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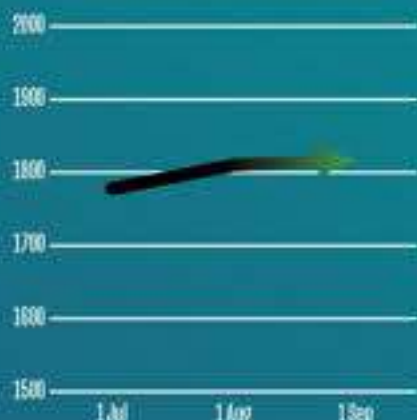
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GOLD \$US/oz

The price of gold was laying relatively low mid-way through the year, however, prices have been inching upwards throughout August. The uncertainty of the marketplace, caused by COVID outbreaks and Continuing lockdowns, has benefitted this precious metal.



IRON ORE \$US/t

62% Fe CFR China

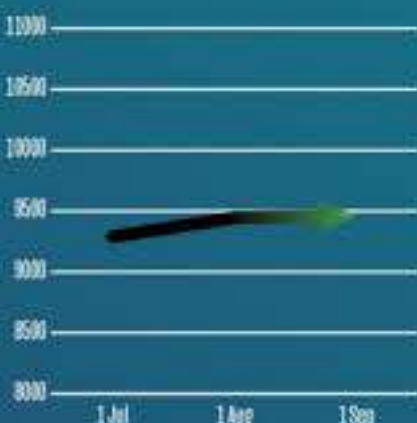
The end of August saw a significant and unexpected retreat of iron ore prices in response to varying demand factors across the globe, paired with lagging seasonal demand. Global production is slated to accelerate until 2025.



COPPER \$US/t

LME Price

Copper prices are showing confidence with the demand in China continuing to grow. Buyers have stopped destocking and are returning to the market as Delta outbreaks contained. The demand for this metal is high due to its use in technology and low-carbon transitions.



COBALT \$US/t

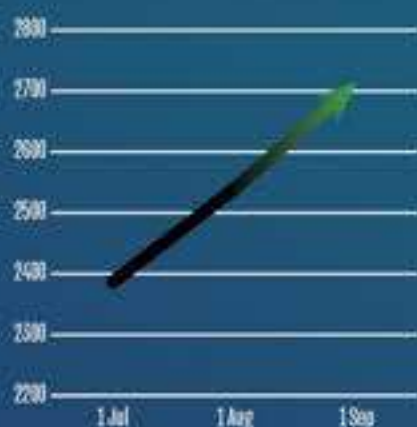
Cobalt spot prices have been largely flat, sliding through the month of August. The trend for vehicle electrification has seen a trend upwards over a few months, which is forecast to persist.



ALUMINIUM \$US/t

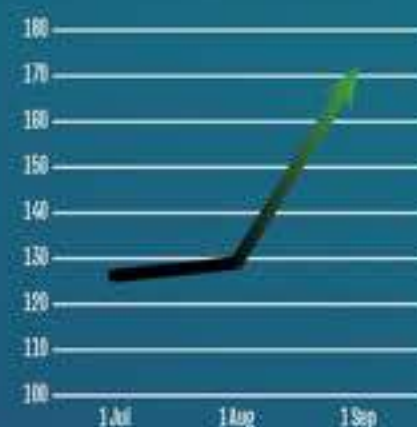
LME Price

The global economic recovery has increased the demand for goods that contain aluminium — from kitchen appliances to cars. Paired with recently curbed aluminium production through China, this has strained supply and pushed prices to a 10-year high.



THERMAL COAL \$US/t

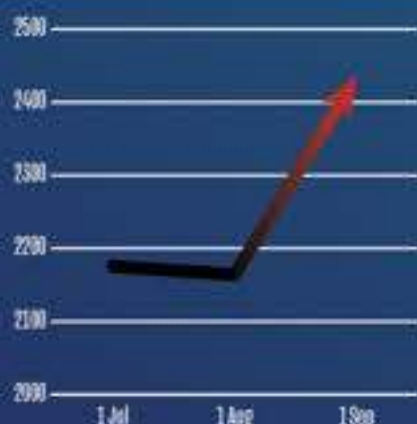
Rising electricity demand and an increase in global gas prices have triggered an extraordinary comeback for this contentious commodity. Prices in the US have been volatile as thermal coal competes with natural gas, the latter of which is currently experiencing a lack of supply.



LEAD \$US/t

LME Price

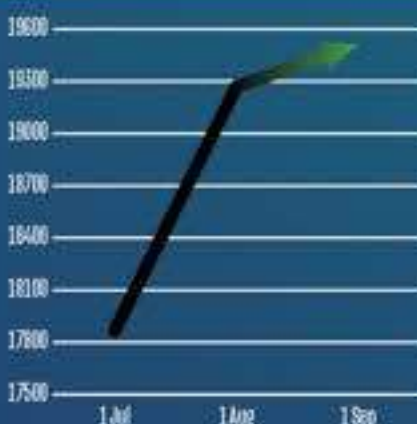
Tight supply and consumer fluctuations caused a slight rise in lead premiums this month. China's economic activity was weaker than expected in August — but with their expected recovery, historically high demand for this metal could return.



NICKEL \$US/t

LME Price

The post-lockdown demand for stainless steel products and continued delays in shipping have seen consumers needing to post their orders for nickel products well in advance. As countries increasingly open up and resume construction and manufacturing, growth may continue at a more subdued rate.



* Prices as at the 1st September 2021

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Golden Times for Australian Miners

BY ANTHONY FENSOM*

The good times are here again for Australia's gold miners, with the local industry slated to become the world's top producer this year, aided by surging exports and exploration activity.

Despite the challenges caused by the COVID-19 pandemic, Australia produced a record high of 327 tonnes of gold in 2020, according to Surbiton Associates.

More records could be broken too. The Australian government's official forecaster predicts Australia will become the world's top gold producer in 2021, while export earnings are tipped to hit \$29 billion in fiscal 2022.

Output is projected to grow at an average annual rate of 8.3 per cent from fiscal 2022 to 2023, with expected production of 388 tonnes by fiscal 2023 driven by new mines and expansions, according to the Office of the Chief Economist.

Exploration jumped by nearly 32 per cent in the March quarter 2021 year-on-year, driven by high U.S. dollar gold prices and improved investor confidence.

Among the new producers, Capricorn Metals poured the first gold from its Karlawinda gold mine in Western Australia (WA) in June, while Ramelius Resources mined its first ore from its Tampia mine in the same month.

Other WA mines in the pipeline include Red 5's King of the Hills project, which is expected to start production in the June quarter 2022, with a similar timeframe for Calidus' Warrawoona gold project in the East Pilbara.

Expansion projects include those by Newcrest, Newmont and St Barbara. Alkane Resources also plans to expand its Tomingley mine in New South Wales, with approvals expected by mid-2022.

'21st century gold rush'

Explorers have been buoyed by new discoveries, such as De Grey Mining's Hemi discovery in the Pilbara which has spurred a reported "21st century gold rush" in Australia's top mining state.

WA accounted for 67 per cent, or 220 tonnes of Australia's gold mine output in 2020, with the state also accounting for nearly 70 per cent of total gold exploration expenditure last year.

While the Pilbara region has long been associated with iron ore, the discovery of conglomerate gold nuggets in 2017 has spurred a wave of new explorers.

"The Paterson Province in the Pilbara region is now one of the world's most sought-after exploration areas," the Office of the Chief Economist says.

Among the new projects underway are Calidus Resources' Warrawoona project in

the east Pilbara, where mining commenced in August, with production anticipated in the June quarter 2022. Novo Resources' Beatons Creek mine poured its first gold in February 2021, with further Pilbara exploration planned.

"These are fantastic times to be a gold explorer in Western Australia, home to some of Australia's biggest discoveries," said Platina Resources managing director, Corey Nolan.

"Investors are backing the sector and with exploration increasing we will undoubtedly see more new discoveries in the Pilbara and elsewhere."

Platina is building its gold presence in WA, recently acquiring the Xanada Gold Project near the multi-million ounce Mt Olympus deposit.

"Xanadu has immense appeal given the number and width of economic-grade gold drill intercepts, which have never been followed up with a systematic exploration campaign," the company said in its June 2021 quarterly report.

It also announced positive drilling results at its part-owned Munnii Munnii Project near Karratha, which it has described as one of Australia's largest undeveloped palladium deposits. Platina also plans a maiden drilling program at its wholly owned Challa Gold Project, located in between the prolific Mt Magnet and Sandstone gold districts.

Other miners are seeking to follow in De Grey's footsteps, including Sayona Mining, which has a portfolio of gold and lithium projects in WA's Pilbara region.

The company is targeting intrusion-related gold mineralisation similar to the Hemi discovery, with some tenements located in close proximity to Hemi.

In June, Sayona announced it was investing further funds in its WA gold exploration, including drill testing of magnetic anomalies at its Mt Dove and Deep Well projects.

Sayona's managing director, Brett Lynch said the company was encouraged by the potential of its WA gold projects.

"Our Pilbara gold projects all lie within a 10-50 km radius and encircle the expanding Hemi, which is shaping up to be a large footprint, world-scale deposit," Lynch said.

"With our recent efforts to identify drill targets, we look forward to advancing this exploration activity and unlocking further value for shareholders, in addition to our flagship lithium projects in Canada."

Safe Haven

Gold prices have fluctuated in 2021, with the prospect of rising global growth and higher bond yields weighing on sentiment.

However, with geopolitical concerns growing following turmoil in Afghanistan and weaker than expected Chinese economic growth, the gold price could have further room for improvement.

Among those bullish on the yellow metal are U.S. investment bank Goldman Sachs, which has a US\$2,000 per ounce forecast, based on increased demand from central banks and consumers.

However, other analysts are less bullish, with Fitch Solutions projecting an average

gold price of US\$1,780 per ounce for 2021 and Capital Economics expecting US\$1,600.

A Reuters poll of analysts and traders conducted in late July found a median forecast of US\$1,835 an ounce in the third quarter of 2021 and US\$1,841 for the fourth quarter. For 2021, prices are expected to average US\$1,812, dropping slightly to US\$1,785 next year.

In its latest update, the World Gold Council (WGC) reported rising consumer demand for gold together with central bank buying, with investment demand in line with its 10-year average.

"Looking ahead, we expect continued improvement in the consumer elements of demand for the rest of the year," said WGC senior markets analyst Louise Street.

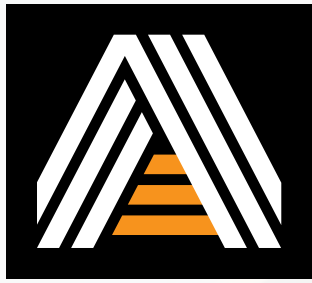
"And while ETFs [exchange-traded funds] will most likely not repeat the record performance of 2020, the need for effective risk hedges and the continued low-rate environment supports our view that investors will add to their strategic allocations throughout the rest of the year."

With the Australian dollar weakening, Australian producers can expect to enjoy healthy profits for some time yet, as gold retains its traditional safe haven status. **AMR**

*Anthony Fensom is an experienced freelance business writer and media/investor relations consultant at Republic PR. He can be contacted via email at anthony@republicpr.com.au



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Pilbara Gold Rush Heating Up



On the back of DeGrey Mining's fabulous Hemi discovery south of Port Hedland, a new gold rush is occurring in the Pilbara Region of Western Australia.

The vast Pilbara area has been host to a number of gold rushes since the precious metal was first discovered at Whim Creek in 1887 and some 130 years later a new gold rush is now underway.

With DeGrey continuing to grow Hemi's reputation as a world class find, the Pilbara is now drawing in gold explorers from all over the globe looking to grab their piece of the golden action while building confidence that Western Australia will remain at the forefront of Australia's gold mining future.

According to the Australian Government's Department of Industry, Science, Energy

and Resources' (DISER) latest "Resources and Energy Quarterly", Western Australia accounted for 67% (or 220 tonnes) of Australia's gold mine output in 2020.

The State was also the centre of gold exploration activity in Australia, accounting for nearly 70% (or \$908 million) of total gold exploration expenditure in 2020.

DISER says a number of recent exploration successes have opened the door to a range of new gold plays in the Pilbara.

- The discovery of conglomerate gold nuggets in the Pilbara region in 2017 has sparked a new gold rush in the area. Unlike traditional gold-bearing rocks that have led to the development of a number of mines in the Pilbara over the last 100 years, the discovery in conglomerate sedimentary rock —

material made up of rocks ranging in size from gravel to boulders – is a game changer.

- DeGrey's discovery of a new Pilbara gold play with its intrusion hosted form of gold mineralisation at Hemi is the first time this type of gold mineralisation has been seen in the Pilbara region. Hemi's riches has attracted a crowd of new players to the area looking to benefit from the "nearology" opportunity.

The Paterson Province in the Pilbara region is now one of the world's most sought-after exploration areas, with Rio Tinto's recent discovery of the Winu copper and gold deposit in 2018, and Greatland Gold's discovery of the Havieron gold-copper deposit in 2018.

Greatland Gold has teamed up with

Newcrest Mining in a farm-in joint venture to develop the Havieron project and explore further. The Havieron project is rapidly developing, with an underground decline opened in May 2021.

Calidus Resources' 4.3 tonnes a year Warawoona gold project in the east Pilbara is expected to start commercial operation in early 2022. Novo Resources' 3.1 tonnes a year Beatons Creek gold mine in the Pilbara poured its first gold on 16 February 2021.

Artemis Resources' Paterson Central and Carlow Castle gold and copper projects in the eastern and western Pilbara are in an advance stage of exploration. Copper and gold were first discovered in the Carlow Castle mine in 1874. **AMR**



Border closures and restrictions are hampering the flow of experienced resource sector employees.

Almost every industry has been, and continues to be impacted by the Covid-19 pandemic, with ongoing border closures and rolling lockdowns continuing to affect business and industry, and the resources and construction industries are no exception.

Anthony MacShane, Director of MACFORCE Australia said state-to-state border closures and restrictions had hampered the flow of experienced resource sector employees around Australia, and meant that each state has had to look within its own borders to find a labour pool for large-scale infrastructure projects.

"This has come at a time that is almost a perfect storm within the industry, with many large-scale projects kicking off, expansions and production ramp ups due to great commodity prices, federal and state governments pushing through infrastructure projects to stimulate the economy, and the growth of renewable and clean energy projects to name a few," Anthony said.

"In short, we have a situation where there's high demand for workers but a limited pool of talent that is already stretched."

Anthony describes his company, MACFORCE Australia, as a recruitment company with

heart, with a focus on changing the way people from all over Australia are employed.

They educate and mentor their candidate pool to help them shape their careers in the industry, through training and employment advice.

MACFORCE's innovative approach to providing fresh, leading-edge information about the industry, and the extensive industry experience of their team, means that MACFORCE has a unique understanding when it comes to finding the right people for the right roles.

"We come from the industry so we know the demands, we know what our clients need, and we know what our workers need to succeed."

He said that the ongoing Covid-19 crisis continued to create some major challenges for his clients.

"There is a real strain on reaching targets in production and on project because the resources are so stretched.

"The overall level of skill across the whole work force has dropped compared to pre-boom times, and an increase in pay levels has made it harder for some employers to



MACFORCE Australia is a recruitment company with heart.

retain their workforces.

"And, because of the uncertainty around Covid, they can't rely on tapping into the interstate labour market."

Anthony said MACFORCE Australia is working to alleviate some of these issues by partnering with Australia's jobactive providers and their consultants to educate, upskill, provide career advice and train those outside the industry to ensure that they're job ready for MACFORCE's clients.

"This includes offering collaborative tailor-made industry traineeships. Our leading-edge Ex Offender Employment Program and in-prison Industry Information Sessions, which was rolled out with much success in WA over the last three years, is set to expand across Australia, allowing us to tap into a deep pool of talent that was traditionally considered taboo.

"We provide career expos, resume writing tips, one-on-one career guidance and training pathways to ex-offenders around Australia."

MACFORCE prides itself on thinking outside the box when it comes to finding new and emerging talent for their clients. They have built a new Recruitment Partners network

to access new talent pools, have expanded their mentoring strategy into the armed forces and has build relationships with a number of Indigenous corporations, allowing them to create meaningful job placements.

"Our team has worked in all corners of the industry, from tendering, contracts, running expansion projects and scheduling to managing projects, which means we understand our clients' exact needs. This helps in a big way when selecting the ideal candidate, and our innate experience of the mobilisation process allows us to move fast with our candidates to ensure we get them working as quickly as possible.

"For our recruits, attitude is everything. Employers just want good people that they can build a team with, so identifying good people is what we have got great at!"

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Record Revenue for Lynas

The good news keeps coming for WA-based Lynas Rare Earths, the largest rare earths producer outside China.

It has been awarded a \$14.8m grant as part of the Australian government's Modern Manufacturing Initiative, which will enable Lynas to commercialise an industry-first rare earth carbonate refining process that has been developed by the company's in-house research and development team.

The new process has been tested at bench scale and has proven effective in producing a higher purity rare earth carbonate that can feed the Lynas Malaysia plant as well as the proposed US rare earth processing facility.

The process will be installed during the construction of the rare earth processing facility in Kalgoorlie and the grant is expected to contribute about 50% of the implementation cost.

In keeping with a commitment to sustainable and responsible rare earths production, the new refining process will contribute to reducing chemical consumption and processing costs.

The \$500m project (including associated upgrades at the Lynas Malaysia plant) will increase employment by about 290 positions during construction and about 120 ongoing jobs once operational.

The news comes as Lynas posted record quarterly revenue on the back of "very strong" demand for its range of specialised metals that offset softer prices.

It reported a jump in fourth-quarter revenue to \$185.9m, more than triple \$38m a year earlier, pushing the stock up 9%.

Demand for rare earth materials such as neodymium and praseodymium (NdPr) has rebounded from a pandemic-driven drop last year as electric vehicles continue to gain popularity amid a global push to reduce carbon emissions.

Lynas and other western producers stand to benefit from efforts by the US to curb its reliance on China for the minerals, which are used in items such as magnets for windfarms, gadgets like smartphones, and military equipment.

The company also said it had identified a second potential site in Malaysia to build a low-level radioactive waste disposal facility amid ongoing delays for clearance of an earlier site identified by the Pahang state government.

Meanwhile, the High Court of Malaysia has dismissed the judicial review proceedings of the anti-Lynas activists which have plagued the plant in that country.

