.

Traditional Power Generation

Diesel and gas power generation still has a large part to play in the operation of mines. Modern advancements in engine design and gas ignition systems has allowed Caterpillar to deliver the new Cat®3520H, a market-leading gas generator.

The inherent high fuel efficiency design

achieves a low operational cost. Features include cross flow design cylinder heads, superior strength steel pistons, high cylinder pressure, high efficiency turbo-chargers, small crevice design pistons, ultra-lean burn design, pre-chamber spark plugs and liner scuff rings.

These features also contribute to low lube oil consumption, longer component life and extended periods between regular services and component overhauls.

"Another feature introduced this year is the three-way temperature control valve, now standard on all versions," explains Darren.

The three-way temperature control valve is part of the engine humidity management strategy that Caterpillar has developed.

This protection system eliminates condensation inside the engine whilst maximising power and efficiency.

"Intake air temperature and humidity are measured and the SCAC temperature and engine power are adjusted when required," Nankivell adds.

Eco-friendly Power

EPSA integrates renewable systems with traditional gas and diesel power generation to deliver efficient and reliable eco-friendly power using:

- High transient loads: Due to its extremely fast ramp rate from zero to full power in 10 milliseconds, the BESS unit can take large load steps with lightning speed;
- Virtual Spin Reserve: The adequately-sized and fully charged battery provides power as needed without having to use extra generators;
- Static VAR compensation: The BESS unit can provide VAR compensation to support the likes of solar installation without the need for synchronous condensers, sometimes called synchronous capacitors;
- Synthetic inertia: Due to the fast ramp rate and storage ability of the BESS,

power can be delivered as needed without affecting the system's stability;

- Grid forming: BESS units can operate in "island mode" to create their own voltage and frequency, allowing them to be the main source of power;
- Grid firming: The units enable stabilisation of the existing, weak grid through synthetic inertia;
- Fuel saving;
- 2 PU fault current contribution.

The Cat® Advantage

Another major advantage of EPSA's Cat® Hybrid Power Systems is that one company provides one solution.

"All components are designed by the same company and they are designed to work together," Darren said.

"Cat® technicians are fully trained to ensure our integrated solution is working together to deliver the best solution."

The systems are also covered by the Cat® warranty, which is supported by the extensive Cat® dealer network.

"Many mining companies currently use Cat® trucks and bulldozers, so the inverters and battery technology are all covered by the Cat® service network and warranties," Darren said.

The growing trend in green energy production has seen an increase in interest and adoption of renewable energy solutions.

Caterpillar's expansion into developing hybrid energy solutions, which include purpose-built fully integrated reliable hybrid products, provides a great solution for companies looking for sustainable options in addition to traditional power sources. **AMR**



BLUE RIBBON SERVICE

The Telfer mining camp run by six Denyo DCA-150 gensets that are set up to run in parallel by Blue Diamond Machinery.

The growing demand for continued power supply and increasing reliance on digitalisation and automation have driven the growth of gensets, including portable gensets. The global market share of gensets exceeded US\$20b in 2019 and is forecast to almost double by 2030, reaching \$39.1b and yearly installations surpassing four million units.

Almost three-quarters of global generator deployments in 2019 were diesel gensets, most of which went to manufacturing, mining, oil and gas and construction sectors. Market share of portable generators are projected to reach just under \$3b by 2025.

However not all generators are created equal. The *Australian Mining Review* spoke to Blue Diamond Machinery sales and marketing director Justin Pitts about choosing the right generators for your end-use application.

Independent Suppliers

Blue Diamond Machinery is a leading national supplier of total power, air and industrial solutions. The products are targeted towards the mining, construction and trade industries, supporting customers within their core capabilities of power generation, air compressors and lighting towers.

Being an independent equipment supplier, and run by owner operators, the company has knowledge and experience across all brands of generators and driven to supply and deliver only the best products and services in the industry.

Lead time is critical in mining and its service centres across the country carry stock in bulk, including spare parts for all the equipment it distributes. All technical and sales professionals are at the frontline, liaising directly with customers for support, advice and technical expertise.

Product Customisation

Blue Diamond Machinery generators are used on mine sites across Australia for all aspects of operations, including running crib huts to powering whole camps or equipment.

With one of the best technical teams in the industry, the company can customise its equipment to suit any specification, including mine specs. Further customisable technical specifications for different end-use applications include fuel tank size, synchronisation of multiple generators, noise level restrictions, fuel efficiency and emissions targets.

All ranges and sizes of products are catered

for, from smaller, portable equipment to larger, heavy-voltage, capital ones – and all are available online to view. Along with being 100% transparent, all pricing is genuine, highly competitive and offers unbeatable value and affordability.

Distributors

Blue Diamond Machinery is an exclusive national distributor for the leading Japanese brand of generators, Denyo; the Italian brand of air compressors, Rotair; and the Italian brand of LED lighting tower range.

The company is also a distributor for both Kubota engines and generators and Honda inverter generators and engines. It was awarded the status of 5-star service agent for Kubota.

This allows Blue Diamond Machinery to keep prices down across a range of brands, products and end-use requirements for its clients. With showrooms and branches in Perth, Melbourne and Brisbane, the industrial leading mechanical and parts team of Blue Diamond Machinery also has a strong presence in the Pilbara and the Goldfields regions of WA.

Denyo Generators

Denyo is one of the biggest names in generators. Originating in Japan, Denyos

are well-suited to mining environments and tough conditions.

Engineered for high-performance, its DCA series of generators are soundproof, complete standalone gensets. All models consist of a Denyo alternator that is directly coupled to a diesel engine, with both set on a common skid base.

Special vibrator isolators are used and all components are fully enclosed in a solid steel, weatherproof bonnet. Highly effective sound insulation materials achieve the ultimate noise suppression.

With Denyo's specialisation in heavy-duty and economically performing generators, the gensets are:

- **Efficient:** 11.25% more efficient than other generators (when compared to 200 KVA)
- **Reliable:** bullet-proof Japanese quality using only the best Japanese engines such as Kubota and Komatsu
- **Mobile:** exceptionally compact, strong canopies designed to be moved around site or truck mounted
- **Prime Power Rated:** designed and



A fleet of mine spec Denyo DCA-25 gensets loaded on to a truck, off to a rental company in the Pilbara, WA.



Three customised 650kVA generators running in sync and powering equipment in the Pilbara, WA.



Blue Diamond Machinery servicing two Denyo DCA-400 gensets that run a mine camp in the goldfields of WA.

rated to run continuously (24/7) in 50°C ambient temperature.

The DCA series offers flexibility with built-in parallel operation drive systems, dual voltage systems, alternating engine speeds and power. The units are easy to operate, with simple maintenance requirements and built with transportability in mind.

Lighting Towers

Blue Diamonds lighting towers and portable air compressors are engineered and manufactured in Italy to suit Australia's harsh conditions, whilst adhering to Europe's tough emission standards. Where visibility is essential, the company offers clients a choice of the industry-leading Generac range or the new high-performance EnviroLED range. All stocked lighting towers are built to last and perform under tough conditions.

Critical elements such as light coverage, superior bright light visibility, fuel savings, high-quality Italian components and the options of mobile or stationary applications are all covered in the company's range of lighting towers, which are all equipped with LED lighting for better efficiency.

Portable Air Compressors

Known as one of the country's most reputable and trustworthy supplier of

quality air compressors, Blue Diamond Machinery stocks leading brands including Atlas Copco, Genesys and Rotair.

Rotair's range of VRK and MDVN portable air compressors are super quiet, powerful, compact and comply with environmental standards.

Atlas Copco offers compact, versatile and reliable range of screw compressors and piston air compressors.

About Blue Diamond Machinery

Brothers Justin and Brad Pitts, along with business partner Chris Simpson, started Blue Diamond Machinery in 2012 and, altogether, they have over 35 years' combined experience between them.

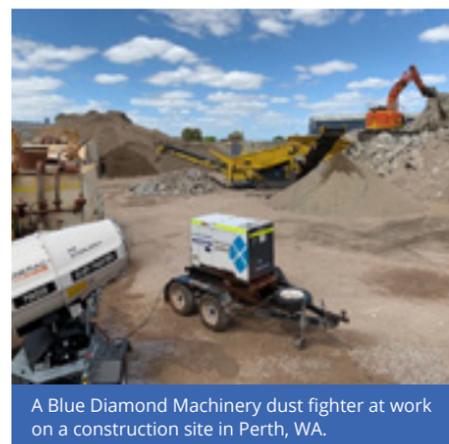
Today, the company is a leading independent supplier of power generation tools to the Australian mining industry with a strong presence in WA.

All quality, reliable products are at unbeatable value and are backed up by expert advice and outstanding support. **AMR**

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Blue Diamond Machinery's customised fuel trailers transported to new homes across CBH sites.



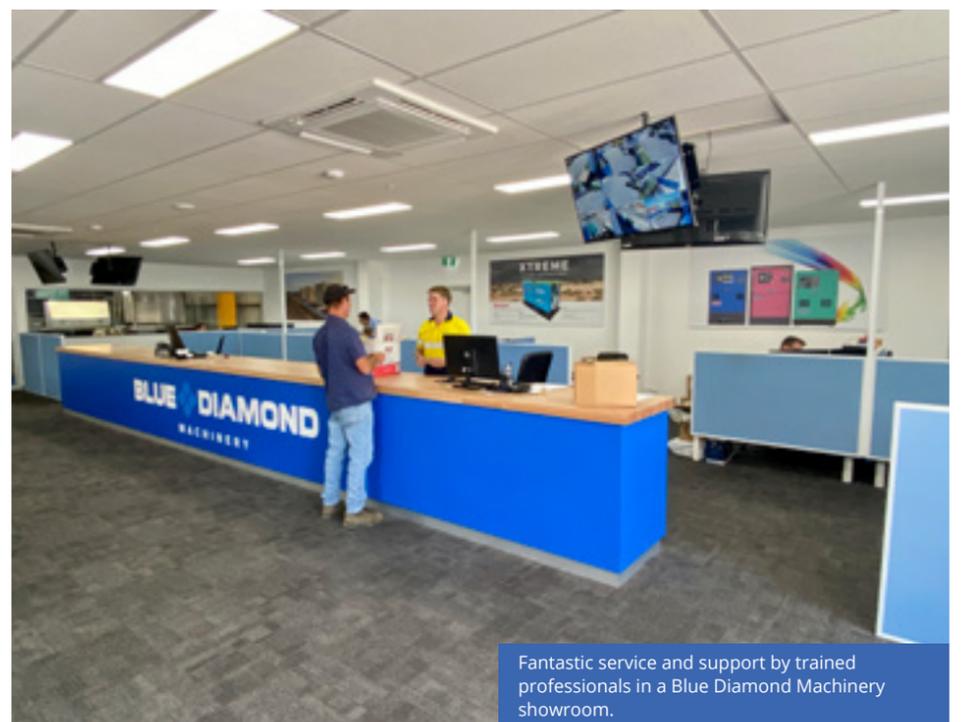
A Blue Diamond Machinery dust fighter at work on a construction site in Perth, WA.



Two mine Spec LED lighting towers are being trucked to a rental company.



All types and brands of equipment are available in a Blue Diamond Machinery showroom.



Fantastic service and support by trained professionals in a Blue Diamond Machinery showroom.



The Vacumatic 1268XL can easily fit and vacuum seal safety equipment such as breathing apparatus for underground mining.

PROTECTION FROM DUST, MOULD AND CORROSION

In the dusty and corrosive environment of mine sites, it is necessary to keep valuable and expensive parts and components free from potentially destructive elements. Elements such as dust, moisture, mould and, even light and atmosphere in some cases, can deteriorate and damage items quickly.

More so in underground mining than in surface mining, the improper storage of spare parts and componentry like electronic circuit boards, machine components and workshop items, can dramatically reduce shelf life.

The challenge of keeping items in pristine condition for as long as possible at mine sites is real. *Australian Mining Review* spoke to Vacumatic Australia's director Urs Stucki to discover how his company's vacuum sealing technology solves the issue of shelf life at mine sites.

Vacumatic Australia

Vacumatic Australia manufactures and exports quality vacuum packaging machines, vacuum chamber machines, tray sealing machines and thermoforming machines to a wide range of industries and sectors.

The company's range of standard and custom-designed solutions can solve any storage and packaging challenges at mine sites. Proudly Australian-owned and operated, Vacumatic Australia has its own modern manufacturing, design and research and development facility in Melbourne, Australia.

"We've been an engineering company for

35 years," Urs said. "We do a lot of things including plant, building and equipment but we started with the vacuum technology packaging for the food industry almost four decades ago."