A costs order has been made in favour of Lynas. This was the fifth time that a court challenge had been lodged, and all of them have been dismissed.

Lynas Malaysia has been the subject of four independent scientific reviews, including two reviews by the International Atomic Energy Agency (IAEA) and the Malaysian Government's 2018 Executive Review



The Lynas rare earth facility at Mt Weld, Kalgoorlie.

Committee, all of which found that Lynas Malaysia is low risk and compliant with the relevant laws and regulations.

The 2015 IAEA Report stated that "... the fears demonstrated by those who oppose the continuation of the operations did not find any support on scientific evidence". **AMR**

Grants Drive NT Exploration

The Mt Todd Mine in the NT.

The Northern Territory has dished out a record \$1.7m in grants under the latest Geophysics and Drilling Collaboration program, aimed at expanding new exploration opportunities and continuing to drive investment and jobs.

A total of 18 projects from 15 companies have now been awarded.

For the first time since the Resourcing the Territory initiative was launched, projects have also been able to access co-funding to support brownfields drilling programs.

In brownfield exploration, geologists look for further deposits near a known mineral deposit or already operating mine.

As these areas are known to have high potential for minerals and associated

infrastructure, the risk in brownfield exploration is considerably lower.

Mining and Industry Minister Nicole Manison said creating jobs for Territorians was this government's leading priority.

"There are currently 20 mining projects working towards a Final Investment Decision (FID) in the Territory with a combined value of \$6.2b and potential to create 5500 construction jobs and 3200 ongoing jobs," she said.

"We have committed a further \$9.5m per year ongoing from 2022 to expand and turbo boost the Resourcing the Territory initiative.

"The information gained from this grants program will be vital in attracting more

investment and more jobs in mineral exploration across the region."

Five companies have so far been awarded co-funding as part of the brownfields expansion, including Vista Gold Australia, which owns the Mount Todd Mine, 55km northwest of Katherine, and which recently recommenced mining operations.

Vista Gold Australia Director Brent Murdoch said receiving a grant was a great result.

"This is another fabulous result for the Mt Todd Mine and the successful grant is a strong validation by the Northern Territory Government of the prospectivity of the Territory," Mr Murdoch said.

The projects that have been awarded funding are targeting a wide range of commodities

including gold, copper, tungsten, nickel, natural gas and helium.

The successful applicants are:

- Inca Minerals
- Knox Resources
- Central Petroleum
- Barkly Operations
- Strategic Energy Resources
- King River Resources
- IGO Ltd, Newcrest Mining
- iCopper
- Core Lithium
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Fancy Moves for Burgundy

The Ellendale Project area supplied over 50% of the world's Fancy Yellow diamonds, which were the subject of a special marketing agreement between the former operator and Tiffany & Co.

Burgundy Diamond Mines has advanced several recent arrangements to facilitate its growth in the high-value fancy colour diamonds sector.

Based off the proposed start of production of fancy yellow diamonds from the Ellendale Diamond Project in 2022, the company had previously announced the potential of cutting and polishing some of this production in the Kimberley of WA to unlock further latent value.

Additionally, Burgundy has been formulating a wider downstream strategy that includes cutting, polishing, marketing and sales of potential production from other projects in its international portfolio, such as the Naujaat Project in Canada, as well as from third party supply.

With the closure of other diamond operations in 2020, the company has had the opportunity to start building the required capability for this strategy, which includes:

- A leasing agreement being finalised to acquire secure premises in Perth, comprising a purpose built high-security facility specifically designed for downstream diamond operations.
- Agreement for the purchase of specialised equipment for the valuing, cutting, polishing, grading, secure storage and sale of high-value diamonds.
- Initiating a process to recruit a team of specialists to support the move to downstream operations. These include highly specialised cutting, polishing and grading professionals with deep experience and unique skills, as well as other skills critical to the coordination, control and security of a production stream of high-value fancy colour diamonds.

Burgundy has now launched a \$49.7m



Ellendale is a historical project that's known for producing iconic yellow diamonds.

capital raise as part of its transformative diamond strategy.

The funding package is made up of an unsecured convertible notes issue to raise \$34.5m as well as a share placement to raise \$15.2m.

Burgundy will issue 34.5m convertible notes to sophisticated and high net worth investors, with each note having a face value of \$1 with a three-year term and a 6% coupon rate.

The unsecured notes will convert at a 10% premium to the price of the share placement

at the election of the shareholders.

The company will seek shareholder approval at a general meeting this month.

In conjunction, the company raised \$15.2m through a single tranche. Around 63.3m shares were issued at 24c per share.

Burgundy will use the money to develop an international portfolio of high potential diamond projects, primarily Ellendale, a historical diamond project that's known for producing iconic yellow diamonds.

Through an option agreement with Gibb

River Diamonds, Burgundy can earn a 100% interest in the Ellendale Project by making staged payments over two years.

Managing Director and CEO, Peter Ravenscroft, said the company was fully funded to successfully execute several key initiatives within our diamond strategy, predominantly advancing the Ellendale project towards production with lucrative downstream potential," he said.

"This positions us well to achieve our goal to become the world's leading midcap diamond company." **AMR**

Rutile Revelation for Curtin

Curtin University researchers have developed new techniques using the long-lived mineral rutile to help guide explorers to undiscovered ore bodies in WA's ancient rocks.

Working with the world-leading mass spectrometry facilities at Curtin University's John de Laeter Centre, Professor Neal McNaughton and his research team have developed new methods for preparing and analysing individual crystals of rutile to reveal hidden secrets of their chemical make-up that could help guide geologists searching for undiscovered ore deposits.

"Minerals like rutile are highly resistant to chemical and physical breakdown," Professor McNaughton said.

"Individual crystals of rutile can survive unchanged even when the rocks that once hosted them have been weathered away over time - like tiny time capsules preserving a record of now-vanished geology."

Samples analysed in the Curtin study showed a clear chemical distinction between rutile associated with richly endowed gold ore systems and rutile from

un-mineralised rocks.

This discovery highlights the potential exploration value of rutile in the ancient landscape of WA.

"By using our new approach to analysing rutile in the early stages of mineral exploration, geologists could quickly establish whether or not local rocks may have experienced a mineralising event," Professor McNaughton said.

Minerals Research Institute of WA CEO Nicole Roocke said the research provides Western Australia's mineral exploration companies with a new way of quickly refining their search for undiscovered ore bodies.

"This represents an important step towards faster and more efficient exploration to support the discovery of the next generation of ore deposits hidden beneath the surface of the state," she said.

"By supporting this research, the WA government is helping our exploration industry develop the tools it needs to succeed." **AMR**



Minerals like rutile are highly resistant to chemical and physical breakdown.



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Getting to the Core of the Matter

Are you looking for the very best core sample handling system for your drilling and assaying needs?

Look no further than Adept Conveyor Technologies – a leader in the field of core sample tray conveyors, roller racks and benches, as well as drill core handling systems.

The company designs and manufactures roller core tray racks, industrial roller racks, mobile storage shelving units, bench arrays and a range of roller racking system solutions at the best price and in the shortest lead time.

Core Tray Benches for Mining and Geo-Physics

As a supplier with extensive field experience, Adept Conveyor Technologies services all your exploration and analysis operations at remote sites anywhere around the country.

The team are specialists in static and gravity conveying equipment that assist in the manual handling of core trays.

Drilling samples can be placed on these core sample roller tray racks for assaying, analysis and storage in line with current regulations.

Everything is catered for – from the smallest single conveyor section to replacement parts and accessories to complete integrated project systems.

The designed and fabricated conveyor and rack systems are made of mild steel and fully galvanised, with stainless steel options.

Occupational Health and Safety

Adept Conveyor Technologies' mobile roller conveyor racks deliver optimum workflow, efficiency and ergonomics effectively and reliably.

There is no lifting work required by core tray operators as the modular and mobile steel roller racks, which are on wheels, can be detached and moved to make other configurations.

The team at Adept can assist in the mitigation of occupational health and safety issues by providing proper hardware solutions in the manual handling of materials handling.

Static and Gravity Systems for Core Sample Handling

Static and gravity systems offer low inertia and free movement of core sample trays throughout the sampling area with ease of operation for all manual handling staff.

Most equipment requires no external power source to operate, providing the most economical options in system design and start-up costs.

The cost of ownership is incredibly low, with the equipment being virtually maintenance-free.

Adept specialises solely in core shed design,

using standard stock roller racking parts, and has designed many systems that can meet your exact requirements.

A wide range of gravity roller table conveyors are available to suit any core shed application.

Cost Savings

Involving Adept in the planning and design stages can lead to a reduction in power costs during operations.

Key markets that Adept Conveyor Technologies supply include the warehousing, supply chain logistics, manufacturing and materials handling industries.

Adept has more than 40 years' experience designing and building large, complex conveying systems for major clients in line with advancements in conveying technology. Their major warehousing clients include Booktopia, Aldi, Costco, Amazon, Woolworths, Toyota, Rheem, Tupperware, Chrisco and Pacific Brands.

Warehouse conveyor systems, which used to run on the 3-phase electrical system, are now being increasingly converted to 24V, with each roller having its own smart card, motor, gearbox and signalling system.

While these bigger and more modern setups involve bigger cost outlay, the operating costs are significantly lower, with up to a 70% reduction in electricity costs.

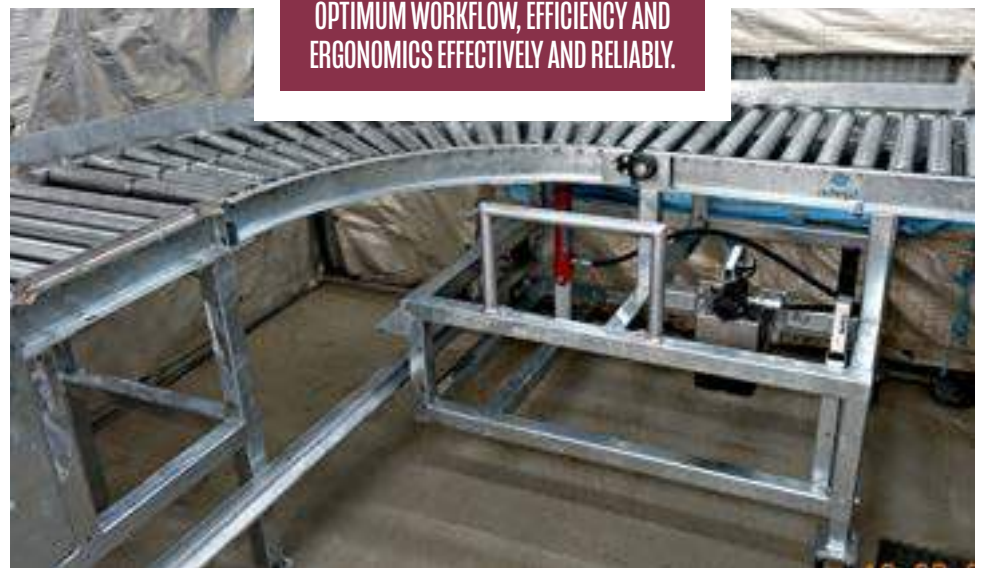
Adept Conveyor Technologies maximises return on investment with intelligent, benchmark quality solutions for warehouse fit-outs.

Flexible, Quality Solutions

With decades of creating solutions and designing hardware solutions for clients, Adept offers the ability to purchase direct from the manufacturer with full in-house design and engineering expertise, cutting out resellers with limited product and engineering application knowledge.



ADEPT IS A LEADER IN THE FIELD OF CORE SAMPLE TRAY HANDLING, DELIVERING OPTIMUM WORKFLOW, EFFICIENCY AND ERGONOMICS EFFECTIVELY AND RELIABLY.



All parts are manufactured in Australia to quality benchmark standards and all systems are installed and commissioned right around Australia.

Their comprehensive range of products relating to core sample tray conveyor benches include, but are not limited to, the following:

- straight roller (or skate wheel) beds
- standard lengths: 1500 mm & 3000 mm – others to order
- split roller (and tapered roller) curves
- standard curve angles: 30, 45, 60 & 90 degrees
- personnel access gates: spring loaded or gas strut lift assisted (swing out types also)
- merges
- diverges
- junctions (tee or angled)
- turntables
- universal "multi-directional" roller tables
- transfer devices
- spring assisted lift tables

- hydraulic lift table platforms
- elevating conveyors (for elevation change between levels)
- transfer cars & shuttles
- vertical elevators (for core trays or pallets)

Accessories include:

- rollers, skate wheels, universal rollers
 - frames
 - supports
 - mobile sub-frames
 - rocker stops
 - barrier end stops
 - speed control devices
 - guiderails
- Finishes:
- wet spray paint enamel
 - powder coated enamel finish
 - hot dipped galvanised. (most requested standard finish)
 - stainless steel – (by special request)

Need more information? Contact Adept Conveyor Technologies now (details in the advertisement next page). **AMR**



Adept Conveyor Technologies offers the most comprehensive and all-inclusive range of Australian designed and fabricated conveyor and roller racking systems.

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- ✓ Core tray roller racks
- ✓ Core roller benches
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Adept Conveyor Technologies is a leader in the field of core sample tray handling, delivering optimum workflow, efficiency and ergonomics effectively and reliably.

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Komatsu Zero-Emission Trucks

Rio Tinto and Komatsu are partnering to fast-track the development and implementation of zero-emission mining haulage solutions, including haul trucks.

Rio Tinto will conduct a pre-production trial of the new equipment at a Rio Tinto site and has the option to purchase some of the first trucks from Komatsu once they are commercially viable.

Rio Tinto's Chief Commercial Officer Alf Barrios said Rio Tinto and Komatsu had a shared history of partnership on innovation going back to when they built the world's largest Komatsu autonomous haulage fleet in 2008.

"Our support of a trial, and the option to buy some of the first trucks from Komatsu, underscores our shared commitment to actively collaborate on product planning, development, testing and deployment of the next generation of zero-emission mining equipment and infrastructure as we look to decarbonise our business," he said.

Rio Tinto is also one of the first companies to

join Komatsu's newly launched Greenhouse Gas (GHG) Alliance, which has an initial target of advancing Komatsu's power agnostic truck concept for a haulage vehicle that can run on a variety of power sources including battery and hydrogen.

Komatsu Ltd Mining Business Division president Max Moriyama said Komatsu was honoured to continue to partner with Rio Tinto.

"Rio Tinto and Komatsu both recognise the critical role zero-emission haul trucks play in meeting the Greenhouse Gas (GHG) emission reduction goals for the mining industry and the need to focus on developing practical haulage solutions," he said.

"We are looking forward to advanced collaboration with them."

Rio Tinto is also a founding patron of the Charge On Innovation Challenge, which is focused on solving the power distribution infrastructure needed to support zero-emission haul trucks.

"We know that addressing climate

change effectively requires businesses, governments and society to work together. Our collaboration with Komatsu recognises the role zero-emission haul trucks will play in meeting the emission reduction goals of not only Rio Tinto, but the entire mining industry," Mr Barrios said.

Rio Tinto has acknowledged the reality of climate change for over two decades and has reduced its emissions footprint by over 30% in the decade to 2020.

The company has set 2030 targets to reduce absolute emissions by 15% and emissions intensity by 30% relative to the 2018 baseline.

Last year, Rio Tinto set new Scope 3 emissions reduction goals to guide its partnership approach across its value chain. Earlier this year, BHP became a founding member of Komatsu's GHG Alliance, which aims to develop commercially viable zero-greenhouse gas emissions haul trucks.

BHP will provide engineering and technical resources to Komatsu to support the development phase as required. These

activities will provide BHP with real-time access to technology in development, with Komatsu drawing upon BHP's mining expertise to accelerate its path to market.

Additionally, BHP and Komatsu will collaborate through the BHP FutureFit Academy to develop the future-facing skills in teams to operate and maintain this pioneering equipment.

BHP's Chief Commercial Officer, Vandita Pant, said tackling climate change requires strong collaboration and collective effort across the supply chain.

"Reducing vehicle emissions is key to our climate strategy, and we are thrilled to join with Komatsu and our peers in the global mining sector on real, tangible action to help accelerate our transition to a low carbon future.

"Extending the FutureFit Academy partnership to equip our workforce to operate zero emissions technology is an exciting addition to our collaboration with Komatsu." **AMR**

Prospects Shine for New Gold Project

Koonenberry Gold has finalised a capital raise of up to \$10mn to pursue the development of a greenfields gold project northeast of Broken Hill.

The company's project has similar geology to the Stawell gold region, which is one of the two largest mine sites in Victoria having produced approximately five million ounces of gold.

Koonenberry Gold CEO Karen O'Neill said old nuggets have been found near the surface at the Koonenberry Gold project, with this site having the potential to be a major new gold district.

The company has a strong and supportive register of institutions, ultra-high net worth family offices and experienced mining investors, most of whom are increasing their exposure via the IPO.

There is a small proportion of the IPO which is being made available to retail investors via several platforms including the company website.

"Koonenberry Gold has attracted a lot of attention from investors within Australia's gold mining ecosystem, but we want to

broaden our shareholder base with an allocation for retail investors," Ms O'Neill said.

The company has already invested more than \$4m to date on defining targets, collecting, and collating geochemistry and geophysical data.

"Koonenberry has eight near-drill ready exploration targets. The Lucky Sevens prospect is the most advanced and we are encouraged by visible gold in the reef at the surface and evidence of a large reef structure along strike and to depth," Ms O'Neill said.

The Koonenberry project comprises 12 exploration licenses covering an area of 1339km².

"This is a large project that has the potential to be a major new gold discovery. Koonenberry Gold will be the first company to undertake a systematic gold exploration programme on its tenements in a highly prospective emerging gold province," Ms O'Neill said.

Koonenberry Gold plans to trade on the ASX under the ticker code (ASX:KNB). **AMR**



Gold nuggets found near the project.



Resetting the life cycle clock



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18 Prominent Hill

FEATURES



Prominent Performance

Prominent Hill has played a prominent role in helping owner OZ Minerals record a strong cash position in its latest quarterly release.

A strong second quarter from the company's major South Australian operations – Prominent Hill and Carrapateena – along with favourable copper prices, led to a 22% uplift in quarter-on-quarter copper production which contributed to a strong first half operating performance, with H1 net revenue of \$986m enabling closing cash balance of \$134m (unaudited) and zero debt.