The company manufactures and supplies quality vacuum packaging machines and bags for food preparation, storage and packing industries in Australia and exports to over eight countries. Today, Vacumatic Australia's machines are used in all industries including hotels, butchers, smallgoods manufacturers, cheese producers, defence force packaging of components to prevent corrosion, mine sites, seafood producers, medical, pharmaceutical, government and aged care.

"We create a longer shelf life for items, including a no-shelf-life limit for certain components, which saves our clients a lot of money because they don't have to replace the items so often," Urs said.

Variable Specifications

With custom-designed solutions and state-of-the-art technology, Vacumatic Australia can build machines to clients' technical specifications.

Swiss-born Urs understands the importance of sourcing quality products worldwide and providing reliable and time-efficient service to clients through the company's overseas-trained technicians and qualified engineers.

Technical specification includes, but is not limited to, overall machine size; construction material, for example 304 stainless steel; chamber height; length of sealing bars;

distance between sealing bars; 100-500 m³/hr Busch vacuum pumps; power and voltage; soft air and double-sealing inclusion; gas flushing facility; and the number of programs, including the material composition of sealing bags.

All types of vacuum sealing functions and capabilities are catered for in Vacumatic Australia's technology, from atmospheric sealing to gas flushing, block packing capabilities to incline control, inbuilt conveyors to sensor controls, large chambers to swing lids, shrink tunnels with hot water to auto-loading systems.

Mine site applications for the vacuum sealing technology are wide and varied, including safety, components and parts storage, samples and catering.

Safety Items

Safety items cover first aid kits and breathing apparatuses. In underground coal mines, for example in Queensland, mine staff require oxygen sets as a safety requirement. They are stored in racks in the underground mine, completely sealed off to prevent moisture and mould from creeping.

There is, with absolute certainty, no chance that corrosion and oxidation can happen as the items are completely sealed off and unexposed in any way to the environment underground.

The Vacumatic 1268XL is a specially designed heavy-duty machine for the mining industry. Featuring a hood and chamber with sealing technology to the front and side of the machine's tray, and an upgraded electronic

and digital control panel for easy and precise operation, it is also suitable for smaller packs including electronics and electrical items, as well as workshop parts.

Stainless steel chambers are standard on all vacuum chamber machines. This custom-made machine is on castors for easy manoeuvrability and, for sanitation purposes, the design makes it easy to clean and wipe down. First aid kits can also be vacuum sealed in this custom-made machine to prevent product contamination, dampening and rusting.

Using a large special vacuum bag, the heavy-duty sealing ensures the original condition of the breathing apparatus and first aid kits for six to 12 months, when they are reopened again for a safety inspection. Featuring a special large vacuum pump and a more heavy-duty sealing system, the bags used are heavier and thicker than the typical 75-100µm. With thicker material at 150µm, this prevents tears to the bags containing heavier items.

Mining Samples

When it comes to mining, bore and oil samples, a custom-made machine featuring a longer chamber is used to create a narrow pack. Vacumatic Australia has provided these machines to mines in Papua New Guinea and oil rigs.

"The bags are manufactured to their specification, their thickness, their µm (micron), including the material," Urs said. "Some clients require high oxygen bags, some products have to be sealed off from light, which require aluminium foil or bags,



Electrical and electronics parts and components, as well as first aid kits, can be stored free from dust, oxidation, mould and corrosion on mine sites.



Vacumatic Australia does fully-automated robotic manufacturing lines.

as well as the use of nylon to strengthen the bags.”

Vacumatic Australia works with all sorts of bag and pouch material and can source if they aren't in stock. In saying that, the company's clients are typically based in niche markets or may place orders for thousands of bags in one go, therefore custom-made bag stocks are usually ordered as required rather than kept in stock.

“It depends on what the clients want set up and the machines used to custom make these bags,” Urs said. “We calculate the whole amount for the client and we provide additional support by keeping it in stock for them.”

Vacumatic Australia's machines are designed to guarantee the best preservation and extend shelf life of any product that requires protection from the elements by providing a safe and efficient method of packing products.

High Volume Catering

In high volume and high output kitchens on mine site villages, efficiency and productivity are the key to well-run catering facilities. With 35 years servicing the catering, hospitality and food industries, Vacumatic Australia has a solid reputation and extensive understanding of food handling and packing requirements.

Its tray sealing machines can vacuum seal prepared food in modified atmosphere packaging quickly and efficiently. When there are hundreds of mine staff gathering at the canteen for mealtimes, with everyone packing food before shift-start, and kitchen staff cleaning up and packing away vast amounts of leftover food, it is imperative a packing machine can move quickly and reliably with high-output levels.

“It is possible to do the whole kitchen production in a day, then pack it in a few hours on the machine, therefore catering for a whole week in as short amount of time as possible,” Urs said.

Meals can be packed in a tray and simply reopened as a cold dish or reheated, after the sealing film is peeled back. CPET trays, which can take temperatures up to 220°C and are microwavable, are typically used for meals that must be reheated later. Like the machines, CPET trays come in all different capacities, dimensions and configurations.

The tray sealing machines come as either fully automatic inline machines with a single chamber or as manual, freestanding machines. Gas flush and vacuum are standard. Special features such as soft air can be added. The production output is around three to eight pieces per minute depending on machine settings.

The top web of packaging material (lid film) covers the filled pockets/trays. The air is evacuated from the sealing die and protective gas is added, using either a vacuum pump or through the gas flushing process. The pack is then sealed by the application of heat and pressure.

Vacumatics Australia's machine range extends from compact, table top machines, suitable for the smallest catering operation, to heavy-duty, high capacity, double chamber machines to meet the needs of the largest processor. All products are backed by after-sales support from the company's nationwide service network.

Components and Parts

With a track record of supplying vacuum sealing machines to air force bases around Australia, plane components, bearings and electronic parts that are made in the US are stored in antistatic pouches four several years.

“Some of the aeroplanes are decades old, as much as 30 years old, and the air force bases can keep the components in pristine condition for a long time without them ever being destroyed through corrosion and oxidation,” Urs said.

This same vacuum sealing technology is available to the mining industry to store mechanical parts, hardware and workshop items, electrical components and chemical products. The Vacumatic 1268XL is currently used in some mine sites to protect electronic parts, for example circuit boards, from environmental damage. After heavy duty sealing, the parts and components can be left in storage without any exposure to oxygen, mould and dust.

Some machines can be custom-made to include conveyor belts, rollers and pulleys, as well as barcoding and lettering systems. Digital and push button technology on LCD screen panels, including the most up-to-date machinery and inhouse CNC machining, means Vacumatic Australia has the most modern equipment and works to the most modern standards. Custom-made bags can also be built for a variety of scenarios such as blocking out light, noise reduction, size and shape, toughness and durability.

Service

Vacumatic Australia can visit clients at their premises or mine sites to determine their requirements. The sale of all machines comes with after-sales service on all its equipment. All the client has to do is to send the machine back to the factory to receive a free service. Machines are not hired out due to the potential for cross-contamination between industries.

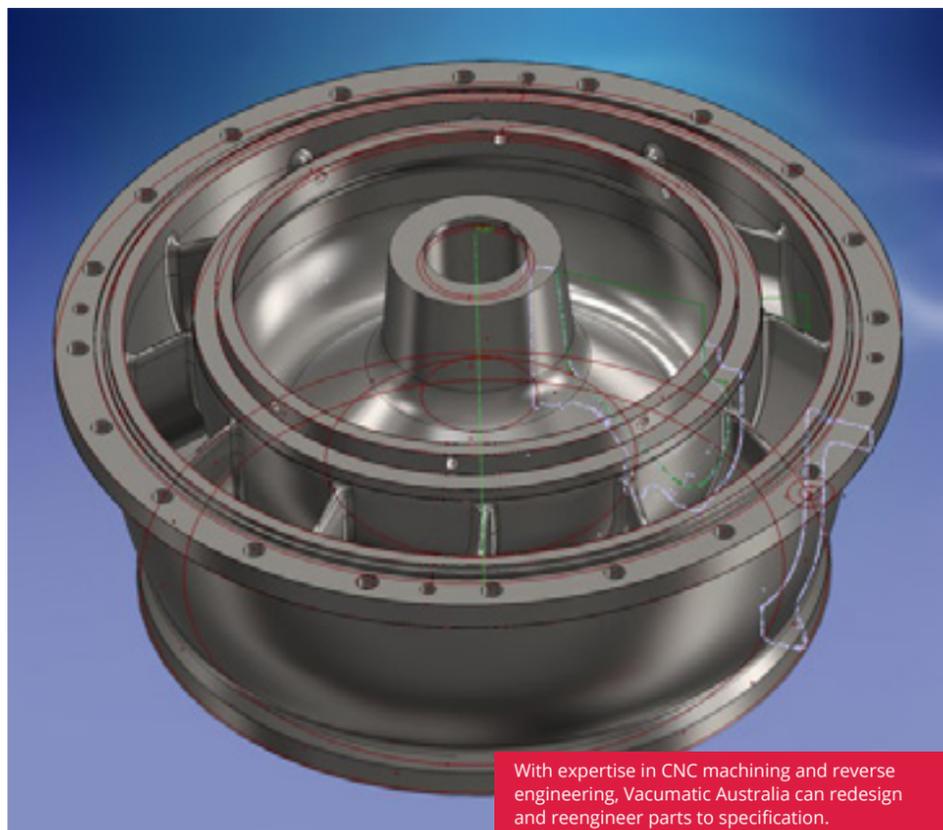
While the company offers maintenance contracts, some bigger clients have their own inhouse engineering and technical departments and may only require training at installation, trial and commissioning of the machines.

Genuine spare parts and equipment are also available for sale. As before, all products are backed by after-sales support from the company's nationwide service network. Vacumatic Australia also specialise in CNC machining, reverse engineering, robotics and automation, as well as fabrication and structural. **AMR**

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An example of fabrication, structural and building work done by Vacumatic Australia.



With expertise in CNC machining and reverse engineering, Vacumatic Australia can redesign and reengineer parts to specification.



Good clean water... FROM CATCHMENT TO CUP ...and back again

Simmonds & Bristow offers a water industry virtual training platform.



Simmonds & Bristow are the integrated water specialists bringing good, clean water to regional, remote and communities across Australia and the South Pacific.

For more than 50 years, the company has been there for its clients through good times and bad, offering sound scientific advice, engineering design support, and operational and maintenance service, providing experienced operators and offering water industry training to get the job done.

Clients include BHP, Rio Tinto, Chevron, Anglo Coal and other mining companies.

According to managing director David Bristow, Simmonds & Bristow service systems are quality assured (quality framework of both ISO 9001 and ISO 17025 NATA), and its expertise is regularly sought by a wide range of clients in public utilities, government and private industry.

"So you know you are in safe hands when you engage us," he said.

"As well, we work closely with our clients at all stages of the project, to better tailor the work to meet the requirements, while also sharing our in-depth knowledge of the water and wastewater industry.

"We believe that knowledge sharing and communication are a key component of a positive, long-term relationship."

- Key areas of experience include:
- Sampling, testing and monitoring
 - Planning and development support
 - Environmental assessment and analysis
 - Water and wastewater treatment plant design solutions
 - Water and wastewater treatment plant commissioning (process commissioning, plant start-up, and optimisation)
 - Operation and maintenance support
 - Water industry relief operator support

Water Industry Training

"Our team of process engineers, environmental scientists, service

technicians, relief operators, and water industry trainers

work together to assist our clients with their water challenges," David said.

"We operate as a multiple disciplinary consultancy serving customer needs and requirements.

"This collaborative approach, which relies on our diverse array of knowledge, skills and experience, are part of the reason we are able to help our clients make good clean water, from catchment to cup and back again."

Engineers and Scientists

The Simmonds & Bristow team of engineers and environmental scientists are ready to help clients get the most out of their water and wastewater assets.

"Whether you need a new plant designed or commissioned, an older plant refitted to keep it humming, an environmental assessment completed or help working with your state's environmental regulator, we're here to help," David said.

"S&B Engineering and Scientific teams are available now to discuss with you your specific site to ascertain current status through to a test and check the onsite performance, capability, and capacity of your water supply and/or sewerage-wastewater system from catchment to plant to reticulation/disposal.

"We will inspect, assess, review and identify issues and solutions so you avoid scrutiny of your water and waste water plants and systems to ensure infrastructure and operational procedures will not let you down.

"We can also recalibrate/retune your treatment plants, so they are performing at the top of their capability/ capacity and to specified tolerances and guidelines.

"Simmonds & Bristow have the expertise and knowledge to take the stress out of your

back house."

Water Sampling, Testing and Environmental Monitoring

Routine monitoring programs allow companies to monitor possible impacts their activities may be having on people, plant and/or environment.

A consistent, regular program with sound scientific foundations will give them confidence that they are doing the right things to meet environmental responsibilities.

They will have the opportunity to learn about operational impacts and how to minimise it pro-actively.

"Routine monitoring programs are designed differently depending on their purpose and where you are in your plant's life-cycle," David said.

"We help match your particular needs to the most relevant standards, guidelines, licences or permits (if they apply) and, of course, your own operational requirements.

"We can devise an effective, yet economic program that fits your needs, location, environment and purpose of monitoring."

- Routine monitoring programs involve:
- Sampling program design
- Sample collection
- Laboratory liaison
- Interpretive reporting
- Remedial actions for all aspects of water quality

Simmonds & Bristow has experience with water and wastewater treatment plants, stormwater, potable water, trade waste, effluent/process water, groundwater, irrigation water, recycled water, soil and plant tissue.

Operation and Maintenance Of Water Treatment Plant

Simmonds & Bristow can help clients with routine operations and servicing of water

treatment plants, offering relief plant operators, as well as operator support and troubleshooting advice.

Treatment plants require dedicated operations staff who are well trained in the particular processes on site.

"Many organisations find it easier to engage Simmonds & Bristow's trained professional operators than source their own," David said.

"Our trained operators have the expertise to take care of a wide variety of plants and technology leaving you free to concentrate on your core business."

All Simmonds & Bristow operators hold a Certificate III in Water Operations and many years of practical experience. Some are also trade qualified plumbers, mechanics and fitters.

"Our skills are very useful in regional and remote areas where outside support is often difficult to find," David said.

Simmonds & Bristow provides a number of Operate and Maintain (O&M) packages to assist with the day-to-day running of water and/or wastewater treatment plants.

The packages focus on preventative maintenance and are tailored to suit various requirements and budgets. Short and long term contracts are available.

Operator Support

Scheduled routine site visits are an effective way to support site-based staff. Simmonds & Bristow can help staff finetune plant operations and build site-held knowledge of operations.

During the visits, the company's experts provide, management advice, and guidance on forward planning of plant improvements and procedural change.

The team's professional engineers, scientists or trainers can guide customers through any problem, big or small, helping them make

good clean water.

“Our practical and sensible advice will always be specific to your location,” David said.

The Operations and Maintenance Packages include:

- Helping Hand
- Valuable Relief
- Intensive Support
- Turnkey Support
- Support Plus
- Plant Supervisor/Manager
- Field Service Technicians

Water Treatment Plant Operator Training

Simmonds & Bristow is the leading Australian Registered Training Organisation RTO 1735, providing specialty water industry training courses since 1991, offering Certificate II, Certificate III, Certificate IV and Diploma in water industry operations/treatment.

Simmonds & Bristow can provide:

- Experienced specialist industry trainers
- Competency-based assessment
- Recognised Prior Learning (RPL & RCC)
- On-site, site specific tailored training
- Water treatment and water waste courses online
- Virtual training programs

Community Service

David said that in 2020, Simmonds & Bristow had been extremely busy supporting, advising and training its many clients in regional and remote communities across Australia and also in the South Pacific.

“During the fire season earlier this year, our operations and maintenance teams provided support to Alpine and Coastal regions with relief operators and maintenance crews by assisting in restoring and keeping plants operating,” David said.

“While the drought continues to affect many

regional areas across Queensland and New South Wales, we have been assisting towns and regional councils in updating and upgrading the plants with design solutions to ensure their assets are maintained and operating to their optimum.

“With La Nino upon us, we are monitoring the effects of high rains falls and how to prevent overflows and pre-empt any issues.

“Whether they are mining sites, island resorts, outback or regional towns, coastal areas or alpine regions, we are there to support them.”

David said that an essential part of the company's service offering is its water industry training as upskilling improves knowledge and practical experience to learners.

“I want to congratulate our training team who partnered with five regional councils to win the joint award for the Regional Water

Industry Worker Pilot Program at the AWA 2020 conference,” he said.

This award was for attracting, training and retaining workers in regional areas.

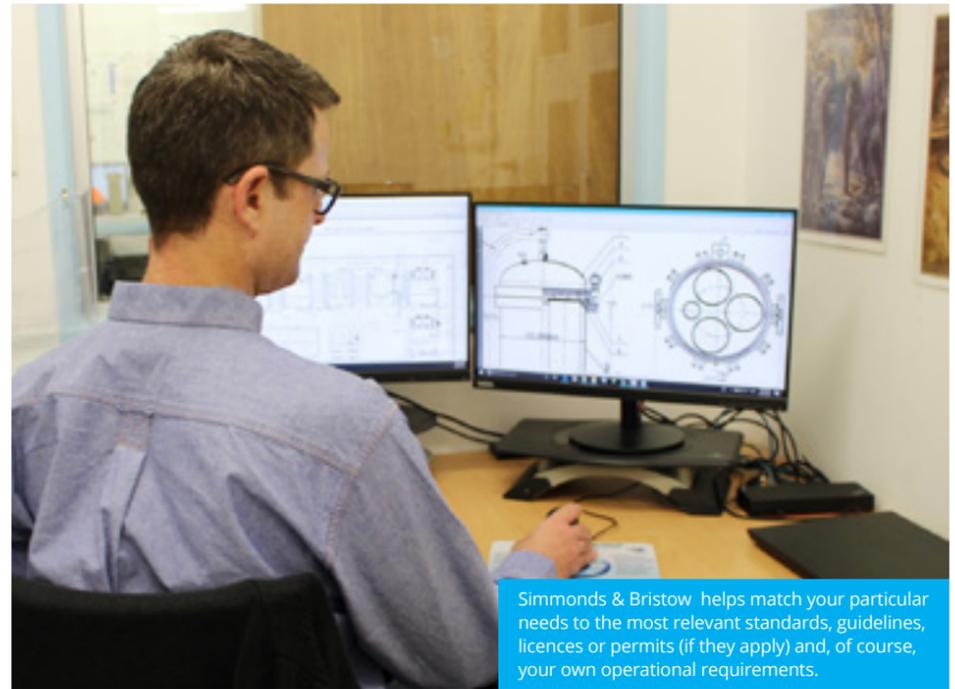
“This year we will be supporting Australian farmers and their families as drought conditions continue,” David said.

“We will be providing farmer gift vouchers across regional and remote Australia, bringing Christmas cheer to farmers' families and their local communities.” **AMR**

SOURCE
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The company's expertise is regularly sought by a wide range of clients in public utilities, government and private industry.



Simmonds & Bristow helps match your particular needs to the most relevant standards, guidelines, licences or permits (if they apply) and, of course, your own operational requirements.

We use Science, Engineering & Technology to help you make good clean water

*Integrated Water Specialists
 Effective-Economic-Environment*

- 💧 Sampling Testing & Monitoring
- 💧 Planning & Development Support
- 💧 Environmental Assessment & Analysis
- 💧 Design Solutions
- 💧 Start-Up & Commissioning

Simmonds & Bristow
 The Regional and Remote Water Specialist
 1800 620 690



simmondsbristow.com.au
 sales@simmondsbristow.com.au

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NO CHALLENGE TOO BIG

Finding new solutions to old problems is par for the course at Mining Maintenance and Fabrication Services (MMFS), where the motto is 'if we can't do it, no one can'.

Possessing unrivalled reliability, MMFS is a full-service company offering support for projects large and small, from their design and inception to implementation and finalisation.

MMFS fabricates, rebuilds and repairs mobile and fixed plant equipment for companies operating in heavy industries across WA.

Having started out offering field service repairs on mine sites around the state, the company opened its Perth-based workshop about 12 months ago after MMFS director, Terry Newell, realised the potential it represented.

The workshop had allowed the team to rebuild and repair heavy equipment that may have previously been too large to deal with on site and would simply have been replaced, such as excavator buckets.

"Our Perth-based workshop now has a

range of equipment suitable for any general or custom fabrication, asset rebuild or repair," Terry said.

"We can help our customers get the most out of their assets by rebuilding them to as-new or better-than-new standards.

"Whether it's mobile or fixed plant equipment, we do it all."

"This ability to take heavy equipment off site and rebuild or repair at the workshop represents significant savings for MMFS' clients, who are now able to have their equipment returned to new at a fraction of the cost of repurchasing.

"It has also seen MMFS' ability to deliver quality products and services to its clients go from strength to strength.

"We go the extra mile to resolve any challenges we come up against and we truly believe that if we can't solve the problem at hand, no one can."

Best in the Field

Although the workshop has expanded its capability, MMFS still offers a first-rate field service whenever and wherever needed.

This consisted of a full field repair and maintenance service provided by MMFS' qualified and highly experienced fabricators and boilermakers.

The field service technicians can assist with all on-site support of industrial equipment and are responsible for providing hands-on repairs and technical supports.

The company also has the capacity to provide cranes and service trucks, with staff highly experienced in servicing and conducting preventative maintenance.

Field services include effective supervision and monitoring, delegation of field service personnel, diagnostics, repairs and adjustment, servicing, on-site technicians, equipment inspections, general fabrication, and tray repairs and relines.

From Start to Finish

MMFS can deliver a wide range of mining services.

"We can deliver an end-to-end or standalone service as required, from in-house engineering and drafting through to fabrication, rebuilds, repairs, and blast and paint," Terry said.

"When it comes to drafting, the team at MMFS brings a fresh approach and innovative thinking to every design, which Terry believes is vital in the ever-changing mining industry.

"MMFS offers a high-class mechanical drafting service to our mining clients.

"We can offer support for various drafting platforms and can manage complex projects, focusing on the accuracy and functionality of every project."

MMFS' capabilities in drafting include product development and the design of wear packages, GET, mechanical components, 3D modelling, technical documentation and prefabrication function testing.

As for fabrication, the team at MMFS works with a variety of materials to produce precise results for its clients.

Taking projects from design to finish, the experienced technicians can assist with all stages of the fabrication process.

No matter the size of the job, MMFS is dedicated to producing dependable results using a combination of technology and





training to ensure projects are completed to exact specifications.

MMFS' unmatched customer service meant the process was guaranteed to be hassle-free and completed on time.

The company's ability to undertake in-house metal fabrication reduces the cost burden for its customers as well as the hassle that can sometimes be involved in fabrication, as there is no need to outsource necessary materials from another firm.

MMFS' capabilities in fabrication include package design and drafting, fabrication on and offsite, installation, wear maintenance, replacements, upgrades and repairs, inspections, heat treatment, project planning, preventative maintenance and line boring.

One of MMFS' current fabrication projects includes the construction of a new ROM dump hopper.

The ROM dump hopper was constructed in the Perth workshop over three months and will be transported to site on the back of up to seven semi-trailers, before being bolted together on-site.

When it came to field service, MMFS was dedicated to providing the right people to complete the job every time and at every site.

The company offers a variety of workforce solutions from long-term and larger team operations to short term hires.

MMFS saves clients time and money by vetting employees first through an interview process and by providing them with the flexibility of only hiring the people they need for the time that they need them. The company has proven results for setting exceptional standards in cost control, planning, scheduling and safety.

MMFS not only provides the manpower but also the tools, equipment, transport and supervision required to complete the job.

Its personnel include boilermakers, heavy duty diesel mechanics, truck drivers, electricians, management, engineers and trade assistants.

Ultimately this provides a cost-effective, timely and worry free solution for clients who can leave the entire project to MMFS and know that the job will simply be

managed well and completed with diligence.

No Compromise on Quality

Above all, MMFS is committed to getting the job done no matter what the challenges and with zero compromise on quality.

According to Terry, this was the cornerstone of the company's success, earning it repeat business and referrals.

"We build trust by being honest and ethical. If we identify a more cost-effective solution, we'll let our clients know.

"We also understand the importance of running an operation efficiently, including reducing operating costs and equipment downtime."

MMFS maintains its high standards in workmanship, efficiency and safety through its stringent employment and training practices.

As the sustainable development and growth of the company is dependent on client satisfaction, it is committed to assuring the quality of the completed product through provision of a quality management system.

It provides conformance to customer briefs, contracts and statutory requirements for projects through all stages, from implementation through to completion.

MMFS was particularly committed to achieving a high standard of safety and health management through continuous improvement and awareness.

The company believes that all incidents are preventable and that working safely is a condition of employment.

MMFS' own health, safety and environment principles are rooted not just in meeting industry standards but exceeding them.

This includes a commitment to providing the expertise, funding and resources to maintain safe and healthy working environments and various measures to mitigate any environmental impacts. **AMR**

SOURCE
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LOCK, STOCK AND BARREL

Cirlock's "next generation" **GLB-4 Group Lock Box** is designed for Group Isolation, a method used when a number of workers need to access a plant with multiple isolation points.

CIRLOCK is an Australian owned and family operated business, specialising in Lockout/Tagout equipment for energy sources, safety signage and safety accessories.

The business was founded in 1992 by Erik Larsen with the purpose of designing and marketing lockouts for electrical equipment and other power sources, especially to the Australian mining industry.