Group copper production guidance was on track, gold production increased and cash costs were lowered.

Prominent Hill continued to reliably increase the level of underground ore mined, with Q2 delivering the highest recorded underground ore mined to date.

Located in one of the world's most mining-friendly locations, Prominent Hill possesses highly competitive fundamentals.

The large copper-gold mine, located 650km north west of Adelaide and 130km south-east of Coober Pedy in South Australia, delivers a high grade resource, with the ore processed using conventional methods.

As well, grade increased at Carrapateena in line with its mine plan.

Managing Director Andrew Cole said the strong financial position continued to support the pipeline of major brownfield projects at Carrapateena and Prominent Hill and the potential West Musgrave Project currently advancing through the study phase.

"Prominent Hill has continued to sustain annualised rates above 4Mtpa with work continuing at the bottom of the current Life-of-Mine level to establish level infrastructure for the commencement of the bottom-up mining sequence," he said.

As well as Prominent Hill and Carrapateena, OZ has assets in the Carajas province of Brazil.

"Full year group copper production guidance remains on track notwithstanding a lowering of annual guidance in the Carajás, Brazil, which has been impacted by direct and flow-on effects of COVID-19," Mr Cole said.

"Group C1 cash costs guidance has been lowered for the year, primarily due to higher by-product credits associated with expected higher gold production at Prominent Hill.

"In line with expectations, copper grade at Carrapateena increased to 1.39% for the quarter. Annual production remains in line with guidance for the full year.

"Availability and reliability of the mining fleet has improved post the transition of the underground mining contractor ... initial capital guidance in this area has increased as a result."

Mr Cole said Prominent Hill had continued to sustain annualised rates above 4Mtpa, with work continuing at the bottom of the current Life-of-Mine level to establish level infrastructure for the commencement of the bottom-up mining sequence.

Simultaneous bottom-up and top-down mining should enable an increase in mining rates from 2022, to between 4Mtpa and 5Mtpa.

The shaft expansion study has progressed to schedule with an investment decision on track for the third quarter this year.

OZ Minerals has also begun trialling hydrogen direct injection into drill rigs at Prominent Hill aimed at improving rig efficiency.

In partnership with supplier Titeline Drilling, Byrnescut and Sandvik, the goal is to enhance innovation among the three companies.

Prominent Prominence
Prominent Hill was discovered in 2001 by Adelaide-based Minotaur Exploration and was considered the most significant Greenfield discovery in Australia for a decade.

Indeed, it produces one of the highest grades of copper concentrate traded on the open market.

There are also significant opportunities for organic growth.

The 24-hour operation is comprised of the Ankata underground mine, a conventional crushing, grinding and flotation processing plant, and a permanent accommodation village for its staff.

The Malu open pit mine concluded operations in Q1 2018.



UNDERGROUND MINING AT PROMINENT HILL.

Prominent Hill has a workforce of about 1200 employees, including contractors.

Concentrate is transported via the Adelaide to Darwin railway to the Port of Darwin. Prominent Hill delivers around 600t of concentrate per day, six days per week, to the port.

Geology
Prominent Hill is an iron oxide/copper/gold deposit located in the Gawler Craton, which covers about 600,000km² of South Australia.

As well as Prominent Hill, the prolific site hosts Olympic Dam and Carrapateena, and a number of other smaller and subeconomic copper-gold deposits.

Most of these deposits are thought to be genetically related to the Gawler Range Volcanic-Hiltaba magmatic event which affected the central and eastern portions of the Craton millions of years ago.

Copper-gold-silver mineralisation at Prominent Hill is mostly hosted within hematite-matrix breccia, with copper mineralisation occurring as disseminations of chalcocite, bornite and chalcopyrite in the matrix of the breccia.

Mineral Resource
The Prominent Hill Mineral Resource as at June 30, 2019, has been estimated at 140mt, grading 1% copper and 0.7g/t gold, and represents a combination of both copper and gold mineralisation.

This estimate includes mineralisation from both the Prominent Hill underground and surface stockpiles, and is inclusive of the Ore Reserves.

The mine life has been extended until 2030 following a 50% increase to underground Proved Reserves.

History
OZ Minerals is a copper-focused, global, modern mining company based in South Australia.

Listed on the Australian Securities Exchange, the company has a growth strategy focused on creating value for all stakeholders.

OZ also has a pipeline of earn-in agreements with experienced exploration companies in Australia and internationally.

Focused on creating a pipeline of opportunities, OZ maintains a commitment to safety, capital discipline and values to underpin its operations.

OZ Minerals prides itself on being a modern mining company that adapts to changing environments, harnessing the innovative ideas of its people and collaborating to leverage the experience of those around.

Australia's third largest copper producer, OZ Minerals was formed in 2008 by the merger of two Australian non-ferrous metals mining businesses - Oxiana and Zinifex.

A proportion of OZ Minerals' assets – excluding Prominent Hill – were then acquired in 2009 by China Non Ferrous Metals (Minmetals), the company now operating as MMG.

In 2011, OZ Minerals purchased the Carrapateena exploration project.

In 2012, the Prominent Hill operation was expanded to include underground mining at Ankata, and in 2015, a second underground mine, Malu Underground, was commissioned. The underground operations were subsequently integrated from an operational perspective.

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Specialty Chemical Supplier for the Mining Industry

InterChem Mining's Simon Assmann and Mike Pietrobon from MinProceSser recently conducted a promising reagent development program onsite at OZ Minerals' Prominent Hill mine.

InterChem has long been regarded as a leading chemicals supplier and mining solutions provider.

Working with leading chemical producers from around the world, the company helps customer operations improve productivity, metallurgical and extraction performance whilst always meeting safety objectives.

InterChem provides a dependable and proven range of quality mining reagents, from solid and bulk liquid commodities, through to more specialised tailored products, delivering un-interrupted supply to both small and large customers, including Australia's copper ore mining industry.

InterChem's diversity is its strength, and its motivation is to continually source and develop new and improved products to better service markets and geographical regions.

From Greenfield projects to plant commissioning, to continuous improvement activities, InterChem's dedicated mining team supports flotation and hydrometallurgical process improvements for a variety of mineral systems, from complex ores and tailored plant applications. InterChem backs up its products with expert advice, first-class technical support,

and supply chain networks to optimise customers' mining operations and improve a mine's metallurgical recovery, mineral concentrate grade and extraction performance (product quality).

The product range in the mining sector includes quality reagents, process technologies and expertise, focusing primarily on flotation, mineral processing, solvent extraction and leaching process applications.

InterChem's capability also extends to other areas in the mining sector, including the availability of reagents for dust suppression, wire rope maintenance lubricants and specialist greases and lubricants for machinery, and selected water treatment reagents.

InterChem's key end markets include the supply of chemicals for mineral beneficiation across most mining operations.

InterChem products are used to recover many metals and minerals, especially copper, gold, silver, uranium, nickel/cobalt, phosphate and polymetallic ores, lead, zinc, rare earths and coal.

InterChem maintains a Quality Assurance Services Accreditation to AS/NZS ISO



Froth flotation carried out by InterChem. It is a highly versatile method for physically separating particles based on differences in the ability of air bubbles to selectively adhere to specific mineral surfaces in a mineral/water slurry. The mineralised froth obtained in the image shown is typical of copper ore types processed in South Australia. InterChem Mining is looking forward to supporting clients and new customers with site specific laboratory screening and plant-based trial work.

9001:2015 and is an approved supplier to notable mining houses, including BHP, Newcrest, and OZ Minerals, and currently services more than 20 mines in the Asia Pacific and PNG mining regions.

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Shotcrete Solutions Specialists

Jetcrete Oz has been the shotcrete contractor of choice for Australian miners for more than three decades.

Jetcrete Oz has been the trusted provider of shotcrete solutions to the Australian mining industry for more than 35 years.

Now the company is also earning a reputation as a leading ground support specialist, adding two more capabilities to its broad range of services.

Jetcrete Oz employs the latest techniques in resin injection and cable bolting, which offers an alternative active rock support system in underground mining.

The company is also the first and only shaft lining contractor in Australia equipped to safely operate in ERZ1 hazardous environments.

Over the years, Jetcrete Oz has introduced most of the modern technologies used for shotcreting in Australian mining, such as overhead wet shotcrete, robotic shotcrete units and hydroscaling.

New technologies such as these have increased development rates for miners through faster excavation cycles, improved early strength support, and increased bonding between the fibrecrete and substrate surface.

Resin Injection

Jetcrete Oz has been a major presence in hard rock mining and is having success with resin injection for ground stabilisation at Argyle Mine.

Resin is injected into the foundation and expands like a gel to create pressure and achieve stabilisation of rock, sand, gravel, concrete and caved material.

It has proven to be a faster and less-invasive solution than previously used methods.

Cable Bolting

Cable bolting is an established technique and an alternative active or passive rock support system for underground mining, with the bolts dramatically improving the shear and tensile strength of the rock mass.

Jetcrete Oz does the majority of its cable bolting work in major mining operations in NSW, such as at Broken Hill and at Newcrest Mining's Cadia Valley Operations in south Orange, and is actively pursuing more mining contracts in this field.

Shaft Lining

Jetcrete Oz is also a leading innovator of shaft lining solutions and successfully completed

projects all over Australia, including coal mines in Queensland.

The ISO-accredited company can deliver remote application of shotcrete in shafts up to 400m deep and 6m wide including vent shafts, escape ways, ore passes and more.

Its state-of-the-art shaft lining unit is purpose built, and features include:

- Industry-first EX d Group I equipment
- Continuous CH4 safety monitoring and end-of-life protection units
- Remote speed control of lining applicator
- Compliance to AS/NZS 4871 standard for electrical equipment for mines and quarries
- Jetcrete Oz also carries out the mandatory pre and post shotcrete application camera surveys.

Jetcrete has refined the remote shaft lining system that has eliminated the need for personnel to enter the shaft during the entire process, saving time and reducing safety risks.

The business currently operates in North America and on 19 mine sites across Australia with a number of mid-tier and major clients including Goldfields, Northern Star Resources, Glencore, Metals X, MMG, Evolution Mining, Oz Minerals, Newcrest and Rio Tinto.

With 13 batch plants, 68 agitators, 41 remote concrete units and mobile plant and equipment, Jetcrete Oz can do any job, anywhere.

As the core business, Jetcrete Oz has extensive experience in all aspects of concrete spraying and is able to establish sites in remote areas in a matter of days.

The business is capable of providing a complete service for all stages of underground shotcreting from onsite concrete products manufacture, to delivery and application.

Jetcrete Oz is also capable of delivering surface and underground civil infrastructure works including earthworks, machine foundations, drainage and culverts, concrete slabs, heavy workshops and site offices. **AMR**



With 13 batch plants, 68 agitators, 41 remote concrete units and mobile plant and equipment, Jetcrete Oz can do any job, anywhere.



Jetcrete Oz is a leading innovator of shaft lining solutions.

JETCRETE



AUSTRALIA'S LARGEST SHOTCRETE CONTRACTOR

Jetcrete has been at the forefront of shotcrete technologies in the mining industry for more than 35 years.

The company's two newest capabilities are **resin injection** and **cable bolting** for enhanced ground support in underground mining.

- Shotcrete Technologies Innovator
- Resin Injection
- Cable Bolting
- Shaft Lining Solutions
- Remote Area Concrete Supplier
- Mobile Plant and Equipment

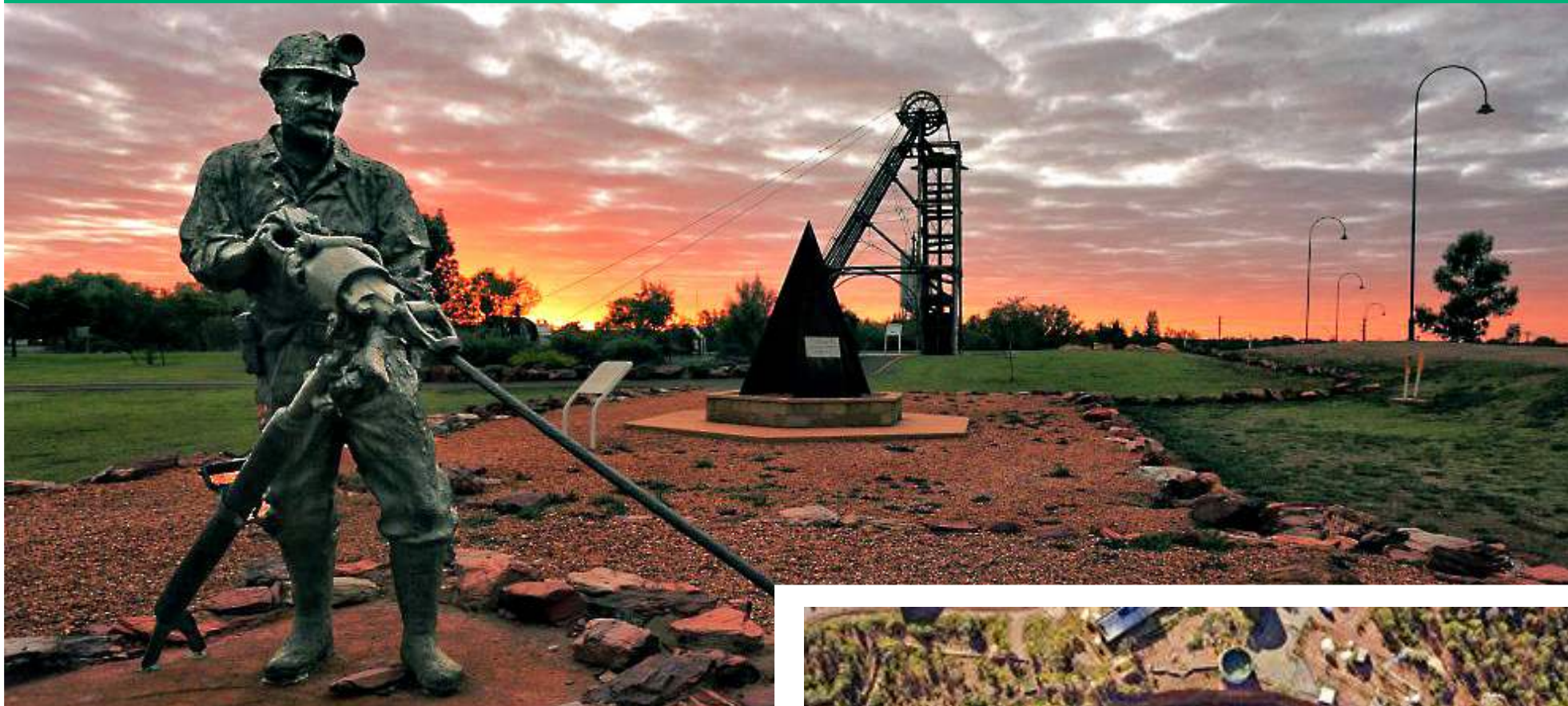


Call our shotcreting experts now on

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“Copper City” Cobar Has a Proud Mining History



The Miner's Statue acknowledges the important contribution to the town of Cobar made by thousands of mining employees and their families.

Copper is used in a wide range of electronics — from air conditioning to smart phones — and it will play a major role in enabling the global transition to a low-carbon economy as a component of electric vehicles and renewable energy.

Central west NSW town Cobar, or “Copper City”, is playing a role in that copper future.

Surrounded by several mines producing vital copper, as well as zinc, lead, silver and gold, Cobar's name is derived from a Ngiyambaa word for the place where pigments of ochre, kaolin, and blue and green copper were once mined for ceremonial use.

The area around Cobar remains rich in history, with extensive rock art painted with copper and kaolin pigments, and traditional meeting sites like Mount Grenfell.

Settlers first discovered copper at Cobar in 1869, and mining quickly became central to the local economy. Recent discoveries have been made of gold polymetallic systems in various deposits, including the Boda deposit east of Dubbo, spurring further exploration in the area. Glencore's CSA mine, Aurelia Metal's Peak mine and Hera-Federation complex are all currently operating mines surrounding Cobar.

Cobar's population has fluctuated over the years with the ebb and flow of the local economy and mining activity. It surpassed 10,000 at its peak in the early 20th century, and it's currently sitting at 3,990. For every investment made in Cobar's mine sites, a growth in jobs, investments and local businesses results.

Boda discovery tips future growth

In September 2019, Alkane Resources (ASX:ALK) announced that the assay results of the Boda “discovery hole” indicated an increase in thickness and grade of porphyry gold-copper mineralisation at depth, and high-grade mineralisation at the surface. Alkane Resources believes that Boda has the potential to be a large-scale gold-copper project with multi-billion dollar potential.

Following the discovery of the Boda deposit, issuing of annual exploration licences in the area has more than doubled.

The link between economic wellbeing and mining is strong, said Stephen Galilee, chief executive of the New South Wales Minerals Council.

“Mining is a key contributor to the local economy of regional communities right across NSW, including Cobar and surrounds. The metals mining industry, in particular, is deeply intertwined with the history and development of so many communities in the central west and far west of NSW. Now, with the rapid development of new technology, there is growing demand for our high-quality metals and rare earths.”

Glencore's CSA mine still going strong:

CSA, which stands for “Cornish, Scottish and Australia” is a mine 14km northwest of Cobar, where it first began site development and mining of lead and zinc in the early 1900s. CSA mine was acquired by Glencore in 1997 and operates as one of Australia's highest grade copper mines. It directly employs 500 people, mostly Cobar locals. It produced 46,200t of copper in 2020, operating 24/7.

During 2020, the underground horizontal development of the mine advanced 5,515m, and on December 31, 2020, the proven probable reserves of copper and silver were 7.7 mega tonnes each. In 2020, it made \$309m in total contributions, spent \$236m on goods and services and supported 174 local suppliers to the tune of \$82m.

The CSA mine had an expected life of at least eight years in 2020. Glencore has extended opportunities for graduates to work across its sites in regional Australia and committed to more sustainable extraction and processing methods at its CSA mine such as the use of the Epiroc ST14 Battery LHD, a battery-electric loader.

Aurelia Metal's Peak gold mine:

Peakgold mine is a polymetallic underground mine 8km from Cobar in the northern Cobar basin, where it has 25+ year production history as a metal mine and processing plant. Currently it has two underground operations in the north and south of the site. In 2018, Aurelia metals (ASX: AMI) purchased Peak mine from New Gold for a net price of \$59m. After the purchase, accelerated



Cobar, known as “Copper City”, has a lengthy and valuable mining history.

mining of the high-grade Chronos gold deposit saw Aurelia Metals achieve back the value of the purchase in only four months.