Cirlock has since grown and expanded its product range to include all aspects of lockout and tagout equipment as well as safety signage and other safety products.

The business now has distributors in all Australian states and many countries around the world. Most of the products in their catalogue are their own design and manufactured by them or on their behalf in Australia.

GLB-4

Cirlock has a range of Group Lock Boxes; one of the most popular is the next-generation group isolation lockbox, the GLB-4. This large group lock box features 20 padlock holes catering for a shackle size of up to 9mm and is made from a welded aluminium construction with a red powder coat finish.

It also features a clear, tough Polycarbonate sliding lid, allowing people to see the procedures at a glance.

An important feature is the three different ways which the A4 size (or smaller) procedures can be displayed: clipped on the outside of the lid, clipped inside the back of the box or inside the unique, 'sandwich' designed lid.

Furthermore, the box can be used for storage of padlocks when not in use, with 24 internal unique Cirlock Padlock Hooks included.

The Lock Box can be wall-mounted and also has a convenient large carry handle. A key rack is provided inside and removable studs prevent the lid from being removed.

The lock box is specifically designed for Group Isolation, which is method often used in work situations where a large number of people are accessing a large plant with multiple isolation points, common in heavy industries and particularly the mining industry.

It requires a lock box into which the keys to the isolation locks are placed. The lock box itself is then locked by an isolation lock and tag.

The sequence of using the lock box is as follows:

1. The worker in charge isolates all hazardous energies using their dedicated locks and tags and then places the keys inside the lock box.
2. The worker in charge then secures the lock box by attaching their own lock and tag.
3. All other workers then attach their personal locks and tags onto the lock box preventing any access to the Isolation Keys.
4. As the workers complete their work, they remove their personal locks and tags from the lock box until all are removed.
5. The worker in charge inspects the plant

to ensure it's ready for re-energisation.

6. The worker in charge removes their lock and tag from the lock box and then removes all the dedicated locks and tags using the keys from inside the lock box.

Cirlock's Maria Burrowes said the company has a range of group lock boxes but the GLB-4 was specifically developed after receiving feedback from industry stakeholders at tradeshows.

"It is 100% made in Australia by Cirlock and has been on the market for about 10 years now without any alterations, demonstrating it's a good design" she said.

"We also make custom-made Group Lock Boxes for industry and a lot of them are based on the GLB-4, just with small changes like more padlock holes and more padlock storage."

Cirlock's large range of Group Lock Boxes come in various sizes and shapes, which makes it easy to choose models suitable for most situations and conditions, in a wide variety of industries.

Most of Cirlock's models are designed and manufactured in Australia to the highest standards, and custom-made versions can be offered.

GLB-2

Arguably one of the world's best Group Isolation Lock Boxes, the GLB-2 is made exclusively by Cirlock. Made entirely from tough moulded plastics, it is almost unbreakable, light-weight and has a convenient 16 padlock holes.

It also features a clear window to view the contents such as the keys inside, six key hooks, carry handle and a key slot for use after closure. It is available in bright red, yellow or blue colours so it can be easily noticed by workers.

It is compact with dimensions of just 200x150x90mm excluding the carry handle, and it can also be wall mounted.

It is also corrosion and spark resistant.

Universal lockout devices

Cirlock has universal lockout devices for circuit breakers in all sizes and brands. It also provides lockout devices for fuse holders, gate valves, ball valves in all sizes, as well as electrical plugs and hose couplings.

The company's unique permanently mounted Cirlock System and Fuselock System are used in some of Australia's largest mines and power stations.

Cirlock's own brand of tough safety lockout padlocks are made with a stainless steel shackle as well as a non-conductive nylon shackle and tough brass key way.

These locks are available in seven different colours, and may be master keyed, keyed alike, or keyed differently. Locks can be personalised with logo or names, either engraved or on labels.

For tricky situations, custom-designed devices are available to suit customer's unique needs and large or small orders can be delivered quickly. **AMR**

SOURCE
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The GLB-4 was designed based on feedback from industry stakeholders at tradeshows.



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Made entirely from tough moulded plastics, the GLB-2 is almost unbreakable, light weight and has 16 padlock holes.

CIRLOCK

LOCKOUT / TAGOUT EQUIPMENT

GROUP

LOCK

BOXES

Full range available from Cirlock

If more than one person is working on the same plant, each person should attach their own lock to the isolation device to prevent the isolator being opened before all locks have been removed. Group lockboxes are the perfect piece of equipment to assist with this process.

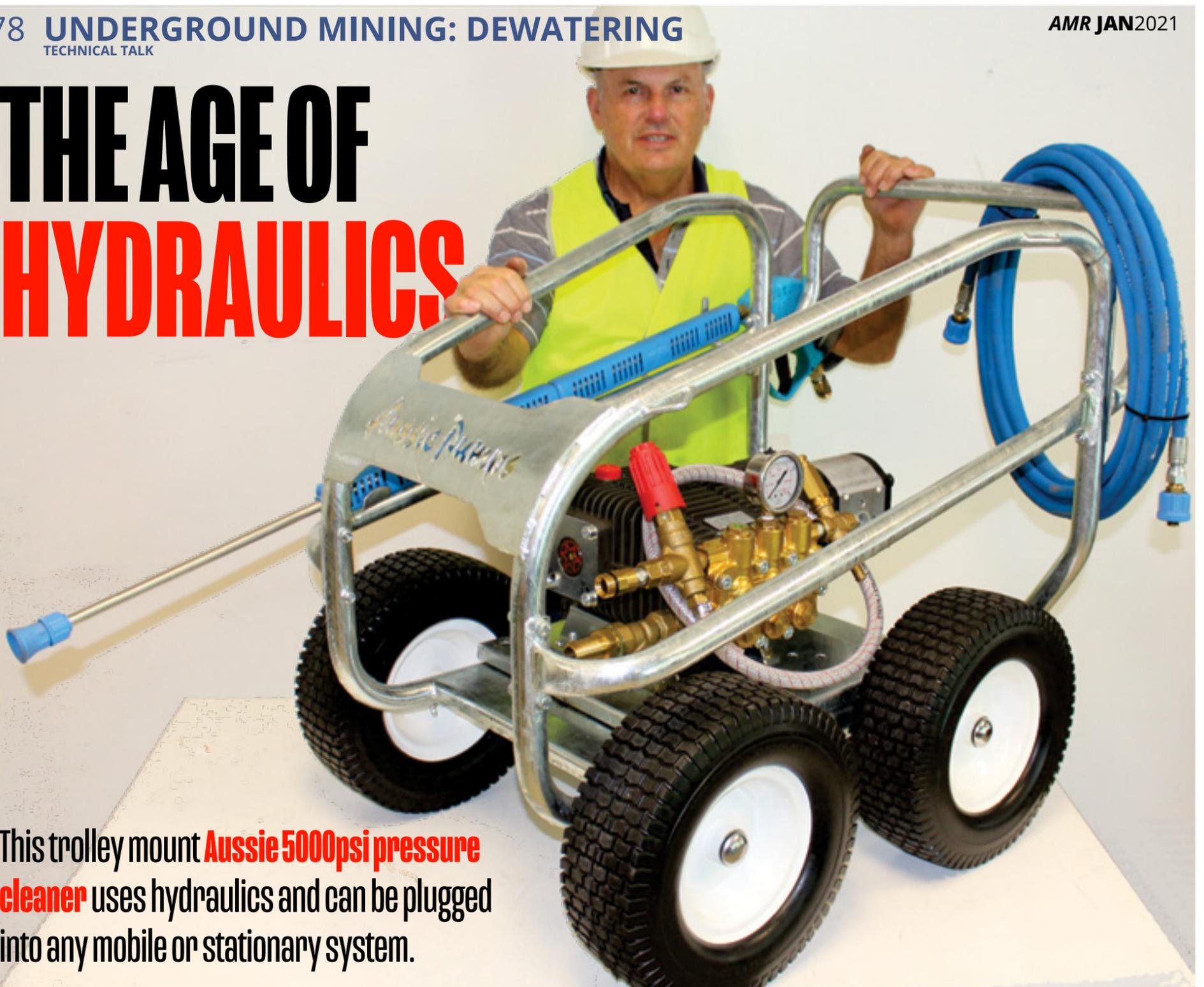
Cirlock stocks options from 16 to 84 padlock holes, in varying designs to cater to the needs of the job. Larger group lock boxes also include storage hooks for padlocks and instruction holders can be fitted to some models.



The full range of Cirlock products are available from your local Electrical Wholesaler
www.cirlock.com.au | lockout@cirlock.com.au | P 07 5445 2910

CIRLOCK
LOCKOUT / TAGOUT EQUIPMENT

THE AGE OF HYDRAULICS



This trolley mount **Aussie 5000psi pressure cleaner** uses hydraulics and can be plugged into any mobile or stationary system.

Keeping mines safe and dry is fundamental to any underground application. Working below the surface with mobile equipment has driven a huge development of the use and application of hydraulics.

Underground mobile plant utilising hydraulics, whether it's driven by high voltage equipment or diesel engines. That lends itself to some innovative ways of moving water from where it shouldn't be.

One Australian company has worked hard on developing both cast iron and 316 stainless steel hydraulic drive pumps for underground applications.

AUSTRALIAN PUMP... INNOVATORS

Aussie Pumps chief engineer John Hales has been involved in the machinery business for more than 40 years. During that time, he has worked with bucket wheel excavators, heavy duty trenchers and compaction equipment.

He is now working on engineering new applications for hydraulic drive pumps both for firefighting and underground dewatering.

"The reality of an underground fire can be terrifying," John said.

"Having mobile plant capable of helping to control and eliminate a catastrophe to fight fire is essential.

"Those machines, some of them carting their own water, can effectively operate a high pressure firefighting pump that is hydraulic driven."

BENEFITS OF HYDRAULICS

Design Engineers love the idea of the use of fluid being a way of transferring power.

The old days of drive shafts, chains, belts and pulleys is long gone. Effective use of hydraulics not only has the benefit of flexibility of design, but also provides a sealed system.

Hydraulics provide a dust-free environment where power can be transferred, if necessary around corners. This gives the design team a load of flexibility that is particularly important.

The use of higher pressure hydraulics as well provides more power as great companies like Rexroth and Danfoss have proved. Another major advantage is that hydraulic engineers are available on every mine site.

Whether it's underground or open cut, machinery is used everywhere where motion and power have to be transferred. Thus, engineers and maintenance staff are familiar with and well versed in preventative service to systems and trouble shooting and repairs.

"The days when Axial piston pumps were considered rocket science are long gone," John said.

AUSSIE GOES HYDRAULIC

Australian Pump Industries first realised the advantages of doing away with diesel engines or electric motors and replacing those drives with hydraulics. It did it based on interest from manufacturers of mobile plant.

Companies manufacturing drill rigs and water carts were first to recognise the benefits of having a high volume self-

priming trash pump with hydraulic drive. The pumps could be driven from the prime mover of the vehicle, to a hydraulic pump, often with a splitter box, or where more appropriate, where power is available, from a power pack.

The company started out with 2" and 3" pumps, capable of delivering around 900 litres per minute flow. From there, requirements for bigger pumps emerged as mining applications required more flow, more pressure and more efficiency.

The result is a range of Aussie GMP hydraulic drive pumps in the semi-trash configuration. They deliver flows up to 2200lpm and heads as high as 90m.

"We are working on a range of self-priming pumps now that will run a 90m head and with flows up to 3000lpm," John said.

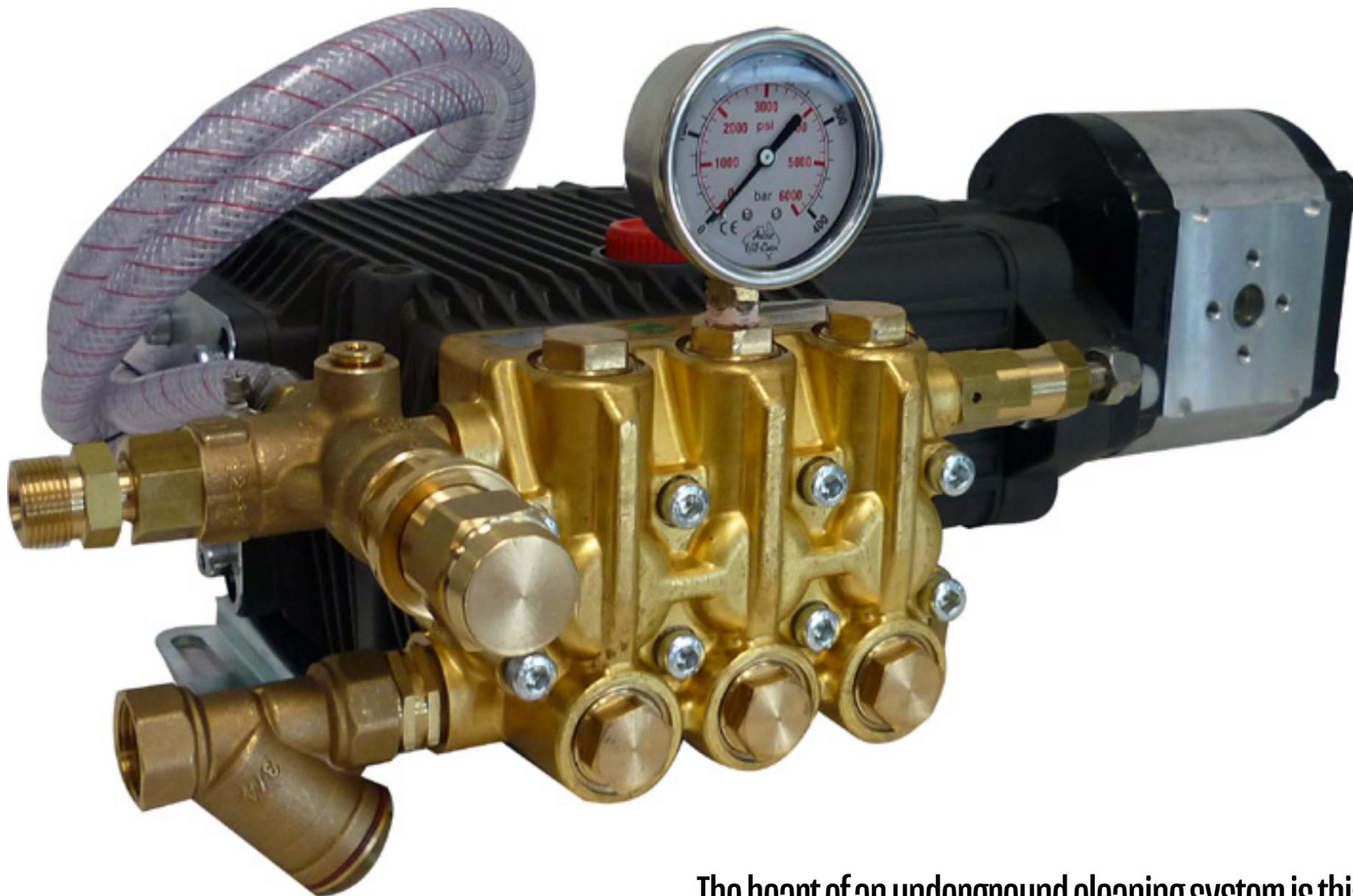
"Best of all, the pumps will be able to handle dirty water because of their trash pump design and be super simple to service."

With a semi-trash design, the machines all feature open impellers, capable of passing solids in suspension, stainless steel wear plates, and silicon carbide seals. Most importantly a front mounted clean out port is located below the suction intake!

"That clean-out port means that debris can be cleared from the pump effectively without disrupting pipework or suction and



An Aussie GMP semi-trash pump can get its drive from both mobile and stationary sources.



The heart of an underground cleaning system is this Aussie 5000psi pump with integrated hydraulics.

discharge hose assemblies," John said.

HIGH PRESSURE HYDRAULIC DRIVE ... "FIRE DOWN BELOW"

Building big cast iron high pressure self-priming pumps is something that is unique to Australian Pumps. These super high pressure cast iron hydraulic drive units are designed for high volume applications. They are available in 2" and 3" configuration.

The company originated the design as electric motor pumps, running at 2900 rpm. They all include heavy duty cast iron bodies, with an in-built tank to make self-priming easy.

The high pressure configuration means that they can deliver loads of water at pressure with some models being able to pump up to 400lpm at 100psi.

"That's a lot of water to throw at a fire," John said.

Best of all, the pumps can be hydraulically driven, with a neat pedestal arrangement providing a clean and enclosed coupling drive from the hydraulic motor to the high pressure water pump impeller.

WHY SELF PRIMING?

In an emergency, there is no time to lose. Fooling around trying to get an end suction pump to prime and finding that the foot valve is faulty or clogged, or the issue of supplying water to fill the suction line-up is simply impractical!

Using atmospheric pressure to prime the pump based on the big integrated tank, is a gift!

The process is simple: a check valve holds the priming liquid in the pump captive, stopping it from running down the suction line. With the pump filled with water, the pump is started with the water in the body flowing out.

That creates a vacuum inside, drawing water up the suction line without any issues or complications to the operation. This is only possible because of the way the Aussie Pumps has a big integrated water tank built into the pump design.

CORROSIVE LIQUIDS?

Copper, gold and many other mines are all saddled with the problem of highly corrosive liquids. Aussie Pumps' engineers understood this is just a matter of material, not radical design changes.

The company quickly developed a heavy duty cast 316 stainless steel version of GMP pumps in the range and adapted them for hydraulic drive.

"Changing the drive was easy. We were already doing it with the cast iron products, so the concept was already proved," John said.

"The 316 stainless steel has proved to be invaluable for any mine where corrosive liquids are being pumped. The pumps are built like tanks and the material is highly resistant to both corrosion and abrasion."

CLEANING MACHINERY?... USE HYDRAULICS

No, we don't mean you use hydraulic oil to clean the machine, but rather high pressure water pumps can carry out routine maintenance underground and operate

from mobile plant.

Australian Pumps pioneered the use of this technology. It originated for service equipment. Now drill rigs have their own hydraulic high pressure water pump installed to facilitate maintenance.

"If you can't see the problem because of the dirt, or dust or accumulated grease, you can't identify and solve it," John said.

Australian Pumps, regarded as Australia's leading high pressure water blaster manufacturer for mining applications, quickly adapted hydraulic drive for mobile plant installations.

"Using low cost, but reliable first world hydraulic motors, enabled us to close couple them to a flanged adaptor, fitted to our Big Berty Bertolini high pressure pump," John said.

The initial machines were in the area of around 15lpm and 3000psi capacity.

Today the company can produce hydraulic drive washers with pressures up to 500 bar (7300 psi) and 24lpm. The machines are super compact, easy to install and the drive lines are as flexible as the hydraulic hose.

"It's a design engineer's dream," John said.

"Imagine having a vehicle mounted wash pump available any time you need it. Of course, clean water is required for the washing process as Triplex pumps don't like contaminated liquids, or aggressively corrosive solutions."

The pumps generally require about 60lpm of hydraulic flow. These Aussie washdown pumps are not only compact but light in

weight as well. Even the biggest machines are only around 40 to 50kg.

The machines come with a wide range of accessories, including stainless steel hose reels, capable of taking up to 50m of hose. Turbo lances for fast cleaning and even drain cleaning attachments are also available in the Aussie package.

The machines are available in both Class A and Class B configurations under Australian Safety Standards. The Class A units do not require RTO certification for operators, but can still function up to 5000psi and 16lpm flow!

Aussie is a real pioneer of this type of equipment and has its eye on not just the Australian market but markets overseas, where its equipment is already operating in mines in Africa, Central Asia and South America.

"Having Australian miners regarded as being up there with the best in the world, is a great advantage for Australian Pumps," John said. "They are like travelling ambassadors. They know, having used our product in the past in Australia's tough conditions, that our products will perform equally well, whether they are in the brutal winters of Mongolia or, the tough dust and potentially dangerous environment of the Somali Kenyan border areas."

Further information on Aussie Pumps development of equipment for mining is readily available from authorised distributors throughout Australia. **AMR**

CLEVER VALVES

Pumping mine water can be a complex task – differences in pressure, water quality, sump and drain locations, pump size all play a part in the effectiveness of the system.

Controlling the flow of the water is a major consideration that requires durable, reliable valves with different functions to ensure the water goes where it is supposed to go.

Australian Mining Review caught up with Steve Hill, National Sales Manager for Challenger Valves, to talk about the company's representation of Cla-Val and other valve solutions on offer within Australia.

About Challenger Valves

Established in 1984, Challenger Valves has been in the industry for more than 30 years, backed by a professional team focused on delivering superior service and cost effective solutions to their customers.

Challenger Valves is a leading manufacturer, supplier and distributor of valves and actuators to the Australian and global mining industry (as well as other industries).

The head office is located in Shepparton in central Victoria, and boasts a 2,400m² purpose-built facility that includes capabilities for production, storage and testing of all its products – many of which carry the coveted Australian Standard Mark.

The wider Australian distribution network includes warehouses in Queensland, SA, Victoria and WA, and the company is ISO9001-accredited.

Challenger Valves offers a broad range of solutions to the mining industry, covering areas such as dewatering, coal wash, dust suppression, slurry transfer, firefighting and gas control products.

Recently Challenger Valves became authorised distributors of American-made Cla-Val Control Valves, used to modulate water flow and pressures within pump networks, particularly underground water systems.

Cla-Val Automatic Control Valves

The Cla-Val Valves are specifically designed to meet the requirements of water systems, made to improve the effectiveness and efficiency of the water distribution system it is installed in.

They operate by using a hydraulically operated diaphragm assembly that opens and closes according to the design requirements of the system.

"The rubber diaphragm inside of the valve body creates an operating chamber, in which we manipulate the pressure (typically sourced from the pipeline) via a hydraulic or electronic pilot to position the valve and provide the required function," Steve said.

"The principle of operation of our diaphragm-operated control valve is that the water travelling down the pipeline towards the valve's inlet exerts a force on the lower section of the diaphragm assembly, wanting to raise the diaphragm assembly which opens the valve and provide a flow path for the water.

"At the same time, the pipeline pressure enters the valve's pilot circuit which is connected to the valve's operating chamber via the cover.

"The available surface area within the operating chamber is larger than beneath the diaphragm assembly therefore if we expose the operating chamber to the same



pipeline pressure as under the diaphragm assembly, the higher force generated from the larger service area within the operating chamber will close the valve.

"Conversely, releasing the pressure from the operating chamber will allow the valve to be hydraulically driven towards the open position.

"The pilot circuit manipulates the pressure within the operating chamber using the hydraulic energy within the pipeline to position the valve according to the pilot's feedback."

The Cla-Valve control valve is highly versatile, as it can be used in a wide array of applications.

"Challenger holds the American-made valve in stock and we can plumb it in to take on the function that the client wants," Steve said.

"They can be used in simple applications or

quite complex applications, and can be used for dust suppression, fire, process water, level control in reservoirs, etc.

"For example, a client may have a critical part of the plant upstream that requires a certain pressure like a filtration plant, and the sustaining function of the valve can allow excess pressure to go into a tank and recirculate back in when required."

The design is impressively innovative and robust enough for the harsh Australian mining conditions.

"They can operate under conditions up to 40 bar and can be made out of all sorts of material - stainless steel, aluminium bronze, bronze, etc. depending on the quality of the water flowing through it," Steve said.

"The plugged tapings on either side of the valve body are the sensing ports which we use to fit pressure gauges (either upstream or downstream of the main valve); it's also where we connect the control circuit.

"The Cla-Val Valve can be operated entirely hydraulically using a hydraulic pilot with a spring. It can be set to maintain pressure upstream, downstream or even both with a combination of valves used as a pressure sustaining system with flow control."

The valve is also versatile in the sense that it can be controlled hydraulically as well as electronically.

"It's either controlled by a hydraulic pilot but it can also be electronically controlled," Steve said.

The benefits of electronic control allow for precise and deliberate control over the system using solenoids. Clients thus have the option of using the mechanical/hydraulic solution due to its robust nature, or going for a more complex electronic system that has the ability to be controlled remotely and communicate with the local SCADA system. And there are other applications.

"The valves are commonly used as a



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sustaining valve downstream from the pump, so the pump fires up against the closed valve and as the pressure ramps up in the manifold between the pump and the valve, then the valve begins to open to modulate the pressure and hold the pump in the efficient sweet spot of its curve," Steve said.

"Without a sustaining valve the pump can potentially rotate too fast and begin to cavitate, so the valve can help extend the longevity of the pump."

Pressure Reducing Valve – Roll Seal

Further to the Cla-Val Control Valve, Challenger Valves offers a range of products, such as the pressure-reducing Roll Seal Valve.

"It is a slightly different design but still works on the same principle as the Cla-Val Valve, using a pilot and diaphragm to open and close the valve," Steve said.

"The difference is that it is a solid stainless

housing and available in smaller sizes. It's an inline design as opposed to globe valve design as previously described.

"As the diaphragm retracts away from the home position it opens up a bypass route to allow the water to flow through. The beauty of it is that it comes standard with a 316 Stainless steel body suited for harsher environments, particularly with salt water."

Modulating Float Valve

Challenger's Modulating Float Valve is "a pretty simple device", Steve said.

"The float is mounted inside the tank or reservoir, and as the water level comes up the float rises, and as it gets to the limit point it closes the valve which stops the tank or reservoir from filling further," he said.