Peak gold mine, as the name denotes, mines gold, as well as silver, copper, lead and zinc. Its implied operating life was extended from four to seven years in 2021 with an 800 kilotonne per annum plant capacity to produce gold doré and separate copper, lead and zinc concentrates.

In the 2020-21 financial year, Peak produced 57,000oz of gold with an expected 53,000 – 58,000oz in 2021-22; 4,700t of copper, with an expected 3,500 – 4,000t in 2021-22; 15,800t of lead, with an expected 13,000 – 14,500t in 2021-22; and 10,800t of zinc, with an expected 13,000 – 14,500t in 2021-22. In the financial year ending 2020, slightly lower gold production was offset by higher price and base metal volumes.

Aurelia Metal's Hera-Federation complex:

Hera-Federation, previously known as Hera, is an underground site in the southern Cobar basin, also owned by Aurelia Metals. Aurelia purchased Hera, then an undeveloped gold-lead-zinc-silver deposit, in September 2009. It was assessed for its feasibility, developed and opened for commercial production in 2015. The first gold was delivered from Hera in 2014. In 2019, the grand discovery of the Federation polymetallic deposit, only 10km south of Hera, was made. The development of Federation will leverage pre-existing infrastructure from Hera and is expected to expand the workforce by 200-250 people.

The onsite processing plant has a 480 kilotonne per annum capacity, and it utilises flotation and gravity separation in order to produce produce gold-silver doré and a bulk lead-zinc concentrate.

In the 2020-21 financial year, Hera produced 31,000oz of gold with an expected 14,000 – 15,000oz in 2021-22; 10,100t of lead, with an expected 11,500 – 12,500t in 2021-22; and 14,300t of lead, with an expected 18,000 – 20,000t in 2021-22. Hera has an implied operating life of two years, however, the development of Federation is set to deliver substantial life extension to the complex, with further feasibility studies underway.

Mining into the future

As the country continues to recover from economic, environmental and health crises, Mr Galilee is confident that mining will remain a vital part of Cobar and greater NSW's economy as developments are made in other industries. The discovery of deposits such as Boda and Federation tip many more years of exploration and production on the way.

“Technological advances in industries such as telecommunications, medicine, defence and energy storage are driving demand for gold, copper and other critical minerals. This growing demand will help generate increased economic activity for regional communities like Cobar.

“The central west and far west regions of NSW, especially communities like Cobar, have much to benefit from the growth in the minerals industry in the coming years.” **AMR**

High Risk Training and Assessment

When it comes to training for the mining industry, you can't go past Sitetrain.

Specialists in site-based training, Sitetrain comes out to your business or minesite and conducts the skills training required for your employees.

Sitetrain chief executive and training manager Damien Palazzi started the family-owned business in 2010 after six years providing quality training and assessment to the mining industry under auspice agreements with established Registered Training Organisations (RTOs).

"After successfully delivering training in Australia and overseas, we decided it was time to become an RTO in our own right," he said.

"Whether it's confined space, working at heights, gas test atmospheres or risk assessment units, we come out to your site, we tailor our training to your requirements or you can choose one of the standard training courses."

Mr Palazzi has been in the mining industry for more than 25 years and has been exposed to multiple aspects of mineral processing in Australia and overseas.

"We understand the mining industry," he said.

"The Sitetrain approach is not "one size fits all" - we know every site is unique and presents its own challenges.

"With our substantial experience in providing certified training programs, we develop and deliver unique site-specific and department-specific training based around your policies, procedures, equipment, site information and your individual requirements.

"We deliver quality industry-reviewed training to all our clients, big and small, while working to ensure you get the most from your training dollar."

Sitetrain has bases in NSW and WA, and as an RTO, it continues to provide site-based and relevant quality training to the mining industry in line with the RII Resources and Infrastructure Industry Training Package and according to the standards set for RTOs.



Sitetrain provides site-based and relevant quality training to the mining industry.

Courses currently running in Cobar, NSW, include:

- TLILIC0005 Licence to operate a boom type elevating work platform (boom length 11 metres or more)
- TLILIC0003 Licence to operate a forklift truck
- RIIWHS202E Enter and work in confined Spaces + MSMWHS217 Gas test atmospheres Combined Course

- RIIWHS204E Work safely at heights
- UETDTRRF06 Perform rescue from a live LV panel

Sitetrain is responsible under its registration with the Australian Skills Quality Authority (ASQA) for the quality of the training and assessment delivered and is also responsible for the issuance of AQF certificates. **AMR**

A RANGE OF TRAINING PROGRAMS THAT SITETRAIN CAN BE RUN ONSITE INCLUDE (BUT ARE NOT LIMITED TO):



- RII30415 Certificate III in Resource Processing
- RII30115 Certificate III in Surface Extraction Operations
- RII30315 Certificate III in Underground Metalliferous Mining
- RIIWHS204E Work safely at heights
- RIIVH305E Operate and maintain a four wheel drive vehicle
- RIIRIS301D Apply risk management processes
- MSMPER300 Issue work permits
- MSMWHS201 Conduct hazard analysis
- CPPFES2005 Demonstrate first attack fire fighting equipment
- UETDTRRF06 Perform rescue from a live LV panel
- CPCCWHS1001 Prepare to work safely in the construction industry (aka "White Card")
- HLTAID011 Provide first aid
- HLTAID009 Provide cardiopulmonary resuscitation (Refresher Course) - 2 hours
- Health and Safety Representative Training (NSW Only)
- Health and Safety Representative Training Refresher (NSW Only)

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Record for Maules Creek

Record annual run of mine or ROM production of 12.7mt at Whitehaven Coal's Maules Creek open cut coal mine in New South Wales has added some gloss to overall reduced production figures for the miner.

While original ROM production guidance was set at 21–22.8mt for financial year 2021, Whitehaven managed 20.6mt, according to its June quarter production report. However Maules Creek's output was 18% above financial year 2020's total and well beyond the mine's original guidance of 11.3–12mt.

Whitehaven operates four mines in the Gunnedah Basin of NSW along with Winchester South in Queensland's Bowen Basin.

Whitehaven managing director and chief executive officer Paul Flynn said Maules Creek, the company's largest mine, finished with a solid quarter and demonstrated its full potential over the course of the year, delivering a record annual ROM production.

Other Whitehaven highlights included:

- a June quarter managed ROM production of 5.4mt
- a June quarter managed saleable coal production of 3.8mt
- a June quarter total managed coal sales 4.5mt, managed own coal sales 4mt, total equity coal sales 3.7mt and equity sales of own coal 3.2mt
- FY21 managed coal sales of 19.8mt, including 2mt of purchased coal, equity coal sales of produced coal 14.4mt
- Managed coal stocks of 3.3mt at period end



Whitehaven expects strong prices for high calorific value thermal coal will materialise into strong free cash flow over the coming months.

Mr Flynn said there were no known cases of COVID-19 at any of Whitehaven's sites to date and operations remain largely unaffected "but for distancing and hygiene measures".

Coal Prices

Mr Flynn was also upbeat about coal prospects after noting that prices had staged a recovery over the period, "responding to increased economic activity as well as continuing supply-side constraints".

From post-COVID lows of less than US\$50/t, spot prices for thermal coal at Newcastle port have climbed back above US\$120/t.

"Prices for high calorific value thermal coal are at 10-year highs, and we will begin to see this materialise into strong free cash flow over the coming months," Mr Flynn said.

Winchester South

The State Government has released a draft environmental impact statement (EIS) on the \$1b Winchester South metallurgical coal project in Queensland.

Submissions are being encouraged on the draft EIS for the mine, located 30 kilometres southeast of Moranbah.

Winchester South is expected to produce up to 11mtpa of high-quality metallurgical coal for steel manufacturing over a 30-year mine life.

The open cut coal mine is forecast to create 500 construction jobs and 500 operational jobs once approved.

Mr Flynn said that since acquiring Winchester South in 2018, the Whitehaven team had developed a detailed project design that capitalises on the site's position in a well-established coal region.

"As our first development in Queensland, we've built productive relationships with the community, local council, the Barada Aboriginal Corporation, government, and other stakeholders, all of whom have been critical to developing the proposal," he said.

"This project will support ongoing economic development in regional Queensland and importantly in the customer countries where the product will be used."

Qld Resources Minister Scott Stewart said the mine will create more than \$500m in royalties, which will be spent on Queensland schools, hospitals, and roads, as the government continues to implement its COVID-19 Economic Recovery Plan.

"This project will be a massive jobs and business boost for Central Queensland and the Isaac region particularly, with those benefits extending east to Mackay," Stewart said.

"Whitehaven Coal has a strong record of local employment and is committed to maintaining local employment here in Queensland.

"Ongoing investment in our resources sector continues to underpin Queensland's economic recovery plan and prove that Queensland is the place to be when it comes to resources investment."

Vickery

Whitehaven is also clock watching on the legal process surrounding its application to expand its Vickery project near Gunnedah, which seeks to more than double annual production to 10mt.

After hackles had been raised over the proposal, the Federal Court ruled that the Government had a duty of care in protecting the health of children from carbon emissions.

Whilst expecting a final decision from the Environment Minister, the company has pressed on confidently with expansion works.

Progress on design work for the coal handling and preparation plant, rail spur and other site infrastructure continued during the quarter.

As a result of the NSW Independent Planning Commission (IPC)'s approval of Whitehaven's application to extend the Vickery coal mine, the company was permitted to extract 13mt a year of coal over a 25-year mine life.

The primary approval followed a lengthy technical evaluation process for the project and a comprehensive program of community consultation and outreach, including a Multi-stage Public Hearing administered by the IPC during February 2019 and July 2020.

In its coordinated Whole of Government assessment released in May 2020, the NSW Department of Planning, Industry and the Environment had previously concluded the Vickery Project was "in the public interest and ... approvable."

Mr Flynn said Vickery would further cement Whitehaven's growing stature as a key supplier to premium overseas markets.

Vickery will be a predominantly metallurgical coal mine and will service established and emerging markets for high quality coal in our near region.

It will entail capital expenditure of \$700m and is expected to generate employment for 500 people during the construction phase and 450 ongoing operational roles.

Whitehaven has pledged that 75% of the workforce will be locally-based.

"While there are still considerable risks for the global economic outlook given the continued spread of the virus, the fundamentals of our business model continue to remain robust," Mr Flynn said.

"Throughout the pandemic, our portfolio of coal products have remained sought after and well sold under long term contracts to

the cornerstone high-energy, low-impurity coal markets of Japan, Korea and Taiwan, as well as burgeoning markets in developing southeast Asian nations."

Kurrumbede Celebrations

In June this year, on the Queen's Birthday long weekend,

Whitehaven opened the grounds of the historic Kurrumbede homestead to members of the local community and visiting public for the first time in more than 100 years.

The property, which is owned by Whitehaven, is located on the outskirts of Gunnedah and is best known for its links to one of Australia's great poets, the late Dorothea Mackellar OBE, who authored the iconic Australian poem, My Country.

Previously closed to the public, the inaugural Open Day offered a rare opportunity to view the homestead and associated outbuildings and to reflect on the role the property and its surrounding landscapes played in inspiring Dorothea and shaping part of Australia's literary history.

In addition to the serious business of poetry appreciation, Whitehaven joined forces with a range of community, volunteer and business groups to showcase local food, music and a selection of historic activities and entertainment including sheep shearing, sulky rides, early 20th century kids' games and prizes for the best Edwardian costume on the day.

While the Open Day was a first, Whitehaven hopes the property will play host to more community events in the future as part of the company's broader commitment to preserving the historic site, which also includes a \$500,000 investment in the progressive upgrade of Kurrumbede's gardens.

Whitehaven Coal General Manager – Community Engagement, Andrew Garratt, said Whitehaven has always been focused on supporting and engaging the local community.

"It was a pretty easy decision to co-host an event like this – and we were thrilled to have been able to welcome more than 1000 people to Kurrumbede for the first time in more than a century," he said.

Whitehaven is also a longstanding sponsor of the Dorothea Mackellar Poetry Awards, which were established in 1984 and have since grown into a nationwide competition for Australian school students and poetry enthusiasts.

Whitehaven has always recognised Kurrumbede as a place of local heritage significance and is working on the completion of a Conservation Management Plan to guide its continuing investment in the property in consultation with the Society and other stakeholders, including the NSW Office of Heritage. **AMR**



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Celebrating 10 Ultra Years for UltraFleet

Ultrafleet founder Jacinta Mannion is celebrating 10 years of business success.



Zac Mitchell from Mitchell Earthmoving has been a long-term Ultra client.



Ultrafleet pride itself on providing an ultra experience.

Ultrafleet is a family owned and operated fleet hire business in Gunnedah, that was first established by Jacinta & Jason Mannion in 2011 when the availability to hire a mine spec vehicle was limited.

At Ultrafleet we pride ourselves on providing an ultra experience with friendly and reliable customer service. Over the years we have established a large diverse cliental base with companies in our local community in Gunnedah, along with various contractors to Whitehaven Coal and other mines in the northwest region and interstate contractors and speciality services.

Whitehaven coal were one of our first clients and still remain one of our largest clients providing vehicles, for short and long term periods and cater for specific needs for certain hires, and their recommendation to contractors attending all their sites to use our services due to the high standard of our vehicles and them being passed out to their high standard of compliance.

Ultrafleet has strong values and supports locals by sponsoring all local sporting codes, events and utilising all local services for fitouts and maintenance requirements. We are locals supporting locals

We now have a fully functioning website to help make your customer experience timeless and professional, from booking your next vehicle service, or a general enquiry or booking electronically. Our vehicles range from Mine Spec Toyota Hilux, Landcruiser and Prados, to commercial Camrys and Kluger's, catering for all aspects of the mining sector from miners to corporate or the local farmer.

This September Ultrafleet is celebrating 10 years of business, with a total of 145 vehicles on the road, and to celebrate this milestone we have 10 brand new hilux dual cab vehicles cruising out to clients this month to meet demand.

The ultra team Jacinta, Lauren, Abbie and Hamish are looking forward to celebrating 10 years and expanding the fleet, and I'm sure there will be some champagne popping somewhere to mark the occasion. And don't worry our clients will receive some Ultra merchandise to celebrate along with the team. **AMR**



A birds eye view of Johnstone Concrete and Landscape Supplies' blue metal quarry near the Narrabri Coal Operations.

Concrete and Quarry Specialists

If you are based near the Narrabri Coal Operations, and wondering where to buy concrete and landscaping supplies, look no further than Johnstone Concrete and Landscape Supplies.

The family business offers a range of products for the concrete and cement industry, quarry rock and services, aggregate and landscaping supplies for the local northwest NSW region and also nationwide.

JCLS been supplying quality products to the Whitehaven Coal Narrabri operations daily since 2013 and the Maules Creek mine on an intermittent basis since 2014.

From 50MPA concrete to grout and all different quarried materials, from its online concrete calculator and delivery estimator to its concrete boom pumps and haulage services, the business is a specialist in all things to do with quarry services, concrete and landscaping.

Johnstone Concrete and Landscape Supplies operations manager Brock Johnstone says the business has been in the family for more than 90 years and prides itself on delivering the highest quality products available on the market.

"We make it a priority to produce the best concrete and landscape supplies possible," he said.

"Thanks to our experienced and dedicated staff, we are considered leaders in our field and a progressive and innovative company.

"We are willing to think outside the box and provide solutions for our clients."

Some of its clients include Whitehaven Coal's Narrabri coal operations, Santos, Maules Creek coal mine, John Holland, ARTC, Transport NSW (Roads and Maritime Services) and the Narrabri Shire Council.

It has been operating a blue metal quarry in Narrabri for over 30 years, which produces a range of crushed and screened aggregates.

Johnstone Concrete and Landscape Supplies also manufactures its own road bases and precoat sealing aggregates, all of which are certified to meet ISO 9001 requirements.

With a fleet of ten gravel trucks, sized from 3m³ up to 26m³, Concrete Boom Pump, Water trucks, agitator trucks and a mobile batch plant that is mine site compliant and capable of producing 70m³ per hour, no job is too big or small.

All projects are undertaken with the ultimate commitment to seeing them through.

A range of additives are available to control the setting or hardening time on cement, including steel fibre, Adva (plasticiser, plastic fibre, Daraset (accelerant) and Daratard (retardant), Colour.



No job is too big or small for Johnstone Concrete and Landscape Supplies. All work is undertaken with the ultimate commitment to seeing them through.

Concrete blocks and posts can be supplied for a variety of projects such as footings, concrete walls, retaining walls and fence strainers.

The company even has a wide variety of compost, mulch, woodchip, bark, sand, loam, decorative gravel and bagged cement and other supplies for landscaping requirements.

Contact your concrete and landscaping specialist now. See the advertisement below for contact details. **AMR**



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Award for HVTC Apprentice



Georgia Foley was recognised for excelling in a male-dominated industry at the 2020 HVTC Excellence Awards, being named Woman in Non-Traditional Trade Apprentice/Trainee of the Year, and has gained an ongoing position with Narrabri Coal as an underground electrician.



Gunnedah local, Georgia Foley, completed her electrical apprenticeship with HVTC in 2020 while hosted to Whitehaven Coal's Maules Creek Coal and Narrabri Coal operations.

Georgia had always wanted to work hands-on for her career and to help around the house after growing up on a farm and seeing her dad work as an electrician.

Her interest in the electrical field led to her applying for an apprenticeship and landing the position with HVTC and Whitehaven in 2016.

Having the opportunity to work with people from different areas on-site and gaining exposure to various aspects of the mining industry was something that Georgia really enjoyed about her apprenticeship.

"Being able to work with people in different trades and learning tips and tricks from them as well as gaining experience in domestic and commercial work really helped me to further my knowledge and develop in my career," she said.

Georgia said her apprenticeship also benefited her personally, as it allowed her

to become more outgoing and become involved in the community through work events.

Georgia was recognised for excelling in a male-dominated industry at the 2020 HVTC Excellence Awards, being named Woman in Non-Traditional Trade Apprentice/Trainee of the Year.

She also took out the same category at the NSW/ACT Group Training Awards and was named Apprentice of the Year in the New England Training Awards before progressing as a finalist for Apprentice of the Year at the NSW Training Awards.