"Because it is modulating, it is not necessarily fully closed or fully open – it will work to keep the water level at the target point at all times, whether it allows for trickling or streaming in."

H Style Strainer

Not only does Challenger Valves specialise in valves and actuators, but it also offers ancillary water system parts including strainers.

"Our strainer is a protection device with a basic screen inside of it that stops large chunks from getting through while still allowing dirty water through," he said.

"It's not difficult to disassemble, you just take the covers off, lift the screen out, give it a hose off and put it back together. It would go upstream of the control valve to prevent rocks/scat/debris getting into the system, which can get jammed into the main control valve and stop it from closing properly."

Deep Underground Pressure Reducing Stations

A lot of the mines go a long way underground, and there is often a tank at the surface that gravity feeds the water down into the mine.

"As the mine goes deeper, the pressure in the line gets greater due to the increasing pressure head, and so we are able to offer pressure reducers so the services and machines aren't damaged downstream," Steve said.

Other Products

Challenger Valves is also able to deliver a full range of valves and actuators including:

- Ductile Iron Butterfly Valves
- Ductile Iron Gate Valves
- Expansion Joints
- Ductile Iron Check Valves
- Brass and Bronze Valves
- Stainless Steel Valves
- Automated Valve Packages
- Actuators Quarter-turn and Multi-turn
- Pressure Regulating and Pressure Relief/Sustaining Valves
- Altitude/Reservoir, Tank Filling and Float Control Valves

Approvals and Standards

The quality assurance offered by Challenger Valves includes -

- AS2638.2 Gate Valves - LicSMKP20472
- AS4795.1 Butterfly Valves - LicSMK40321

- AS4794 Swing Check Valves - LicSMK40161
- AS5081 Control Valves - LicSMK26174
- AS4020 Water Quality - AWQC
- AS1628 Bronze Valves- LicWM-001893
- Australian Gas Association

Project Management

Challenger Valves also offers a dedicated project management team to ensure the seamless delivery of projects, including ongoing support, consistent supply of stock and spare parts, and in addition is able to provide a specialist maintenance and service vehicle.

Order picking is precise and same-day despatch is on offer for any stocked items if ordered before midday – and the order is able to be tracked using the online tracking facility.

Conduct and Occupational Health and Safety

Challenger Valves is a values-based organisation and is committed to ensuring the health, safety and welfare of its employees and contractors, by ensuring the strict adherence to all statutory requirements.

As a minimum, Challenger requires as a condition of employment that all staff observe and adhere to the highest possible standards of ethics, integrity and behaviour outlined in the Challenger Valves Code of Conduct.

The 100% Australian and privately owned company believes that all employees are entitled to be treated fairly with respect and dignity and given equal opportunities without fear of discrimination in any way.

AMR



THIS IS THE WAY

Underground dewatering systems are the umpires of the mining world. If the pumps are doing a good job, nobody notices. If they fail, it's a massive headache.

Ensuring a mine has the right pumps for the application is paramount to ensuring a quality dewatering system and reducing time spent maintaining broken pumps.

In most underground mines, standard heavy duty submersible pumps of different sizes are the weapon of choice (between 8kW to 90kW) for pumping dirty mine water back up to surface.

Though often not a whole lot of thought gets given to the quality of the water the mine is pumping before it's too late.

In particular, mines that include shotcrete in their ground support standards will tend to pick up large amounts of poly-fibres in the water run-off, which makes their way to the sumps and does a great job of blocking the pumps.

Australian Mining Review spoke to PumpEng commercialisation manager Matt Oliver to find out about the pumps it has designed and manufactured, the ways it is tackling the

shotcrete fibre problem, and how it went about providing the best tailored solution to its clients to make sure they have the right pump for the right job.

The Right Pump For the Job

PumpEng recently implemented a fresh structured business methodology that is formally referred to as The PumpEng Way, whereby the focus is on providing data-driven tailored solutions and recommendations.

"At PumpEng it's about increasing the mean time between failure," Matt said.

"With The PumpEng Way, we will improve pump performance by partnering with the teams on site to install the right pump correctly. Instead of being focused how much a pump costs to repair, we are focused on ensuring the pumps don't fail. If a pump never fails how much does it cost to fix?"

"The initial inspection is critical. To gather the data, gather information and what's important to you is just critical.

"Once we know what we are working with, we're able to analyse and guide you on what is The Right Pump for the Job. Changing a 30-year culture is challenging, so providing the opportunity to evaluate our recommendations is key."

The PumpEng Way

The PumpEng Way begins with the opportunity to explore your options in an obligation-free initial meeting to outline their Core Values, their capabilities and previous successes, and walk them through how the data-driven process translates to your operation.

Next a site visit inspection is arranged whereby PumpEng representatives will visit the client's site, evaluate the current dewatering system (or future dewatering requirements), establish current benchmarks, identify pain points, investigate pump usage history and define success.

Once PumpEng is familiar with the requirements, the next step is analysing data to present date-driven solutions and provide sump-health recommendations, identify and propose the right pump the job and to offer risk-free evaluations.

The overarching focus of The PumpEng Way is to form a lasting partnership to provide sustainable long term improvement based on data, commitment to each other to educate and support. Their track record



of accountability, proven success and innovative engineering puts PumpEng ahead of the pack.

After partnering with PumpEng, each 90-day period PumpEng representatives will support clients with a site survey and a snapshot of the previous quarters' facts and trends that will provide valuable insight on overall pump performance and include Pump or Pocket recommendations to communicate to the clients' teams.

Matt gave examples of the types of solutions PumpEng may be able to offer.

"Many sites are just using the same old style pumps – but we've got options; if you are using shotcrete with poly-fibres or have aggressive ultramafic rock and finding your pump maintenance at a high level, then we have our JetGuard pump," he said.

"There is an opportunity for us to come to engage with the customer to find out what the correct solution is – be it a ScatPump or a JetGuard or one of our traditional Raptor models."

Fit For Purpose

Some of the questions asked by PumpEng to help generate a fit for purpose solution include –

Pump Capacity – How big a pump is actually needed?

Quality of the Liquid – What type of liquid is to be pumped from inside the site?

Safety – Could the choice of this pump have an impact on site safety?

Gradient/Height – How steep is the ground that needs to be pumped over?

Pipe Length – How long is the pipe carrying the water out of the mine?

Pipe Diameter – What is the outside measurement of the pipe?

Pipe Class – What is the inside measurement of the pipe?

Combined with a site trial, service backup, lowered cost of servicing, attention to energy rating and ongoing consulting and evaluation, The PumpEng Way is designed to maximise long-term value for the client.

The JetGuard

Many submersible pumps were designed long before shotcrete poly-fibres became widely used in underground mining operations, and so by default are not suited to pumping in these environments and these fibres are a major cause of pump failure and production delay.

The JetGuard pump was designed by PumpEng to specifically deal with mine water that contains a large amount of shotcrete fibres, with the first line of defence a curtain of water that sprays onto the surface of the sump water and away from the pump, repelling the floating fibres, pushing them away from the pump to keep it from blocking.

"The JetGuard has some great features – it's our own IP and goes a long way to solving the damaged caused by shotcrete fibres," Matt said.

"We're finding that at one site we've increased the average life from three to four times and at another from two weeks to over six months".

Built tougher, the JetGuard is less susceptible to damage from bumps or knocks on the outside, and the all metal wet end provides longer wear life as opposed to traditional elastomers

The ScatPump

The ScatPump is a highly durable, top-

discharge slurry submersible pump with a mechanical agitator and wide clearances.

The pump has a straight path from the intake to the discharge which uses the pumped liquid to cool the motor. Because of the straight path and lack of any elbow joints, the pump is more efficient at moving the water and has less internal head loss.

It also means that the profile is smaller with fewer surfaces that can wear and can fit into tighter areas. Its primary purpose is to pump thick slurries, and its inbuilt agitator is designed to keep all particles suspended while the 30mm strainer allows the larger particles through.

Full Service

PumpEng offers a full range of services for submersible pumps including spare parts, pump repairs, maintenance and servicing.

As the original manufacturer of the pumps, PumpEng is able to directly support each of their branches Australia wide and their international partners.

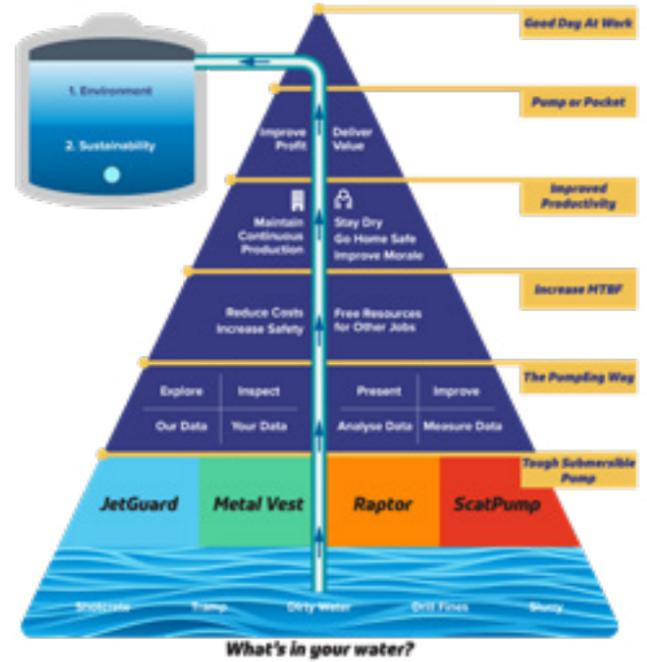
The Journey To A Good Day At Work

Tough submersible pumps is what PumpEng does, and with a core focus on underground mining, it's The Way they do it that's different. The Journey to a Good Day At Work begins with The PumpEng Way and with the commitment on increasing the mean time between failure, the benefits are wide reaching.

The service crew change less pumps, keeping them out of harm's way (and get wet less often), the jumbo keeps drilling, the maintenance costs are reduced, there is improved productivity and ore on the ROM – whatever your focus is, there's more time to focus on important proactive tasks (or five minutes to enjoy a coffee!)

The ultimate test of a Good Day at Work is improved profit and if PumpEng for some reason doesn't deliver value and it isn't able to keep you pumping, the Pump or Pocket commitment kicks in. **AMR**

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GAME-CHANGER

The SV60 used in an underground coal mine.

Mine dewatering may be a standard requirement at mining operations across Australia and globally, but that doesn't mean it's always smooth sailing, often throwing up challenges depending on the materials involved.

When it comes to particularly thick slurries and high solids contents, traditional types of pumps including slurry, submersible, sump, air-operated diaphragm and helical rotor pumps simply cannot cope with the task.

Usually, this means bringing in expensive machinery or manual handling to deal with the issue.

But there's a better solution, according to SupaVac Global Sales Director Daniel De Groot.

The SupaVac patented product range is owned and manufactured by an Australian precision engineering company, Poche Engineering.

Daniel said when traditional pumps are no longer able to handle the material, SupaVac pumps come into their own, handling thicker slurries and more solid material matter in a safer and more affordable system.

"Conventional centrifugal or rotor type pumps are all electrically or hydraulically-driven, whereas SupaVac is 100 per cent air operated, so it uses compressed air which renders it intrinsically safe," he said.

"When you're looking at an operation like an underground coal mine, safety is a focus, so it's a key advantage with SupaVac."

How the SupaVac Works

The pumping and material shifting process utilised by the SupaVac is deceptively simple, occurring in a cyclical motion making it not only safer, but also requiring less human intervention according to Daniel.

"Basically, it uses a proprietary venturi," he said.

"The compressed air runs through that venturi, it expands and creates the vacuum, which draws the material into the vessel under low velocity.

"You've got the timer switches on there, so it switches from the suction cycle to the discharge cycle, where it will then switch valves over automatically.

"It then uses the compressed air as a pressure blanket on top of the material to push it down the discharge line under higher velocity keeping it in suspension to push it down the discharge line."

As for how much solid matter a unit can pump, Daniel was certain of the SupaVac's prowess.

"The more flowable the material is, the higher the transfer rate, but you can pump completely dry material as well," he said.

"Typically, we say that solids can form about 70% of the suction and discharge of the pumps.

"The range starts at the SV30, which is a 50mm suction and discharge arrangement and then we go to the SV60 and SV60-V units which are 75mm.

"Then there's the SV110 and above, right through to the SV510, which are all 100mm suction and discharge units, so by that point you're looking at a unit that can deal with 75mm solids."

The SV60-V is a one-person vacuum loading, pressure discharge pump capable of recovering and transferring up to 27 cubic metres per hour at SG1.0 of almost any flowable material. It generates up to 25"Hg+ of vacuum combined with high airflow,

which allows the unit to transfer materials ranging from mining slurries, solids and oil sludge through to cementitious powders and grains.

SupaVac in Underground Coal Operations

According to Daniel, the SV60-V is better for drier materials and most suited for offshore oil and gas rigs.

It's the SV60 that shines in the coal industry and other underground operations due to its lower dimensions.

"The SV60-V is vertical, whereas the SV60 is a horizontal model, giving it a lower centre of gravity and a capacity to accommodate the height restrictions you often find in an underground operation," Daniel said.

The SV110 slurry and solids pump is a vacuum loading pressure discharge batch system that can recover up to 50m and deliver up to 500m while remaining a one-person or fully automatic operation.

Its 100mm inlet and outlet, along with its conical tank design, make it a formidable tool for the removal of aggregate and mud slimes behind tunnel boring machines or continuous mining machines.

The larger, SV510 heavy duty solids pump was designed to transfer up to 45 cubic metres per hour of semi viscous muds and various materials via vacuum load or top load gravity feed. Like other SupaVac pumps, it possesses an ATEX Zone 2 and CE conformity approval rating.

Although the SupaVac has historically fit into a niche market, it has been used extensively in underground coal mines since the 1990s, where the name has become synonymous with any form of air-operated vacuum pump thanks to its use across the sector.

Daniel said while SupaVac could be used

across varied operations its main application has been in coal fines recovery.

"The units have been used for recovering the coal fines and then putting it into the asset stream, also from any sumps or pits," he said.

"All sorts of things can end up in a sump from bits of rope to used gloves and the unit will pass all of it; whatever fits in will get through.

"That's because there's no internal moving parts, so there's nothing to get stuck on."

Daniel said the other big advantage of SupaVac pumps was that there are no wearing components inside the pump.

"There's no wear on the vessel and the like, which is what people typically think will happen," he said.

"Because there's no moving components, the pumps can run dry indefinitely.

"We've also got a range of air-operated float switches so that if the pump is at a low level it will actually switch the pump off and as the sump raises it will turn the pump back on automatically.

"That's all pneumatically controlled and that helps the mine save money with their air consumption as well."

As for the SupaVac pump's volume capacity, Daniel said it may be at the lower end compared to centrifugal systems, but the pumps still pack a punch and are the solution when other pumps can no longer pump the material.

"Our pumps are recovering the mess that someone else would have to deal with manually, so it's typically low volume, but it's far more effective than the alternative



A SupaVac submersible pump rescue.



The SupaVac team and a SV250-400RF unit.

options which are manual handling or bringing expensive machinery," he said.

"Depending on the hose length, solids consistency and the like, we'll generally see the small pumps doing anywhere from two cubic metres per hour to 10 cubic metres per hour.

"Typically, in the mines the largest SupaVac we go to is the SV250 and on larger units like that with more solids-laden material that's reasonably flowable, you might be getting up to 25 cubic metres per hour."

This equates to about 50 trailer loads of material an hour, showing the capabilities of the SupaVac over excavators and other interventions when dealing with materials that traditional pumps are unable to tackle.

The SV250 mobile sludge pump is a vacuum loading pressure discharge system that can recover flowable slurries from up to 50m and deliver the same in excess of 1000m while remaining a one-person or fully automatic operation. It can transfer more than 40 cubic metres per hour at SG1.0 depending on application requirements.

Designed to transfer an extremely wide array of heavy sludges via 100mm suction and discharge lines, the SV250 can operate with various Jet Packs ranging from 150cfm to 750cfm depending on specific application requirements.

Looking to the Future

Although the SupaVac range was developed in 1993, Poche Engineering is determined to continue developing innovations for current and future markets.

"Through Poche Engineering, we have been reinvigorating the product and working on new product development," Daniel said.

"We brought in the new smaller SV30 and larger SV510 pumps in 2020.

"With the technology, the pneumatics on the units that we've had since the product was developed in the early 1990s, we're actually just finishing off the next generation of pneumatic controls for the unit, which will make them more user friendly while increasing safety, useability and serviceability."

Daniel said Poche Engineering was looking to move beyond simply supplying pumps by developing a complete system.

"A team of engineers have been looking at developing complete systems and working on a coal fines recovery system, which recover the coal fines, then dewater them and put them back on the conveyor belt," he said.

"We're evolving into a bespoke solution designer where we provide a complete system for mining operations facing situations where they otherwise would have had to bring in expensive machinery."

Poche Engineering also currently offers a rental fleet of units, including a trailer-mounted unit with the compressor fitted and ready to go.

With its headquarters in Ingleburn, NSW, Poche Engineering has been in operation for more than 80 years. It has expanded to employ more than 40 people across multiple sites, supplying to mining operations across Australia and the world. **AMR**

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A SupaVac SV60-V rental trailer unit with computer and accessories.



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COMPLETE DEWATERING SYSTEMS

One of the most important considerations in any underground mine is the dewatering system.

Without an effective dewatering system, the mine fills up with water and the operation stops. The systems need to be appropriate and robust.

Operations sometimes take a piece-meal approach and stitch various systems together to manage the ground water, but inevitably the best way to manage the dewatering systems is to implement a planned approach to ensure the selected system is appropriate and the lowest possible long term cost.

The Australian Mining Review spoke to Aqua Energy Group Director Daniel Thompson and Business Solutions Manager Phillip Rowley to find out about their wide range of turnkey full-suite dewatering solutions.

Company History

Aqua Energy Group has a proven history working within the pumping industry starting as a family business and growing steadily to become the large company it is today.

"I've been in the pumping game for 20+ years, it was originally a family company so I started predominantly learning on the factory floor in the early years before moving through sales in industrial and mining applications," Daniel said.

Not content with offering pure pumping products and services, an opportunity was seen to expand the business to include a qualified electrical engineering skillset.

"Five years ago an electrical engineering company that we'd done a lot of work with became available on the market, and we decided it was a good fit for us. Together we decided to form Aqua Energy Group," Daniel said.

"In the early days there was a market to sell electrical products to the mining industry, but where we soon found our best fit was in offering 100% turnkey solutions for electro-mechanical solutions. So five years ago we decided pretty quickly that was the industry we were going to target.

"We've been quite successful at doing that - and not just the mining game but also a

lot of tier 1 infrastructure projects. We're currently doing water infrastructure on two of the largest projects currently underway in New South Wales."

Some other recently completed dewatering and energy projects completed by Aqua Energy Group include the Lithgow Water Management System, Hunter Valley Coal Fire Pumps, Lake Tekapo Canal Remediation, and another major Hunter Valley client's Fire Pump System.

Turnkey Solutions

Aqua Energy Group offers a wide range of electrical dewatering products that includes pneumatic diaphragm pumps, electrical submersible pumps, fishtanks, and bore hole pumps - however its main speciality is providing tailored full-suite turnkey solutions that includes power, pumps and data management applications.

In underground mining, the systems are constantly needing to be refined and built upon as the mine gets deeper and deeper. As underground operations progress, more pumps get added and not necessarily from the same provider.

This can cause discord between the various infrastructure components which can eventually lead to an increased requirement for maintenance.

"Where our customers struggle is that they might buy a switchboard from somebody and a pump from somebody else. To integrate that is a major hassle on site, and they end up with two completely different systems that don't talk to each other or don't work how they should," Daniel said.

Tailored Focus

Aqua Energy Group offers engineering and planning to bring together a range of products to suit each operation's requirements.

"We sit down with client in the design phase and talk about how we can make their lives easy by providing a total turnkey solution - whether that's with underground dewatering which is a major part of what we do, or it could also be unique applications where the client are trying to do something a little bit different," Phillip said.

Where competitors are only able to offer



Completed fishtank install in an underground mine.



A bore pump being installed.



Onsite with Aqua Energy Group, delivering a turnkey mining booster pumpstation.

their individual catalogue product, Aqua Energy Group brings together a range of different product offerings that best suits the needs of the client.

"We are different than others - we will design, manufacture, install, commission and maintain the infrastructure. We don't just sell a catalogue product, we provide fully engineered turnkey solutions," Phillip said.

"Where other pump suppliers are limited purely by the pumps they provide in their catalogue, we go out to market and find the best pump that would suit the application and combine that with other offerings and together we come up with the best solution for that application."

Custom Engineering

Aqua Energy Group is able to design and manufacture tailored engineering solutions to suit any application. Their tailored solutions are not limited to only mechanical solutions - Aqua Energy Group also offers fully integrated electrical and software solutions.

"With underground mines there is very specialist machinery, so the client might have a requirement to move the pump with a particular machine and we are able to accommodate that," Phillip said.

"For example, if the plant needs a QDS or tow point attachment for a specific underground loader, we can engineer this to suit. Electrically, we can integrate the system and tie it in with the site SCADA system and the client can monitor the data from anywhere on their mine site.

"We will conduct a site assessment with our engineering team to better determine what solution is suited to the clients application, compared to other companies that are restricted by their own catalogue," Phillip said.

Fishtanks

Fishtanks are large mobile pumping stations that are used to pump water from multiple levels in an underground mine up to the surface.

Pneumatic diaphragm pumps and submersible pumps are positioned at

strategic locations (for example decline faces and production level sumps) to pump dirty water along poly lines until it converges and meets to fill the nearest fishtank, which then uses more powerful pumps to drive the water further up toward the surface.

"Some of these fishtanks we supply have been installed underground in very harsh working conditions and they have stood the test of time. There will be about four to five years of operation before we need to perform minor modifications or upgrades."

Maintenance and Upgrades

Further to the turnkey solution offerings, Aqua Energy Group is also equipped to maintain and upgrade existing and old infrastructure.

"We do a lot of upgrades as well. Sometimes we get some pretty horrendous pump stations that have been working for a long time underground and our clients ask us to upgrade and overhaul them," Phillip said.

"One client had a competitor's fishtank underground and was running into a lot of water issues and had trouble getting parts.

They had terrible water quality, and their service company couldn't provide suitable products and he was in dire straits.

"We performed some engineering calculations for him, found out he could use the motor he had on site, sourced a Duplex pump unit in stock in Australia and we got them coupled up, and within three days the system was underground working to full capacity once again.

"Thanks to our in-house engineering expertise here, we were able to check all our hydraulic calculations, and we were able to ensure that we could provide a solution for his particular application and assist in saving his flooding mine.

"Our solution also meant that the client could bypass other infrastructure and make the dewatering system more efficient.

CONTINUED ON P90



11kV dual section circuit breaker.



A transportable HV/LV switchroom.



Aqua Energy Group production team members consulting on technical drawings.

CONTINUED FROM P89

"Because of the water quality, and in particular the low pH levels, the original pumps were eaten out completely, so we recommended a more appropriate heavy duty pump. It was a bit more expensive but it was going to be worth it!"

"It's the hardened materials used to make the pump that we supplied: Duplex stainless steel, 8.8 grade high silica content stainless steel. It's actually higher than 316 grade steel," he said.

Phillip said that the difference between failing pumps can be as simple as wrongly selecting the pump material. Aqua Energy Group has sourced many different materials such as 27% chrome iron and 904 grade duplex stainless steel, with our team of mechanical engineers always on hand to assist in selecting the correct material for the application. This ensures maximum durability and pumping life.

Some of the custom features available on our fishtanks include:

- Manufactured to mine requirements
- EXD options
- QDS options
- Trailer mount options
- Slurry handling units
- Full remote automation
- High head versions
- Air redundancy backup systems.

With in-house design and manufacturing capabilities, along with the flexibility to suit individual mine requirements, Aqua Energy Group's fishtank dewatering systems are only a portion of what Aqua Energy Group is able to offer.

Bore Hole Pumps and Power

An alternative to running a series of fishtanks up the decline of an underground mine, is to drill and install a dedicated bore pump. Typically these are planned and installed before operations commence in that part of the mine, and are designed to dewater the strata including maximum likely flow requirements.

Borehole pumps are a type of submersible pump that can be mounted both horizontally and vertically as well as supported underneath floating pontoons. These can be used in remote areas for water supply or dewatering and can be solar powered if no mains power is available.

Aqua Energy Group is also equipped to install a full borehole pump system from top down.

"Bore pumps are another way of dewatering an underground mine. We can put in a borehole dewatering pump station. With vertical bore hole pumps we lower the equipment down using cranes and special equipment then supply all the power to it – substations, controls, switch rooms, etc," Daniel said.

Aqua Energy Group can provide bore hole pumps of all types, made from materials including corrosion resistant stainless steels, bronze and marine grade stainless steels which means the pumps are capable of running in any conditions. Using the correct material means less downtime and maintenance on the pump.

"Every turnkey solution we provide has its own specific purpose. If there is no power available on the surface then a bore pump may be a very costly exercise," Daniel said.

"Whereas if power is more readily available underground it makes it more sense to use underground dewatering devices such as our fishtanks.

"Typically with a bore pump you're going straight up and down so it's the most efficient method of dewatering. Whereas if you're heading up the decline, you could have 3-5km of rising main on a gradual decline, so several fishtanks may be required to get the water all the way to the top. If one fails, it can interfere with the whole operation."