Since completing her apprenticeship in 2020, Georgia has completed further training through a High Voltage course, an EEHA (Electrical Equipment for Hazardous Areas) course, as well as a communications course.

Georgia was successful in gaining an ongoing position with Narrabri Coal as an underground electrician, where she assists with maintaining equipment, servicing breakdowns, completing inspections, hanging cables, and various other tasks.

AMR



SKILLS CHANGE LIVES

For over 40 years, HVTC has been providing leading mining companies across NSW with quality apprentices and trainees.

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Specialised Civil Services (SCS) has been a reliable family owned and operated Narrabri Construction Company since 2000. Being a great service provider means having complete and total confidence in the people providing those services, and we're proud to have the best in the business working with us. With a focus on personalized service, competitive rates, and customer satisfaction, we're always striving to meet and exceed our high standards and our clients' expectations.

SCS have managed the successful delivery of a variety of projects including:

- Mining services
- Major dams and tailings dams
- RO Plant construction
- Pipelines
- Pump Stations
- Roads
- Irrigation channels
- Concrete construction
- Subdivision Construction
- Field levelling
- Large control structure
- Overburden removal
- Remedial works on mine and gas sites

APPROACH

The Specialised Civil Services management team acknowledged an industry requirement for a company with a "hands-on-approach" from management to service the needs of our clients. As a result, we are able to work efficiently, embracing "partnering" philosophies and delivering best value for money outcomes which incorporate the needs of all stakeholders.

This hands-on and individualised approach provides a unique, flexible service with numerous advantages for our clients, and the local communities in which we work.

The advantages of this approach are:

- SCS takes a non-adversarial approach to client relations and always has direct lines of communication to upper management available
 - It allows us the ability to adapt to shifting project requirements, driven by either internal directions or external factors
 - It enables us to fully understand community needs and to encourage positive involvement with the notion that we employ locally, we spend locally
- Other benefits SCS offer include
- Rapid mobilisation and independence, with a modern fleet of equipment
 - Comprehensive safety systems and safe working procedures
 - Quality Systems – Safety Management Plans
 - Environmental precautions built into our operational procedures
 - Fostering positive relationships with clients, communities and staff

PLANT LIST

All Specialised Civil Services plant is mining design guideline approved and of varied sizes. Machines available with GPS control.

List of equipment as follows:

- Graders
- Excavators
- Dozers
- Loaders
- Compactors
- Body (Tip) Trucks
- Water Trucks
- Backhoes
- Truck & Trailers, with float hire available

QUALITY

SCS is committed to providing exceptional results in all areas of its construction /mining activities. The highest standards of safety performance, quality workmanship, and environmental requirements are expected and delivered under the management system operated by SCS. The company utilises the latest technology including graders, scrapers, bulldozers and excavators. We also operate a local maintenance facility, with self-contained fuel and oil bunkers to ensure a high quality environmentally responsible maintenance management system.

SCS is committed to a "zero harm" safety philosophy and our management procedures ensure that safety is the first and highest priority.



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45+ Years of Lifting Excellence

GBP Cranes and Heavy Haulage has been operating for over 45 years and is continuing to grow and expand its customer base, and its fleet of products. The business was founded in 1975, and quickly the directors developed an understanding of industry demand for cranes and crane fleets to suit different projects.

It currently offers 27 cranes ranging in capacity from the 15t, 20t and 25t Frannas, up to the brand new 250t Liebherr Slew Crane.

GBP Heavy Haulage fleet includes a range of 9 axle platforms down to Extendable and widening low loaders along with step decks, flat tops, b-doubles, tilt trays and newly acquired Road Train.

Since 1999, GBP Cranes and Heavy Haulage have been working alongside Whitehaven Coal, Australia's largest independent coal company, and it remains GBP's largest customer to this day. Whitehaven Coal's operations have boosted the economy of Gunnedah and the surrounding areas, which has given GBP Cranes the opportunity to expand its reach to clients in different areas. GBP Cranes acquired Narrabri Crane Service in October last year, which saw it take the lead as a provider of cranes and heavy haulage in the Narrabri and Western regions, as far out as Bourke.



The team at GBP Cranes and Heavy Haulage is appreciative of the close relationship that has been built with Whitehaven Coal over the years; from the directors and senior management whose vision fuels this impressive site, to the employees and communities who bring the mines to life with productivity, using the products of GBP Cranes. GBP Cranes prides itself on supporting local businesses and ensuring that it can help provide ongoing benefits for the local area, a vision shared with Whitehaven Coal. The economic and environmental wellbeing of local communities has long been a priority of GBP Cranes, which offers after-hours servicing

to our products, 24/7 assistance and no obligations quotes.

Due to its work with different clients, many of whom are large-scale and high-profile, the health and safety standards of GBP Cranes workplaces and products remain at industry best, with its employees being some of the highest-skilled in the industry. The GBP Cranes and Heavy Haulage plant is frequently upgraded, with operations continually optimised, so that it can provide the most innovative and up-to-date fleet. This commitment to continual improvement and high-quality work adds great value to the projects of its clients.

HELPING A CLIENT WITH THE MAINTENANCE OF AN 18T FINAL DRIVE

One client of GBP Cranes, a major mining contractor, said that its products and services consistently exceed expectations.

"Our regular freight liaison and operator for GBP Heavy Haulage, goes above and beyond to ensure our freight leaves and arrives both safely and on time." they said.

GBP Cranes and Heavy Haulage look forward to continuing its strong relationship with Whitehaven Coal and an extended, growing client list. **AMR**



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Fleeting Moments for Whitehaven

Hitachi mining equipment at work at Whitehaven Coal.

Hitachi Construction Machinery Australia (HCA) is proud to be a major supplier (OEM) of the Hitachi "Load and Haul" mining product fleets to Whitehaven Coal, and take this opportunity to thank the mining company for its continued support of Hitachi mining equipment.

Whitehaven Coal has had a working relationship with HCA for 12 years, with the original deliveries of Hitachi EX3600-6 and EX5600-6 excavators into the Werris Creek operations.

In more recent times, there were further deliveries of Hitachi excavators and trucks into the Maules Creek and Tarrawonga operations.

At the time of initial deliveries, HCA ensured the appropriate service support structures were in place. These support structures continue to evolve and expand in line with the growing fleet numbers, to ensure the Hitachi fleet provides high performance and availability to all Whitehaven operations.

HCA continues to strengthen its support for the region with the opening of the HCA Gunnedah Branch facility in early 2019.

This investment will ensure that the appropriate parts and service support is available for not only Whitehaven's growing fleet, but also other major customers in the region. The Gunnedah facility signifies HCA's commitment for long-term growth within the mining industry and regional NSW.

HCA is committed to continuous improvement development, again shown in the Whitehaven Coal relationship with HCA's WENCO Fleet Management Systems (FMS) in operation at Maules Creek.

Over recent years, this FMS was developed from the WENCO Mine FMS product to also facilitate the Autonomous Haulage System (AHS) product in conjunction with HCA.

Further to the FMS and AHS products, HCA is very appreciative of Whitehaven Coal's ability to facilitate other continuous improvement projects of product development with Hitachi mining excavators and dump trucks, to maximise greater productivity and lower the cost per BCM/tonne from the load and haul fleets.

The growth and success of Whitehaven Coal is extremely pleasing. HCA is proud of its association and involvement in ensuring that it continues to provide customers premium products and reliable solutions.

The combined Gunnedah and Muswellbrook HCA teams service more than 200 mining machines in the Gunnedah/Hunter Valley area, with Whitehaven Coal owning about 85 of these.

HCA General Manager of Mining, Eric Green, said the company was always investing into the business and showing all mining and construction equipment customers that it wants to continue support for their current and planned new fleets of equipment. **AMR**



EX8000-7

The Hitachi range of large excavators and dump trucks are covered by Global e-Service and ConSite, allowing your team to monitor machine health and productivity in real time.



HITACHI

Reliable solutions

A Mine of Information

Despite the threat of COVID-19, more than 2000 miners, explorers, investors, media and supporters turned up for last month's Diggers & Dealers Mining Forum at Kalgoorlie-Boulder.

The mining conference combines corporate presentations by listed mining and exploration companies alongside a large exhibition area housing more than 164 exhibitors from the sector.

Delegates include miners, explorers, brokers, bankers, investors, financiers and mining service industries from around the world.

Because of the pandemic and lockdowns, most of the delegates were from WA, though some from interstate endured a two-week quarantine period to be at Kalgoorlie.

The Forum, in its 30th year, provided a unique opportunity for industry professionals to meet and network, visit regional mine sites, engage with media, raise finance, invest in projects and generally engage with the resources sector at an executive level in a mining community setting.

Diggers & Dealers got underway against a backdrop of a re-energised battery minerals sector, a soaring iron ore price, an increase in second and third-tier gold sector mining acquisitions and an emerging rare earths sector.

Keynote Presentation

Keynote speaker Professor Ian Goldin, the Oxford University professor of globalisation and development and a former World Bank vice-president, beamed in via teleconference, sharing his views on the current global economic situation and trends affecting the mining industry.

In 2014 Professor Goldin famously predicted that a pandemic would be the most likely cause of the next financial crisis.

Professor Goldin has received wide recognition for his contributions to development and research, including having been knighted by the French Government and being nominated Global Leader of Tomorrow by the World Economic Forum.

He told delegates at the Forum that the relationship between Western countries and China would need to improve to avoid a negative impact on the mining industry.

Even as iron ore prices rise to historic highs, there is concern that Chinese bans on iron will eventually affect the outlook for the metal. Professor Goldin said the tensions between China and Australia had major implications for the mining sector.

And not only would a Cold War be hugely destabilising for the world economy and slow down global growth, he said it would lead to excuses for protectionism and nationalism: the antithesis of global trade.

"And it heightens the risk that we do not deal with systemic risks. We cannot stop the next pandemic if we are fighting a Cold War. We cannot stop climate change," he said.

"There is no global problem I can think about which does not require China to be in the room as part of the solution, and its role is growing in this respect."

Tipping a slowdown in demand for coal and petroleum,

Professor Goldin predicted an end to fossil fuels, but "whether it's 2030, 2040 or 2050 will depend on the country".

"It's more complicated when one talks about iron ore because I see a continued strong demand for steel, but reducing the carbon content in steel will be vital," he said.

"One cannot do the climate transition without steel.

"How are you going to build a world wind turbine, without steel?

"And so I see robust demand for steel, but increasing pressure in terms of the carbon content."

Professor Goldin echoed the sentiment that demand for commodities such as lithium, nickel and rare earths would lift by up to 10 times at least over the coming decade.

"And then we will see huge demand for copper which is vital for grids and we'll be moving into a vital need to rebuild grids," he said.

Nickel West

Outgoing BHP Nickel West Asset President, Eddy Haegel, took to the podium to elaborate on the progress of the mine on its pathway to net zero, which included the extension of the mine's power purchase agreement with the Merredin solar farm in the Wheatbelt region.

"It's a 100MW solar farm and WA's largest. Nickel West will increase its offtake with the Merredin Solar Farm from 20 to 50%," he said.

"While these announcements offer us a tremendous step forward towards our goal of becoming fully sustainable, we want to do much more."

BHP and its power partner in the Goldfields, TransAlta, also plan to build two solar farms and a battery storage system to help power the Mt Keith and Leinster operations. This will help BHP reduce emissions from electricity use at Mt Keith and Leinster by 12%, based on FY2020 levels.

The Northern Goldfields Solar Project will include a 27.4MW solar farm at Mt Keith and a 10.7MW solar farm and 10.1MW battery at Leinster, and will displace power currently supplied by diesel and gas turbine generation.

This will result in an estimated reduction of 540,000t of CO2e over the first 10 years of operation. This is the equivalent of removing up to 23,000 combustion engine cars from the road every year.

BHP commissioned the solar farms and battery to be built, owned, and operated by TransAlta as part of the Power Purchase Agreement (PPA) extension signed in October 2020. Construction will commence in Q2 FY2022, is expected to take 12-14 months, and at its peak will employ more than 100 people on site.

"This is the first large-scale onsite solar farm and battery that BHP has commissioned at any of its global operations," Mr Haegel said.

"The Northern Goldfields Solar Project will further improve our position as one of the lowest carbon nickel miners in the world. It will reduce emissions from electricity use at Mt Keith and Leinster by 12%, reduce



CELEBRATING 30 YEARS



Keynote speaker Professor Ian Goldin.

Nickel West has extended its power purchase agreement with the Merredin solar farm in the Wheatbelt region.



fuel costs and improve the reliability of our electricity supply with the addition of the battery storage system."

The announcement followed the signing of an agreement for Nickel West to supply the commodity to Tesla, the world's largest manufacturer of electric vehicles and battery storage systems.

In addition to the supply agreement, BHP and Tesla will collaborate on ways to make the battery supply chain more sustainable, with a focus on end-to-end raw material traceability using blockchain; technical exchange for battery raw materials production; and promotion of the importance of sustainability in the resources sector, including identifying partners who are most aligned with BHP and Tesla's principles and battery value chains.

This was Mr Haegel's last presentation in the role. He recently stepped down from his position and has been replaced by Jessica Farrell.

Uranium Upswing

Boss Energy chief executive Duncan Craib told the Forum that the company's mothballed Honeymoon mine in South Australia was poised to restart, taking advantage of "the next uranium cycle" which has the spot price sitting about the \$US32/lb mark, up from below \$US28/lb in March.

The mine had been placed into care and maintenance in 2014 after prices collapsed in the wake of the 2011 Fukushima disaster.

Mr Craib said the mine was so well-advanced it was ready to come back into production.

He said while Greenfield exploration projects could take eight to 10 years until they start producing, Honeymoon was raring to go and fully permitted.

"It has an export permit for 3.3m lbs. Having an export permit means all the other permits are in good order, such as native title agreements, chalk resource values, etc," he said.

"We have full Federal and State government support, and the SA government is helping support geophysical activity exploration at Honeymoon.

"We have also been building up close relationships with fuel buyers."

Boss bought Honeymoon from Canada's Uranium One in 2015.

There are only two uranium mines operating in Australia following the closure of Ranger in the Northern Territory in January: Olympic

Dam and Beverley, both also in South Australia.

"South Australia is the premier uranium jurisdiction in Australia," Mr Craib said.

"Honeymoon is destined to be Australia's next uranium producer and one of the first worldwide to come back into production.

"The past six months have seen an increasing recognition of climate change and how nuclear can sort of mitigate that climate change through its reduction in carbon emissions.

"We want to (take advantage of the trend) and create a profitable and sustainable mine.

"We believe that prices will rise to the mid US\$30s to the high US\$30s on a spot price level by the calendar year end."

Sexual Harassment

Pilbara Minerals chief executive Ken Brinsden reinforced that sexual harassment was not acceptable and that mining companies needed to do more to change the culture at mine sites.

He told delegates that offenders need to be rehabilitated, not moved along, or they would wind up unchanged somewhere else. Several harassment cases in WA's Pilbara region are before the courts and a WA parliamentary inquiry has been established to investigate inappropriate behaviour towards women in the sector.

"Unmute yourself, stand up again disrespect," Mr Brinsden said.

"We have come a long way, but not far enough. I encourage you all to work harder on the culture in and around our workforce, in and around our work sites, in and around our camps.

"And if you have a dinosaur who hasn't got with the program, don't just immediately send him down the road, because somebody else is going to pick up that same problem.

"Let's have a crack at rehabilitating individuals, turning them around, making them better people.

"And to my mind, that's going to be a much more sophisticated and better industry response to what represents a reasonably serious challenge to the future of our industry.

"If we're going to get the other 50% of the gender balance into our workforce, we've got to do it better than we're doing today."

AMR

The Axis of Success



Axis' mining equipment is ready to handle the toughest jobs.

On the back of a strong period of growth and contract wins, Axis Hire recently celebrated a successful participation at the 2021 Diggers & Dealers Mining Forum in Kalgoorlie.

Managing Director Mark Cates, CEO Simon Jacob and Business and Operations Manager Mike Brown fielded plenty of questions on the company's fleet strength and equipment availability at what was a very positive 30th anniversary Diggers & Dealers event.

The trio were able to catch up with a number of former, current and future customers and update them on the company's industry-leading fleet, simultaneously learning about the latest trends in the local mining industry

Founded by Mr Cates in 2007, Axis Hire has built its business and reputation on excellence in client service. Axis Hire's growth since 2007 has been based on client referral and word of mouth as being the best indicators of performance and service.

While it has a focus on resource projects in WA, Axis Hire has proven successful at servicing clients throughout Australia.

The company has been successful in building a strong client base and reputation through its understanding of its customer's values, responsiveness, experience and reliability.

"We don't risk our reputation on shortcuts," Mr Jacob said.

"Axis Hire specialises in supplying customised fleets of light vehicles, trucks, civil and earthmoving equipment, built tough to mine spec."

"We pride ourselves on our attention to detail. The Axis Hire team is built on collaboration and commitment."

"It is no cliché that the best businesses are built around highly capable people."

"Our close-knit team means we're agile and able to cultivate meaningful relationships with our clients."

"Clients speak with someone who understands their business and solves problems with them. We can be proactive rather than reactive. We walk in our clients' shoes."

Axis Hire takes a collaborative approach to determining a client's needs and the level of service is the same, regardless of whether a client hires a fleet of dozers, graders and dump trucks, or a light vehicle.

"We make it a priority to ensure that your fleet is suited to the site and project you assign it to," Mr Jacob said.

"Every project we undertake is unique and requires a tailored solution. We look to provide solutions that are sustainable for life of mine or contract."

Axis Hire is proud to be a supporter of regional WA. With an office in Welshpool, Perth, based at the workshop and administration premises of its sister business Axle Hire (servicing the transport and logistics industry with a diverse truck and trailer fleet), Axis Hire has state of the art administration and workshop premises in Bunbury and a local presence in Newman.

Evidencing its commitment to regional WA, Axis Hire has recently made strategic land acquisitions to allow expansion of workshop capacity at both its Bunbury and Newman premises. It is recognition of the role the regions play in the construction and mining sectors in WA.

Over the past 14 years, Axis hire has built up a strong network of operations across the civil construction and mining sectors including:

South Western Australia

Axis Hire's administrative headquarters and fully equipped workshop are based in Bunbury. From this location, Axis Hire has convenient access to clients in the mining and civil construction sectors down to Ravensthorpe and Esperance. Axis Hire is proud to support clients working on the Bunbury Outer Ring Road project.

North Western Australia

In the North-West, Axis Hire provides light vehicles, coaches, earthmoving equipment

and trucks during the construction and operational phase of various projects and has become a major supplier of equipment to general services, maintenance and mining contractors.

Pilbara

Axis Hire's branch in Newman was strategically chosen to provide support to its Pilbara-based clients. In the Pilbara region, Axis Hire provides a range of fleet including light vehicles, loaders, excavators, dump trucks and specialist plant.

Goldfields

Axis Hire supports mine construction and mine production in the iron ore and gold sectors. Axis Hire has a growing fleet of dump trucks, graders and excavators sourced to meet client and site requirements in the mining production sector

Queensland

Axis Hire has long term relationships in Queensland supplying light vehicles and trucks. The fleet ranges from mine spec to specialist fleet, all tailored to meet the requirements of the operational environment.

Axis Hire's fleet capability extends from light vehicles to heavy earthmoving equipment.

The fleet is updated regularly and maintained to the highest OEM standards.

The earthmoving fleet includes excavators, rollers, dozers, wheel and IT loaders, graders, dump trucks, water carts, water trucks and skid steers.

The heavy truck fleet includes service trucks, water trucks, tipper trucks, vacuum trucks,

fuel trucks, crane trucks and prime movers.

The light truck fleet includes 4x2 and 4x4 vehicles completely customised light truck hire. Light trucks include flat bed trucks and fitters trucks. Axis Hire has a wide range of bus hire and coach rental options, which includes off-road 4x4 buses, a 12-seater mini bus and 21-25 seat buses.

But it is not only hire equipment that Axis Hire can supply to the local mining sector. Other popular services include:

- Mobilisation and demobilisation using in-house transportation capacity.
- Custom Rebuilds - Axis Hire has the experience to rebuild large equipment to client requirements, either for customisation or for second and subsequent life.
- Maintenance - Axis Hire is able to carry out detailed maintenance work on large equipment, including regular OEM component change outs.

Axis Hire has a skilled maintenance team comprising established mechanics with 25+ years' experience through to dynamic apprentices who receive the very best mentoring possible.

Mechanical staff are selected based on their commitment to the Axis Hire philosophy of being a sustainable and service oriented business. The crew are sticklers for detail!

Axis Hire understands that it is the little things that matter just as much as the big things. Whilst it knows that perfection is elusive, it still seeks it by focussing on attention to detail to make the client experience the best that it can be. **AMR**



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Trusted Engineers for 30+ Years

The METS Team thoroughly enjoyed their time at Diggers and Dealers 2021. The presentations were excellent and a testament to the ingenuity and hard work of people in the industry. Diggers brought a ton of insights into the mining sector, and the potential to assist junior mining companies who are dealing with complex ore bodies and metallurgical technical challenges.

The vast majority of junior mining company boards consist of geologists, mining engineers, lawyers and finance professionals with metallurgical processing executives in the minority. METS Engineering ("METS") frequently witnesses the lack of processing knowledge during interactions with boards and management teams and believes this oversight continues to prove a problem for resource companies during the development of projects.

"It is one thing to find a deposit and another thing to mine it but to extract maximum value from it, you need a specialist in mineral processing."

METS Engineering ("METS") is an independent specialist consulting group providing services to the global resources industry. Although the company is Perth based, the professional staff work globally on projects whether in Australia or overseas, from the West Perth office or on site. Since 1988, METS has established itself as a quality service provider. METS core business is founded in establishing long-term relationships with its clients enabling us to draw upon its historical knowledge of specific project operation to derive the best possible solution outcomes. METS is aptly skilled to provide comprehensive services to the mining industry in:

- Mineral Processing
- Engineering Design
- Hydrometallurgy
- Smelting and Pyrometallurgy
- Training
- Specialist Services

Mineral Processing

Mineral processing is METS' core specialty. The METS team has over the last 30+ years serviced the resource industry in all regions of the world. The team has a broad range of services within the area of mineral processing from scoping studies, designing test programs, all levels of engineering study through to project commissioning and optimisation of operations.

METS engineering offers a range of testwork programs and engineering studies to assist in any stage of your project including:

- Testwork programme management
- Interpreting testwork results
- Sighter testwork
- Conceptual/scoping studies
- Pre-Feasibility Studies (PFS)
- Feasibility Studies (FS)
- Definitive Feasibility Studies (DFS)

Engineering Design

The METS team has an in-house multi-disciplined engineering and design team providing engineering and design services to its clients. The engineering and design capability is based on extensive operational and delivery experience gained over the last

30+ years that it has been providing services to the resource industry. METS takes pride in the success of its clients' projects through providing practical, functional, cost effective and constructible solutions to complex problems.

METS Engineering includes experienced processing, electrical, mechanical, civil and structural engineers with substantial experience. The METS team apply their expert knowledge to all stages of a project from front end engineering design, conceptual design, planning, detailed design through to commissioning.

METS' Engineering Design services cover:

- Mechanical design
- Engineering studies
- Civil and structural design
- Piping
- Instrumental and control
- Equipment design, specification and selection

Hydrometallurgy

METS has designed and operated heap leaches, pressure leaches globally, having been involved in studies, piloting, project development and commissioning. This includes purification, crystallisation and electrowinning.

Smelting and Pyrometallurgy

METS Provides consultancy and services for smelting projects. It covers an extensive number of commodities and smelting process routes, and has been involved in studies, project development, commissioning and audits of smelters. METS has worked at smelters here in Australia, China, Europe and South America. This includes ferrous and nonferrous metals.

Training

METS provides customised and in-house training courses that give participants increased technical awareness and practical expertise no matter what their level of experience. METS can also assist in creating, re-writing and updating your operations training manuals. All of METS' services can be delivered via an e-learning option or with site placed trainers if required. With over 50 training courses, the variety of topics offers an excellent opportunity to broaden one's knowledge of the resources sector in general and individual disciplines in specific

Specialised Services

The METS team has over the last 30+ years serviced the resource industry in all regions of the world. The team has a broad range of specialised services including the area of expert witness, due diligence, optimisation, financial modelling, metallurgical accounting and audits.

It is METS' goal to help its clients achieve greater value from their projects by delivering valued outcomes – reduced costs, greater efficiencies, risk mitigation, clearer understanding, steps on how to move a project forward and greater



operational accountability. Although the current business conditions pose challenges for many clients, METS is working alongside each of them to deliver resilience and strength to their projects. It's dedicated to helping you achieve success. A testament that is reflected in its over 30-year history. Services include:

- Process Plant Audits
- Metallurgical Accounting
- Due Diligence
- Simulation and Debottlenecking
- Expert Witness
- Financial Modelling
- Plant Optimisation
- Risk Assessment
- Skills Hire

METS' Commitment

What differentiates METS from other firms is the unique combination of specialised

services combined with a nearly 30 years proven track record of delivering successful projects to clients. By combining innovation and integrating the skills and experience of its engineering staff, the METS team bring greater efficiencies and service know-how to all client projects. METS works as one dedicated team and as a result, projects are planned, managed and completed on time and to budget with few surprises. As a single point of contact for engineering deliverables, it accepts total responsibility and efficiency in controlling costs at every phase.

The vast range of services offered by the METS team over the last 30 years can take its clients commodities from the ground, through processing and to global markets.

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MINERAL PROCESSING & TECHNICAL SOLUTIONS

SPECIALISATIONS

- MINERAL PROCESSING
- HYDROMETALLURGY
- PYROMETALLURGY
- ORE CHARACTERISATION
- FLWSHEETS
- TESTWORK PLANS
- CONCEPTUAL STUDIES
- SCOPING STUDIES
- PRE-FEASIBILITY STUDIES
- FEASIBILITY STUDIES
- BANKABLE STUDIES
- PILOT PLANTS
- PROJECT DEVELOPMENT
- DUE DILIGENCE

SPECIALISATIONS

- EXPERT WITNESS
- RISK ASSESSMENT
- PROCESS INNOVATION
- COMMISSIONING
- DETAILED DESIGN
- AUDITS
- PROJECT CAPITAL REDUCTION
- OPTIMISATION
- TRAINING
- VALUATIONS
- TESTWORK DESIGN & MANAGEMENT
- INVESTIGATIONS
- GREENFIELDS & BROWNFIELDS

COMMODITIES

- ALUMINA
- COPPER
- GARNET
- GOLD
- GRAPHITE
- IRON ORE
- KAOLIN
- LEAD/ZINC
- LITHIUM
- MINERAL SANDS
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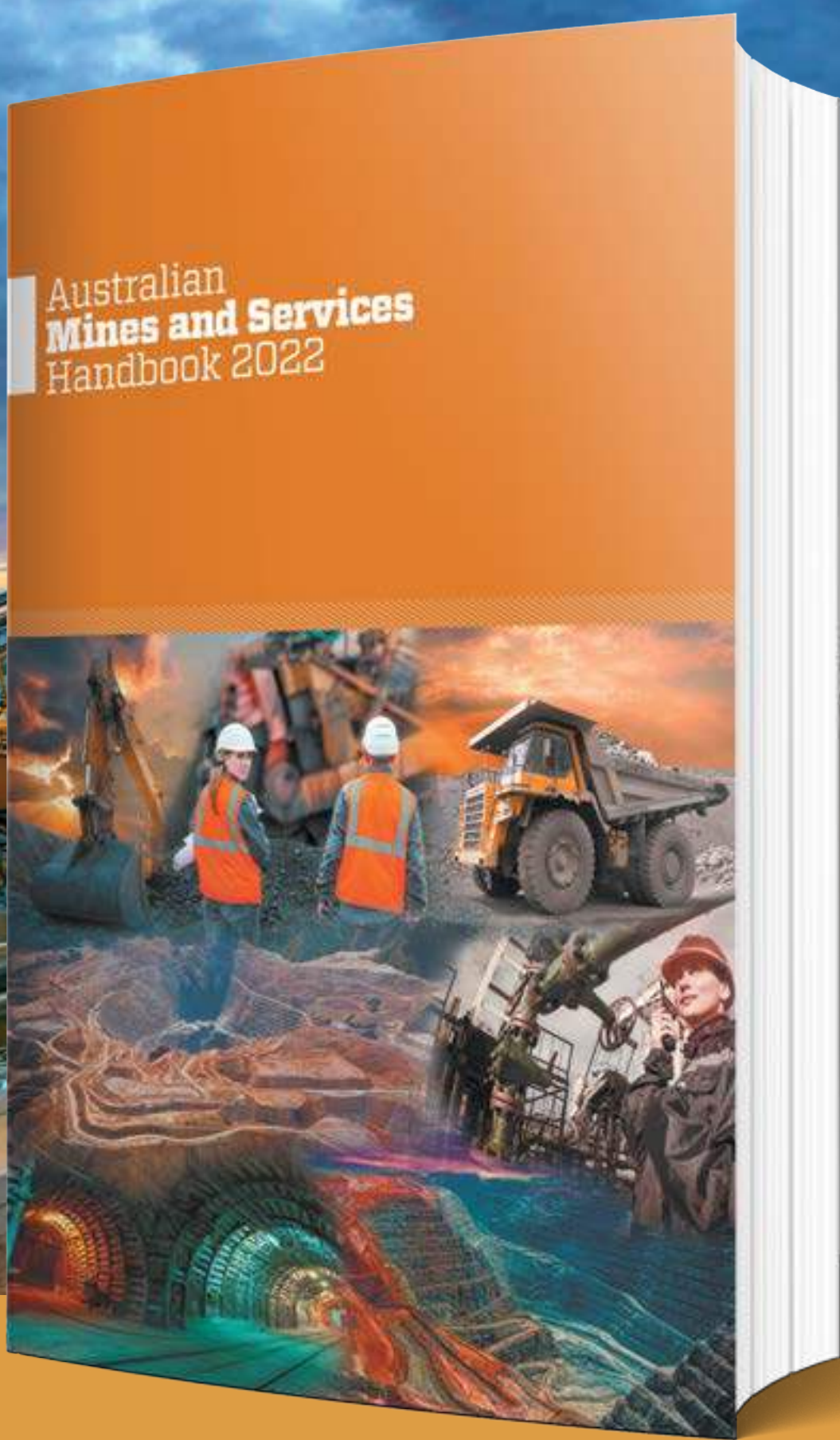
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WA Billboards is the last privately owned, dedicated outdoor media company in WA.

The company successfully trades in a competitive market by offering clients a broad range of outdoor media options across metropolitan and regional WA.

WA Billboards has an extensive inventory of billboards all over WA, from the Kimberley, through to the Goldfields, Perth CBD and down to the South West.

Having this broad coverage of both regional and metropolitan billboards ensures that there is a perfect spot for companies to reach their desired target audience.

In addition to outdoor billboards, WA Billboards holds the advertising rights in most of WA's regional airports including Kalgoorlie-Boulder, Newman, Karratha, Port

Hedland, Onslow and Geraldton.

Advertising in these locations catches the attention of FIFO workers, city commuters, national and international tourists, and farmers.

With the development of technology, WA Billboards is moving towards digital.

The company has installed large format digital signs at Karratha, Newman and Kalgoorlie-Boulder airports, enabling quick content changes and the ability to showcase products or services in greater detail than traditional signage.

For all enquiries, contact Kate at kate@wabilboards.com.au or **0488 152 252**

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- Weekly Mines Activity Report (Operational Activity specific to Mine Sites)
- Directory listing on Mine Suppliers Online



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Olympic Dam a Gold Medal Performer

First discovered by Western Mining Corporation (WMC) in mid-1975, the giant Olympic Dam Copper-Uranium-Gold Mine is now one of the biggest polymetallic operations in the world.

Located in central South Australia, approximately 560 km north of Adelaide, the Olympic Dam Mine was named after a livestock watering dam on the Roxby Downs pastoral lease, which in turn was named during the 1956 Melbourne Olympic Games. Production officially commenced at Olympic Dam in 1988, before Global mining giant acquired the asset in 2005.

Since that time, BHP has continued to ramp up production and investigate expansion options, however, the growth plans suffered a setback in last 2020 when the company revealed it was reviewing its plans.

Following more than 400 km of underground drilling associated with the Brownfield Expansion (BFX) project studies, the company told shareholders that it while now had an improved knowledge of the ore body's variability – the results had also identified a number of challenges for the economics of the expansion project.

The company announced that with that in mind it had decided that the optimal way forward at that time was through targeted debottlenecking investments, plant upgrades and modernisation of our infrastructure.

However, it did not shut the door on further studies into longer-term options for growth. The current focus will remain on completing an asset integrity programme. This will underpin more stable operations and expected copper production of more than 200 ktpa. BHP said the long-term opportunity for Olympic Dam is unchanged, with its

enhanced understanding of the resource in the Southern Mine Area and the promising results from Oak Dam providing strong foundations for unlocking the full growth potential of this asset.

The company says preparations are well advanced for the next Smelter Campaign Maintenance to be executed early in FY2022. Olympic Dam has a range of future growth options under consideration as part of its sustained, long-term growth strategy, from incremental debottlenecking through to large scale investments.

A third phase of exploration drilling on the Oak Dam project has been completed with additional geotechnical and geo-metallurgical data collected to assist in the understanding of the deposit. Further drilling will be conducted in FY2021, which will inform the company's next steps with the project.

In the meantime, BHP continues to make key adjustments to operations, recently bringing into service a new electro-refinery crane, further strengthening the asset's stability and reliability.

The 95-tonne crane with 32-metre span will be used to submerge 360-kilogram copper anodes into the refinery's 768 individual electrolytic cells, which extract the purified final copper product that Olympic Dam exports to global customers.

With dual lift capability and automatic laser positioning, the crane has the capacity to carry over 20 tonnes at a time, at a maximum travel speed of three metres per second.

The multi-million-dollar crane replacement project commenced engineering in 2016 and started construction in 2018, creating 130 jobs in South Australia during construction. "The new refinery crane will improve



operational stability and reliability in our refinery, allowing us to operate more safely and efficiently, and support increased production volumes over the long term," BHP Olympic Dam Asset President, Jennifer Purdie, said.

"Copper cathode from Olympic Dam is sought-after for its quality and purity, and will be increasingly in demand as an essential product for global decarbonisation. "This project shows BHP's commitment to our long-term future in South Australia by continuing to make significant investments, creating local jobs and opportunities for regional businesses."

That continued development work by BHP saw Olympic Dam recently record its highest annual copper production since BHP acquired the asset in 2005, and its best-ever gold production.

Olympic Dam's copper production increased by 20 per cent to 205 kt, reflecting improved smelter stability and strong underground mine performance.

The mine also achieved record gold production of 146 koz.

However, production for the 2022 financial year is expected to decrease to between 140 and 170 kt as a result of the planned major smelter maintenance campaign and subsequent ramp up planned between August 2021 and February 2022.

Background

Olympic Dam is one of the world's largest ore bodies, with world class deposits of

copper, gold and uranium and a significant deposit of silver. Olympic Dam operates a fully integrated processing facility from ore to metal.

The project is made up of underground and surface operations and operates a fully integrated processing facility from ore to metal.

The underground mine is made up of more than 450 kilometres of underground roads and tunnels. Ore mined underground is hauled by an automated train system to crushing, storage and ore hoisting facilities.

The processing plant consists of two grinding circuits in which high-quality copper concentrate is extracted from sulphide ore through a flotation extraction process.

Olympic Dam has a fully integrated metallurgical complex with a grinding and concentrating circuit, a hydrometallurgical plant incorporating solvent extraction circuits for copper and uranium, a copper smelter, a copper refinery and a recovery circuit for precious metals.

Since it opened in 1988, an extensive underground mine, an integrated metallurgical processing plant and expansive open-air tailings storage facilities have been constructed.

The adjacent Olympic Dam mining centre and the nearby township of Roxby Downs service the mine and accommodate its workforce. Daily flights to and from Adelaide are provided via the Olympic Dam Airport.

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Relationships creating success



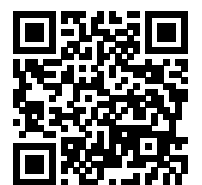
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Sandfire is a growing name on the global mining landscape.

Sandfire Transitioning to International Miner of Note

Sandfire Resources Limited has identified a number of new international growth opportunities through a recent major strategic review.

The review comes at a time when Sandfire continues its transition into an international, multi-asset base and precious metal producer.

Notably, the review confirmed Sandfire continues to deliver against the key targets and strategic initiatives of its Strategic Growth Plan.