Depending on the size of the pump, fishtanks are typically used to pump a vertical head of anywhere between 50-200m. The borehole pumps Aqua Energy Group provide can pump much further.

"Some of our bore pumps have pumped up to 700-800m," Daniel said.

"The entire system is installed from above ground. The hole is drilled above ground, the pump is lowered from above. You never have to go underground to install it."

Previous successful borehole projects completed by Aqua Energy Group include many high profile clients within the mining industry across the Asia Pacific region.

Other Pumping Solutions

"There are very complex dewatering systems in underground mines," Phillip said.

"With most of these mines having a number of both bore pumps and fishtanks to manage their dewatering requirements."

But further to the fishtanks and bore hole pumps, as part of the turnkey comprehensive

solutions on offer Aqua Energy Group is also able to provide:

- Centrifugal pump packages
- Fire pump package systems
- Helical rotor pumpstations
- High pressure plunger pumpstations
- Pontoon pump stations
- Water supply pressure systems
- Diesel self priming pumpstations
- Slurry pumpstations
- Vehicle wash bays
- Water treatment plants
- Water reclaim plants
- Solar powered pump systems (including solar panels and inverters.)

Aqua Energy Group's mine dewatering pumps are all built to required standards and available with any number of optional extras, and all spare parts including impellers, bearing assemblies and mechanical seal kits and wear parts all readily available.

Power Generation - Energy

Aqua Energy Group doesn't just supply pumping solutions – as the name suggests, part of the service includes power supply.

This includes:

- Generators
- High voltage transportable substations
- HV distribution boards
- Modular kiosk substations
- Motor control centers / panel controller
- Section circuit breakers
- Step-up/step-down substations
- Switchrooms and other substations
- Other miscellaneous electrical underground equipment.

Full Electrical Service

Aqua Energy Group is IS9001:2015, ISO 14001:2015 & AS/NZS 4801-2001 approved, with a team of qualified electrical engineers, project managers, electricians and technical staff able to assist clients through all phases of a project.

Design

Aqua Energy Group has a competent in-house electrical design team that is available to translate site requirements into practical solutions using their designated electrical engineers and design specialists.

Aqua Energy Group is often asked and assists with feasibility studies, technical advice and designs drawings to suit various applications for our regular clients. This is all part of the Aqua Energy Group customer experience.

Install

Aqua Energy Group is also equipped to install its large range of electrical equipment to suit the project site's needs – whether it

be a small packaged pump set or large turnkey project. Aqua Energy Group have an extensive team of qualified and experienced personnel that ensures your project is delivered successfully every time.

Commissioning

The commissioning process is the most important part of the installation in order to ensure a successful project. Aqua Energy Group's commissioning team is experienced at delivering the most complex of projects and offers test runs as well as comprehensive handover instructions to the client.

Maintenance

Aqua Energy Group has a competent mechanical and electrical team that is dedicated to providing the best maintenance, and is able to conduct regular maintenance or provide specialised emergency services. Aqua Energy Group's workshop is fully equipped with testing facilities available to attend to plant repair requirements.

Company Reach

Aqua Energy Group prides itself on its track record of successfully delivering challenging projects that require specialist solutions and innovative engineering methods. Its commitment to quality, the environment and customer satisfaction helps the company deliver the best packaged solution for a site's requirements.

"A lot of our work comes from word of mouth. We're getting a lot of phone calls from people who have heard about us and our work," Daniel said.

"We have capabilities in NSW and Queensland, and have recently been getting enquiries from WA. We have about 40 staff in Newcastle and are in the process of getting a head office set up further north in Queensland.

"We have successfully completed several projects just recently, from design through to commissioning, for several Tier 1 mining clients which featured many of our turn-key solutions.

"We do sell products, but nine times out of 10 we'll provide a turnkey solution and we'll continue to turn up year after year to support it." **AMR**

PUMP IT UP

National Pump & Energy is an Australian specialist pump supply and service company offering design, construct and install of specialised dewatering systems customised for any mining, construction, oil & gas, municipal and infrastructure projects, and operation.

NPE has built a reputation based on performance and service excellence with a commitment and capability to provide a rapid service nationally for pump, generator and associated equipment hire, sales and maintenance. The process is simple and effective – working closely with clients on each site to develop an in-depth understanding of the water management priorities prior to commencing design and work.

Australian Mining Review caught up with National Pump & Energy National Sales Manager John Lys about the pumping solutions on offer.

“Our underground pumps offering is based on our partnership with Australian-made Minetuff Pumps as their exclusive distributor for sales and service support in Australia,” John said.

“The type of pump we use is a submersible drainage pump specifically designed to meet the exacting needs of the most demanding global mining and construction markets for underground or surface mining.

“This design of pump has been around for a lot of years but over the five years we’ve



NPE endorses Australian-made Minetuff Pumps for underground dewatering applications.

been associated with Minetuff, there has been a lot of R&D work and improvement on the drainage pump range for underground mining – we’ve seen advances with specifically-engineered materials, generous material thicknesses and adjustable hydraulic designs ensure that these pumps are every bit as TUFF as the environments that they work in.”

National Pump & Energy is delivering complete turnkey packages from concept to creation, installation and commissioning, operation, maintenance and reporting.

“We can support the end users from a rental point of view, or have a supply agreement for parts, or a complete service agreement for repairs as well. We offer day to day hire or full long-term rental agreements to fully support site requirements,” John said.

To ensure maximum availability of working pumps, National Pump & Energy and Minetuff are stocked and ready to provide

support at any given moment.

“It comes down to the quality service support that you need to give your customer,” John said.

“You need to have good backup to provide immediate changeout and support for failures etc. NPE holds a large suite of pump models and types for underground mining all throughout Australia.”

National Pump & Energy staff are fully trained in the technical aspect of their products and offerings, and John stresses the importance of proper investigation and planning.

“If you don’t run the pump to the best efficiency point you can end up with a failure fairly quickly,” he said.

“So as a company we offer a full pump audit – we’ll go through and have look at the pump system from bottom to top and top

to bottom.

“We will work out if the incorrect size or style of pump is being utilised, or if we can recommend an alternative option to reduce life cycle cost of repair and increase reliability. We will then table recommendations and solutions and work closely together with the client on an ongoing basis.

“Technology is changing as well as an appreciation of understanding what is deemed an asset, and we’ve got a lot of opportunities to create a better design in the system for underground pumping.

“Being a very specialised pumping solutions provider, NPE supply and install everything required from source to discharge and deliver customised solutions in between.”

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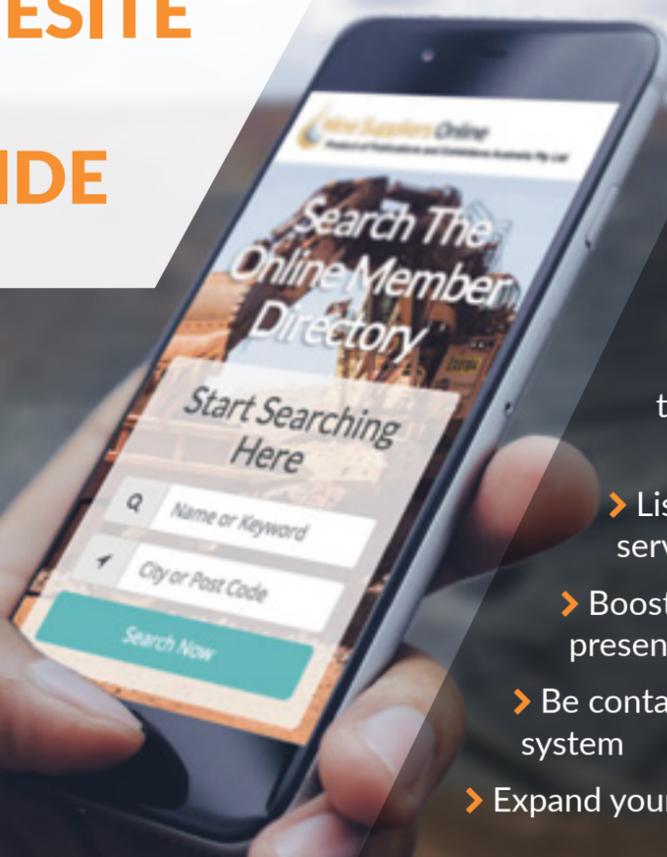
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DAVID BURNS

ACCENTURE GLOBAL MINING LEAD

Tumultuous 2020 has come to be defined by 'Digital Transformation', with cloud computing providing the digital gateway to realising innovative technologies.

While our latest research encouragingly found that approximately 85% of mining and metals companies have adopted cloud in some form, the mining industry still unfortunately remains behind its peers.

But the new year brings with it fresh opportunities and Australia's mining industry is incredibly well positioned to not just make up the ground, but lead the industry globally.

Clearing the Industry Hurdles

The slow start to the sector's digital adoption isn't surprising, given the industry's well-known challenges, including volatile commodity prices, fast-changing international trade relations and compliance with new environmental and safety regulations.

However, in order to properly address all of these issues for the long-term, a robust and secure technology backbone is required.

The timing for an overhaul is conducive, given the need for every country and organisation to take a strategic look at its future, to synergise business, human and environmental interests into complementary strengths.

Effectively, this is a "Triple Zero" future of zero harm, zero loss and zero waste.

In this environment, the health and wellbeing of the workforce drives sustainable business operations, operational processes are under continual review and the business embraces a resourceful circular economy model. Realising this future is not easy.

It calls for digital technologies - including artificial intelligence (AI), analytics, connected supply chains, IoT and more - and central to successfully amalgamating these technologies is cloud computing.

The Benefits Of Cloud Technology

The cloud is not new for mining. Our research has shown cloud technologies aid the industry with throughput improvement of up to 5%, increased revenue per tonne by almost 2%, increased productivity by 10%, while reducing lifecycle overheads by almost 75%, logistics costs by up to 12% and improving key performance indicators like On Time, In Full (OTIF) by approximately 10% and fleet load factor by over 30%.

However while this is a great start, most companies stopped short of embracing the full promise of cloud technology to accelerate business strategy and drive digital transformation.

COVID-19 has reshaped the mining landscape and provided renewed clarity of the important role cloud plays in enabling new ways of working - from automated video analytics to pre-empt accidents, to optimising processes intelligently through digital twins or smart sensors.

These new ways of working in our digitally accelerated world rest on fit-for-purpose cloud setups and applications that can unlock real value and maximise the greatest benefits from these investments.

A smartly deployed cloud can host a combination of digital technologies, giving enterprises and workers full visibility across their mining operations on demand, and lay a foundation for artificial intelligence (AI), machine learning (ML) and superior cyber security.

This can translate into significant cost

savings which can be up to 30-40% in operating costs, realised from data harmonisation, improved on-time decision-making, optimised inventory and workforce allocations at a tactical level.

The secondary benefit of digitally advancing the industry comes from informing strategic approaches with real-time device data.

Technology like IoT and smart sensors provide analytics that can be aggregated with context data (IT) and applied to industry-specific analytical models to determine actionable insights.

This increased visibility helps achieve better production throughput, asset utilisation and operator performance.

All benefits combined, our analysis for an average mining company with \$40b revenue, a holistic digital transformation program - with key building blocks enabled through cloud - can generate incremental value, from cost savings and revenue gains, of up to 15 to 20 percent of total IT spend over the investment period. In every business sense, that's a game-changer.

Setting Up For Success

While many miners are experimenting with cloud technologies, only strongly defined and business sponsored initiatives will result in a competitive advantage.

Moving to the cloud is not a technology decision alone. It is guided by business priorities and expectations and driven by technology enterprise architecture guardrails.

We have identified some key opportunities that will ensure all miners build the right foundations and exploit the greatest value from cloud from the outset.

Jumpstart the transformation by migrating non-core applications of shared service functions such as HR, finance, procurement to SaaS on cloud.

Rehost high volume, scalable functions like database management, infrastructure on IaaS.

Establish a modern cloud-based data model to take advantage of artificial intelligence and machine learning.

Use a digital decoupling approach to decompose other legacy technologies, reducing mainframe data processing.

Enhance cyber security and data privacy (identity and access management, information protection, compliance, firewall and protection services).

Mining's Cloud-Driven Future

The mining industry has begun to realise that cloud is not restricted to cost optimisation but also unlocks business agility and innovation.

It's a gateway to integrated efficiency, not solely for localised operations, but expansively for global networks.

Despite a tentative start to the mining industry's cloud journey, the cloud imperative for the sector is now undeniable, not as a destination, but as a launching platform to a digitised future.

Increased industry adoption of cloud technologies is the vehicle that will accelerate Australia's position as a leader for the resources sector, enabling Australia to set an example for the world to follow. **AMR**

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