The company has also confirmed that it is making positive progress with its board succession plan which is targeting an appropriate blend of skills and experience to oversee Sandfire's growth phase.

That succession plan recently saw Sally Langer, Jennifer Morris OAM and John Richards appointed as Independent Non-Executive Directors of the company.

Non-Executive Director, Paul Hallam, has also advised of his intention to retire from the Board effective at the 2021 Annual General Meeting (AGM) in November 2021.

The senior management structural manoeuvres continue to evolve in line with Sandfire's expanding global presence, including the recent appointment of an in-country CEO in Botswana, Head of Exploration, Head of Investor Relations and Head of Business Development and Technical Services. The strategic and structural review and succession plans are being driven by the company's transition from a single-mine company into an international, multi-asset base and precious metals producer.

The key components of the company's Strategic Growth Plan will see Sandfire make the transition from a successful mid-tier mining company based on a single asset in Western Australia into a diversified, multi-asset company with an expanding global footprint including new operations in Botswana and the USA.

Sandfire Resources Managing Director and Chief Executive, Karl Simich, says that the company's growth plan will bring increasing value to its shareholders.

"I believe those who invest in companies like Sandfire are primarily looking for capital growth within a broader macro thematic. For Sandfire, the macro thematic is clearly the energy transition that is now gathering pace, and the critical role of copper will play in decarbonising the world," Mr Simich said.

"Over the last 10 years Sandfire has delivered significant capital growth but in addition, we have also delivered meaningful capital returns to investors, with an average

dividend yield of 3% over the last five years. "We aim to achieve similar outcomes with our new development in Botswana, the Motheo Copper Mine. We believe our Kalahari projects have the potential to be far larger and we have a clear line of sight to expanding production at Motheo.

"As Sandfire has done at DeGrussa, we will continue to operate to the highest standards of sustainability, working collaboratively with all our stakeholders to deliver the best possible outcomes for our investors and the communities we live in and work with."

The company has embarked on this new chapter of growth against the backdrop of an exceptional long-term outlook for copper due to its pivotal role in the impending global energy transformation and push towards decarbonising the world economy.

"Our DeGrussa and Monty mines are already fully optimised and are highly productive. DeGrussa has been a very consistent high-grade mine and Monty is one of the highest-grade copper mines on the planet; operations achieved a unit cash cost of US\$0.82/lb in FY21 meaning that at current copper prices we're a highly profitable business," Mr Simich said.

According to Sandfire, a recent highlight in its growth has been the award of the Mining Licence for the Motheo Copper Project by the Government of Botswana, clearing the way for full-scale construction of the project to commence.

In December 2020 Sandfire announced Board approval for the development of the mine, which is expected to form the cornerstone of Sandfire's dominant position in a new long-term copper province in the Kalahari Copper Belt.

Construction crews are now mobilising to site to ramp-up development, with Motheo representing one of the few new copper mines in development anywhere in the world.

While the Base Case 3.2Mtpa operation itself delivers impressive economics over an initial 12.5-year life using conservative copper pricing, Sandfire anticipates expanding quickly to a 5.2Mtpa operation.

A recently announced upgraded Mineral Resource for the A4 Deposit will underpin a Feasibility Study targeted for completion in the December 2021 Quarter. A4 represents a key element of the company's strategy to rapidly expand production at Motheo with the processing facility designed to be quickly scalable to the increased throughput rate.

At the same time, the company's recent drilling at the A4 Deposit has revealed the potential for exceptionally high grades of up to 16% copper in the Kalahari Copper Belt



Exploration success will continue to add to Sandfire's future.



The DeGrussa project continues to operate to the highest standards of sustainability.

– an exciting and significant development given that this is just the second of a large number of targets we have tested within our extensive ground position in Botswana and Namibia.

Driven by these encouraging results, Sandfire's regional exploration across the Kalahari Copper Belt is also moving into top gear, both within the Motheo Expansion Area and further afield, including across our licences in Namibia.

The company is also eagerly awaiting results from recent exploration drilling at the Black Butte Copper Project in Montana, USA, while other significant exploration activities underway – including in the Doolgunna region of Western Australia and in Eastern Australia in the Temora and Cobar regions.

Production Success

Sandfire's DeGrussa Operations in Australia has delivered strong copper and gold production for the FY2021 with 70,845 tonnes of copper and 39,459 ounces of gold in concentrate, above and at the upper end of guidance bands, respectively.

The company said this strong operating result generated revenues of \$813 million from concentrate sales and closing Group cash and equivalents at 30 June 2021 of \$574 million.

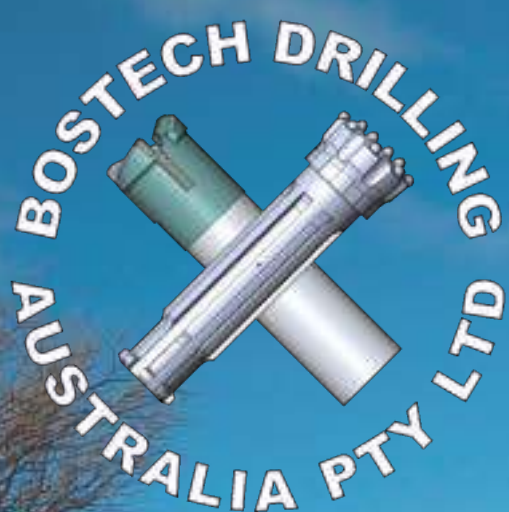
The strong FY2021 production result was driven by the exceptional performance from our DeGrussa mining and processing teams. Since the discovery and development of the high-grade Monty mine in 2019, Sandfire has operated a strategic mine plan that aims to complete mining at the DeGrussa and Monty mines, as closely as practically possible, at the same time.

The processing team has focused on blending DeGrussa and high grade, but variable, Monty ore, and carefully managing plant throughput and recovery to maximise copper production.

A resource definition drilling programme has also been completed at the Old Highway deposit, with the integration of drilling and assay data into the existing geological modelling underway.

This work is expected to result in a maiden JORC Mineral Resource Estimate for the Old Highway Gold Project later this year.

Work is also continuing on the key elements of a Feasibility Study examining options to produce gold from the Old Highway deposit leveraging off the processing capacity at the nearby DeGrussa processing plant. Sandfire envisages making a decision on whether to progress the project to construction in late CY2021. **AMR**



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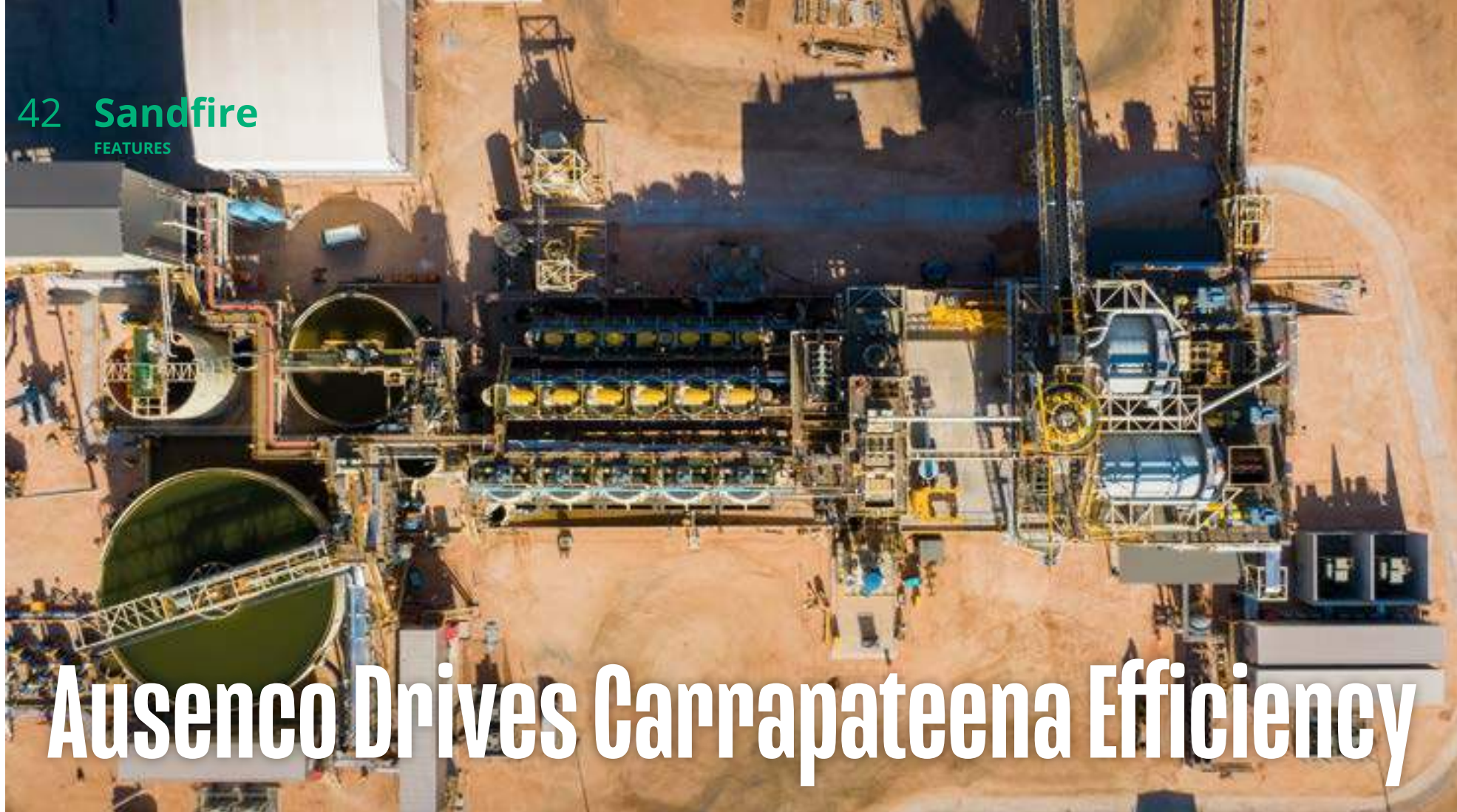
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Ausenco Drives Carrapateena Efficiency

Carrapateena is a copper-gold deposit located in South Australia's remote, arid Gawler Craton, about 160km north of Port Augusta.

Ausenco presented OZ Minerals with a 4mt/y process plant design that was cheaper, smarter and safer than the pre-feasibility study (PFS) design.

It took a Best-solution-for-project approach and worked openly and collaboratively with OZ Minerals in an Early Contractor Involvement stage to provide a cost-effective, fit-for-purpose solution that incorporated their design and equipment preferences, and provided certainty of outcome.

Engineering commenced in December 2017, with construction of the mineral processing plant, non-process infrastructure, and site-wide services commencing in Q2, 2018.

The 20-month construction period was wrapped up in Q1, 2020 and then ramped up to nameplate capacity in under one month after commissioning completion. It continues to achieve excellent recoveries for OZ Minerals.

OZ Minerals' Managing Director and CEO Andrew Cole said it was a credit to all concerned to see the mill reach nameplate throughput so soon after handover and

concentrate being accumulated.

Project Solutions and Approach

The Ausenco compact plant not only lowered capital cost and drove efficient project delivery, it continues to drive improved operability and sustainability without compromising performance.

The plant requires fewer operators, needs less energy to operate, reduces environmental impact and improves safety due to reduced operational interaction.

Ausenco found better ways to deliver the Carrapateena Project, including utilisation of local and internationally sourced bulk commodities; use of preassembled structures, bolted tanks and prefabricated fully equipped modular switch rooms to minimise site labour; and implementation of Advanced Process Control (APC) to optimise overall plant performance and minimise operator intervention.

Project Scope

The 4mt/y Minerals Processing Plant (MPP) is designed to produce copper concentrate, processing ore delivered from the underground mine. At a high level, the plant consists of the following major design sections:

- Coarse Ore Stockpile and Reclaim
 - Coarse ore stockpile with a live capacity of 12,000t, allowing for 24 hours of mill feed capacity with 60,000t of storage.

- Coarse ore reclaim via two apron feeders and onto the SAG mill feed conveyor.

- A closed Semi-Autogenous and Ball Mill (SABC) grinding circuit with ore feed video characterisation and mill discharge particle size analysis.

- Pebble Crushing system

- Copper Flotation circuit of rougher, cleaner and scavenger tank cells

- Regrinding system including regrind cyclones and a 1,600kW High Intensity Grinding (HIG) Mill

- On-stream analysis with froth monitoring cameras providing data input into the multivariable control system for flotation.

- Concentrate Handling, Storage and Load-Out

- Tailings Handling

- Water system including an 8,500m³ pond to store process water for the plant and a reverse osmosis plant

- Electrical and Instrumentation Systems

- Site Power Distribution (SPD)

Non-process buildings included administration, mine office, site operations centre, change-house, Liquefied Petroleum Gas (LPG) storage system, fixed and mobile plant maintenance

workshops, warehouse and reagents store.

Site-wide services included electrical services, communications and data, potable water, sewage, fire systems, roads and drainage.

"Having produced first concentrate the overall project value continues to align with the Feasibility Study Update of 2017," Mr Cole said.

Outcomes and Achievements

- 20-month construction period, commencing Q2/2018
- First concentrate in December 2019
- Achieved capacity throughput within a four-week ramp-up period after commissioning
- 30% less power usage over the life of the plant (compared to the feasibility study)
- 50% footprint reduction (compared to the feasibility study)
- Improved operability and maintainability
- Reduced environmental impact
- Successfully executed challenging freight and logistics tasks to remote site

Working with the Local Community

- Ausenco prioritised South Australian goods and services
- 30% of the workforce comprised local South Australians
- It worked with the Kokatha People to deliver employment programs that resulted in 11% of the construction labour force being sourced from the local Port Augusta community.

"We have been privileged to have the support and direct contribution from the Traditional Owners, the Kokatha People, and our pastoralist neighbours, as well as from a great many individuals and businesses in the Upper Spencer Gulf and elsewhere in South Australia," Mr Cole said. **AMR**



The plant design:

- ✓ Reduces environmental impact
- ✓ Requires less energy
- ✓ Improves safety

Ausenco

Finding a better way to produce copper for Oz Minerals

We know how to optimise your layout, improve capital efficiency, reduce your carbon footprint and improve the lifetime value of your asset.

www.ausenco.com



Carrapeteena

50%
Smaller footprint

30%
Less overall power

11%
Traditional Owners and broader First Nations Community workforce

✓ Local workforce, goods and services prioritised

✓ Best practices for remote site logistics

44 Companies Gearing Up

INDUSTRY FOCUS



Reliable Water for Remote Sites

Desert Sands has recently acquired a Concrete Batching Plant, which has a 70 cubic metre capacity. The plant also includes a water chiller, to assist with hot weather projects.

Mining is thirsty business and Desert Sands Cartage Contractors has the solution.

Established in 1989, the Laverton-based contractor is a specialist service provider to mining projects in regional WA and the Northern Territory, with one of its key services including potable water supply and cartage.

According to Desert Sands chief executive Rex Ryles, when projects are in the exploration, earthworks and construction

phases, the company is called in to provide potable drinking water for personnel mobilised on-site.

"No matter where your site is located, we travel far and wide to ensure you and your staff are looked after and have a reliable source of drinking water," he said.

"We've worked with mining companies and regional shires far and wide from the Gruyere gold mine to Anglo Gold sites, Downer EDI, Crescent Gold, Poseidon and many more."

At the Gruyere gold project, Desert Sands was involved from the first shovel in the ground through to production, looking after civil earthworks, camp/plant concrete set up, and camp potable water.

The contractor also has extensive experience in hauling gold ore, nickel ore and concrete, along with sand, gravel and fuel into some of the most remote and isolated areas in Australia.

Other specialty services include contract screening, dozer and semi-drop deck and

front end loader hire, road maintenance and construction for local government organisations, general civil works, bulk tipper haulage, and more.

More information on the company's offerings can be found at www.desertsandscartage.com.au or by calling (08) 9031 1326

AMR

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Committed to Healthy and Safety

Recon is passionate about fresh quality food and prides itself on giving the best hospitality and service to customers and clients.

Recon Catering is regarded as a leader in contract catering and accommodation services, along with facilities management, for various mining, gas and offshore industries.

An integral service provider to a range of clients across Australia, and proudly 100% Australian owned and operated, the company is passionate about fresh quality food and prides itself on giving the best hospitality and service to customers and clients.

No location is an obstacle as Recon manages set-ups to shutdowns, including rolling camps. It remains focused on catering, accommodation, and all aspects involved, including waste management, janitorial services, wet mess management, village maintenance and aerodrome services.

With a proven track record with all our current clients, Recon Catering has established a reputable work ethic from its

management to the dedicated and qualified staff.

Recon Catering has been established with a fresh and capable approach to fulfill projects on time, on budget, with quality goods and services.

Due to low company overheads and a well-skilled workforce, Recon Catering has some distinct advantages over the competition.

It establishes long-term quality relationships with clients, through high end product delivery and a flexible adaptable attitude and culture throughout the company.

Recon Catering industry competence covers a broad variety of services delivered by experiences, safe, professional, and well-mannered staff, all selected through specific recruitment process and internal training.

The Vision

It is Recon Catering's aim to become

an industry recognised mid-tier service provider that delivers tailored facility management services with the flexibility to satisfy every client's personal needs.

Its teams are known for their open and proactive approach and committed to the principles of collaborative contracting. It understands that the delivery journey is as important as the final product.

Each Recon catering team is defined by the project they are delivering, and are chosen on a best-fit basis.

Recon Catering is fortunate to employ a pool of talented people, across all levels of staff from senior management to camp managers.

The core team specialises in key areas such as HACCAP, quality assurance, and environmental management.

Ongoing training and development

programs keep our staff skills at the forefront of the industry.

The Core Team

Nigel Stevens: Founder of Recon Catering, Nigel has more than 25 years' experience in the hospitality industry, working in remote areas.

Kristina Kolosova: The Operations Manager, Kristina has been in this position for four years. Highly experienced in HR and mining/defence OH&S, she brings a wealth of experience from her six-plus-years in hospitality administration.

Victor Fitzpatrick: The company's Executive Chef plays a pivotal role in the Recon Catering team and has been with Recon for three years. A chef for over 20 years, he has a passion for great food, which is passed on through the team. **AMR**

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Western Metalworx
Managing Director
Anthony Chiera.

Western Metalworx Isn't Slowing Down

With 35 staff, an expanding purpose-built Malaga workshop and a reputation for uncompromising quality, Western Metalworx is one of the state's leading providers of steel and aluminium fabrication for the mining and industrial sectors.

Describing the company as a trusted fabricator, however, is only telling a small part of the story. Western Metalworx has always represented a different way of doing business, focussing on relationships, innovation and problem-solving in an industry that can often get bogged down in the details of everyday production.

"A lot of older operators in this space can be single-minded," says Managing Director Anthony Chiera. "I like to see my business as being an advisor, helping to solve problems and overcome issues. We'll suggest cost saving initiatives, new ways of doing things. We try to be dynamic and creative in everything that we do and always prioritise the longevity of a business relationship over a quick win - it's in our best interests that all of our clients succeed."

Western Metalworx has been on a growth pathway since 2014, when the industry was suffering the effects of an economic downturn. Anthony's one-vehicle mobile welding operation had been travelling to all corners of the metropolitan area in search of more work when Western Metalworx (then a small business with two full-time fabricators) contracted him to manufacture stainless steel cement silos and undertake bucket repairs. The partnership was successful, and by the end of the year Anthony was heading up the business.

A larger company couldn't solve the problem of slowing ore prices, though, and the team noticed other fabricators beginning to shut up shop. To avoid the same fate, they hit the road again. They drove around the city knocking on doors, quoting for work, building a profile and a reputation with zero marketing budget. That practice - actively seeking and quoting for jobs - continues to this day, as does the basic philosophy of working to deliver a product that's better than the competitors at a reasonable price.

"We don't stop at fabrication," Anthony insists. "You have to look at the problem that the client is trying to solve."

While usually seen as negative, the Western Metalworx team tend to think of problems as opportunities to move forward and try something new. "We get excited about problems. They give us an advantage, a drive to innovate."

This commitment to innovation can be seen through Western Metalworx's unique product offerings. Using Solidworks, a powerful piece of solid modelling computer-aided design (CAD) software, the team draw up new designs in real space, test them out and refine them. This results in custom-built,

one-of-a-kind pieces developed in direct response to genuine client requirements.

Sometimes, Anthony will pre-empt the need; in his spare time, he's putting together a data logging device which uses a Raspberry Pi microprocessor to sense vibrations. This prototype will identify sources of fatigue and stress in steel platforms and structures, avoiding potential frame cracking. "We have a client in the goldfields region expressing interest," says Anthony. "I think it'll be an excellent tool for predicting product wear and identifying possible improvements for fixed and mobile plant maintenance."

There are plenty of other ideas brewing, too, but they're not all product related. A key driver of growth and innovation is fresh blood, and Western Metalworx is always on the lookout for young talent. There are currently eight apprentices on the team, two of whom were recruited as part of an Indigenous engagement initiative. In a time when many are talking about a skills shortage, Western Metalworx is actively investing in the future of its people.

"The talent is there," says Anthony. "You've just got to nourish it. We're reaching out to schools, collaborating with TAFEs. The reality is that times change, people come into the industry and people leave it. If you plan for the future, if you invest in people, they will repay you with their talent and you can keep moving forward."

For Western Metalworx, 'moving forward' means growth. From the two employees on the books when Anthony took over, the company has grown to 35, a number which will soon be much higher. A 1200m² expansion to the Malaga premises is on the cards, raising staff capacity to at least 50, and there are no plans to stop.

The next goal is to manufacture in Kalgoorlie, and possible sites are already under consideration. With plenty of scope for shutdown work, mobile welding and fabrication, the company's goal is simply to better support its regional clients and engage with the wider industry as it continues to develop.

The growth isn't limited to people and plant; a recent transformation project saw the office fitted out with state-of-the-art project management software running on a wall-length touchscreen, enabling real-time job tracking and process control. With Jared Dale (Operations), Justin Hollis (Production) and Brad Harrop (Procurement & Logistics) rounding out the management team, Western Metalworx is poised to continue innovating long into the future.

No matter how large the organisation becomes, though, there are some things that will never change. "We stand for quality," Anthony says, "and we create our own opportunities. We're an Australian business building products for Australian industry - and we do it better than anyone else." **AMR**

Operations Manager
Jared Dale allocates
jobs via touchscreen.

The Western Metalworx
management team in
the Malaga workshop.

All welders and fabricators are
coded to the highest standards.



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▶ Create

We develop a solution that efficiently gets a machine up and running – and is built to last

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A Cut Above the Rest

HD Plasma and Laser Cutting Services provides an innovative and dynamic profile cutting service to all steel manufacturing industries within Australia.

The purpose-built, multi-function, steel processing business located in Bibra Lake, WA, is seen among the leaders in the steel cutting industry.

Laser Cutting

The technology of the HD Plasma and Laser Cutting Services machines delivers superior performance, giving the ability to provide clients with exceptional quality, together with 24-hour operations, shorter lead times compared with other conventional laser cutting machines.

- Cutting table size 4000 x 2000mm
- Capable of processing up to 20mm thickness mild steel
- Capable of processing up to 20mm thickness QT Material
- Capable of processing up to 32mm thickness aluminium
- Capable of processing up to 25mm thickness stainless steel

Plasma Cutting

HD Plasma and Laser Cutting Services operates three plasma machines - one Kinetic K4000 and two Kinetic K5000.

These state-of-the-art, heavy duty combination plasma/oxy/machine centres can process a wide variety of materials at an extremely fast rate.

The 62m plasma cutting bed, together with 24-hour operations, allows high volumes of cutting to be achieved with short lead times.

- Counter sink/counter bore
- Drilling - 3mm up to 60mm
- Plasma cutting - 3mm up to 50mm
- Oxy-cutting - 60mm up to 300mm
- Beveling - up to 50mm with maximum of 45°

Steel Plates

HD Plasma and Laser Cutting Services holds steel plate in stock.

Plate is sourced from quality local and imported steel mills, to cut a wider range of materials at a greater thickness range than most of its competitors. **AMR**



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GRADE	THICKNESS (mm)
AS 3678-250	UP TO AND INCLUDING 300mm
AS 3678-350	UP TO AND INCLUDING 300mm
FLOOR PLATE M/S	UP TO 10mm
BOILER PLATE - ALL GRADES	UP TO 80mm
QUENCHED AND TEMPERED	UP TO 80mm
CARBIDE OVERLAY	UP TO 40mm
ALUMINIUM PLATE	UP TO 32mm
PGI, ZINGANEAL, GALVANISED & COLORBOND	UP TO 6mm
STAINLESS STEEL - ALL GRADES	UP TO 40mm

A cut above the rest



HD Plasma & Laser Cutting Services Pty Ltd is a purpose built, multi-function, steel processing business located in Bibra Lake, Western Australia.

We can deliver an innovative and dynamic profile cutting service to all steel manufacturing industries within Australia.

HD Plasma & Laser Cutting Services philosophy of progressive service to our customers is what is bringing us to the forefront of the steel cutting industry.

A continual process of system and service development and refinement is where our key advantage lies. We constantly find new ways to add value to the service we deliver to you.

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After almost half a century of successful operations, North Queensland-based Perrott Engineering has built a track record of providing quality hydraulic and engineering services to a wide variety of industries across Australia, PNG and Southern Asia.

The company has also proven to be highly versatile in meeting the demands of clients across a vast range of sectors and locations in solving a variety of problems.

To be able to maintain that high level of success and follow-up business over such a long period is no fluke and comes on the back of a dedication for maintaining a high level of skill development, state-of-the-art workshops and keeping a close eye on the latest technology developments.

General Manager, Ainsley Mirtschin, said the company is particularly proud of its capabilities in designing and manufacturing any request up to machine capabilities

and the quality of its machining team and equipment.

Services Include:

- Obsolete Component Reproduction
- Manufacturing to OEM Specifications
- Small to Medium production run Capabilities

Perrott Engineering's reputation for machine level capabilities has been built over a number of years with the company introducing its first NC (Numerical Control) lathe about 30 years ago.

Since then it has added further full Computer Numerical Control (CNC) machines.

That technical capability has been boosted by the company's newly established CNC Precision machine shop in Cairns which now has a full range of machines including a three-axis CNC lathe, a five-axis continuous vertical machining centre with 3m bed, EDM Wire Cut machine and a new seven-axis Multi-Tasking Machining centre with five-axis continuous capability.

The recently opened centre is now home to the most advanced CNC machining capability in Northern Australia and importantly brings to North Queensland machine capabilities not normally seen in a regional centre.

The company also operates a wide range of manual machines including a surface grinder, a cylindrical grinder, a tool and cutter grinder, a universal mill, small bore hone, glass bead and grit blasting machines, Ceracoat painting facilities and small heat treatment furnace.

All this quality equipment means Perrott



Archimedes shaft machining in VTC-800/30SR.



Obsolete worm gearbox housing replacement manufacture.



Stainless steel pipe adaptor flanges.

Engineering is able to manufacture a wide range of products out of practically all metals and carry a large range of alloy and carbon steels, stainless steels and aluminium bar products in stock.

Perrott Engineering's unique machine capabilities allows us to provide:

- Full 5 axis continuous machining up to 3m long.
- Short lead times on urgent manufacturing of components.
- Complex components in almost all materials.

If it can be drawn in a CAD programme, we can most probably manufacture it.

Notably, this is one of only a very few full five-axis continuous capable machines of this capacity in Australia.

The company's design engineers also

utilise the very latest Solidworks CAD software and FEA analysis programs along with MasterCam CAM software on all CNC machines.

Perrott Engineering is particularly well known for its ability to move quickly on items which require a quick turnaround versus the lengthy lead time on items that are coming from overseas.

"We have the expertise, experience, and specialised equipment to design and manufacture in-house a wide range of components and equipment, reverse engineering of obsolete components/parts, OEM components and items with long lead times that can affect operational income," Mr Mirtschin said.

"In short, we have the ability to quickly design and manufacture any metal components to your needs." **AMR**



Splined bore steel Taperloc hubs.



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Perrott Engineering's unique machine capabilities allows us to provide:

- Reverse engineering
- Manufacture to OEM specifications
- Obsolete component reproduction

We are known for our ability to deal with items that require a quick turnaround - versus the lead times required for items coming from overseas.



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Clover are an integrated pipeline infrastructure business.

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Plan

Every mining and resource project is unique. Regardless of the commodity—whether coal, iron ore, precious metals, lithium, or CSG—Clover combines specialist technical knowledge, creative thinking, and extensive experience to assist clients with detailed project planning and consultation services.



Source

Total-package capability means a comprehensive ability to source a wide range of standard and custom products—rapidly—and as needs evolve on site. Clover Pipelines offers a wide range of high quality products—certified to the relevant Australian and International standards—spanning fit-for-purpose polyethylene, steel, ductile iron, PVC and GRP pipe products to suit a range of mining applications.



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In the face of hard deadlines and shifting priorities, Clover is perfectly suited to deliver over the long haul, both in time and distance.

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Mark Gould

MINING & RESOURCES MANAGER
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With over 15 years' experience spanning civil and mining roles with some of Australia's major pipeline suppliers, Mark's knowledge of our complete suite of PE, GRP, Steel, Ductile Iron and PVC products ensures he's strongly placed to facilitate full package solutions: at scale, across the country. With a team of more than seventy project engineers, estimators, design consultants and sales professionals backing him, Mark has robust support to deliver large scale mining projects.



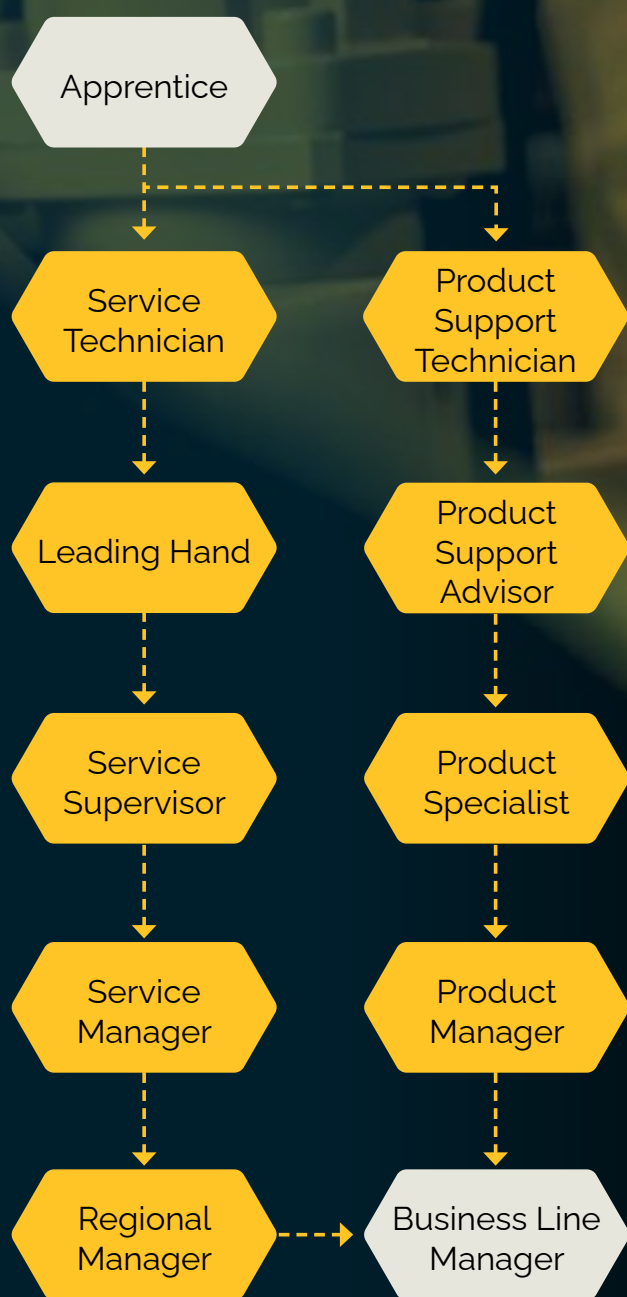
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Risks of Silica Dust Inhalation

At mine and quarry sites, a number of operational processes produce dust such as extraction, screening, stockpiling, breaking, crushing, drilling, grinding, milling, sand blasting, cutting and sawing. When weather conditions are dry, hot and windy, the risk of dust generation and transport increases, as does the risk of inhaling crystalline silica dust.

Silicosis Symptoms

While the main symptoms of silicosis are shortness of breath, chest pain, cough and tiredness, in the early stages there may be no symptoms present. Over time, the lungs suffer irreversible scarring and stiffening from constant exposure to silica dust. At 100 times smaller than a grain of sand, silica dust can be inhaled without knowing.

Fine Crystalline Silica Exposure Standards

Worker exposure to fine crystalline silica cannot exceed the exposure standard of 0.1 milligrams per cubic metre on an 8 hour time weighted average. This standard has been reviewed by Safe Work Australia, and a national agreement has been reached to reduce the exposure standard to 0.05 milligrams per cubic metre. In addition, worker exposure to fine crystalline silica must be as low as reasonably practicable.

Cleanspace on Respiratory Protection.

"This is a wake-up call not just to stonemasons but to anyone working with crystalline silica," CleanSpace CEO Dr Alex Birrell said.

"Regardless of whether you see the dust or not, silica is a hazard you simply can't afford to ignore.

"I implore all employers to review their current respiratory protection program to ensure the exposure to silica dust is minimised, and check employee training includes silica-specific information."

Cleanspace Australian-Made Respirators

When looking to protect yourself or your staff from airborne contaminants, PAPRs offer high and reliable protection, far exceeding disposable masks. CleanSpace Respirators, proudly made in Australia for over 10 years, outperform other respirators when it comes to comfort and ease of use.

CleanSpace respirators are a revolution

in the area of respiratory protection. They provide all the protection of a PAPR and are free from belts, battery packs and hoses, making them more comfortable and easy to deploy.

When used in hot or 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.

These smart powered devices are easy to operate using a one-button system. These unique features mean more workers wear these respirators for a full shift every time.

CleanSpace assists miners and their staff to be safe in the workplace and compliant when working around silica dust.

Compared to disposable masks, CleanSpace Respirators are high protection reusable devices with economic advantages, as the annual cost of replacing disposables stacks up.

Disposable masks are well-known for causing fogging and discomfort, leading to low compliance, frequent stopping, or mask changes.

CleanSpace Ex is intrinsically safe and can be safely used in potentially explosive environments such as mining.

- **High protection:** CleanSpace Respirators are AS/NZS 1716, NIOSH and CE approved. CleanSpace Respirators offer 99.95% filtration efficiency.
- **Comfort equals compliance:** CleanSpace offers both half-face and full-face masks with assigned protection factors of 50 and 1000 respectively. The full-face mask also has a high impact rating. CleanSpace Respirators are compact systems that have up to eight hours of run time and fast top-up charging.

Dr Birrell said the feedback from teams wearing CleanSpace Respirators with the full-face mask for mining, is that the mask is comfortable to wear all day,

and the cool fresh air on the face is a dramatic improvement on disposable or reusable half masks.

"They have also told us there is no fogging or hot moisture on their face," he said.

- **Product Range:** 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, bush firefighting and fire investigation.

CleanSpace 2 can be used in a variety of industrial applications where water tolerance or intrinsic safety is not required.

- **Customer Support:** CleanSpace Technology, an Australian company based in Sydney, assists in product training, fit testing and instructions on maintenance and care with attentive customer support. **AMR**

CleanSpace EX PAPR with full-face mask.



Scan for more info

CleanSpace Technology
sales@cleanspacetechnology.com
cleanspacetechnology.com



CleanSpace Respirator with half-face mask.

CleanSpace Respirators



WA's Fabrication Specialists



Specialist steel fabrication company Arch Engineering has been operating since 1970.

With the capacity to complete a wide variety of fabricated steel projects for the mining, process, oil and gas industries, it can manage, implement, and integrate all aspects of complex industry projects from drafting, fabrication through to surface treatment and delivery.

The business, located in Bibra Lake, WA, has a 3000m² facility and employs a skilled workforce with commitment and experience to match all project requirements.

Arch's fabrication team is experienced and possesses strong capabilities to execute wide ranging fabrication projects for mining, oil and gas.

The team is committed to high quality standards and efficiency to ensure client expectations can be met, and boasts quality management system certification to ISO 9001:2008.

Arch Engineering's fabrication workshops are equipped for all type of fabrication and modularisation services.

They incorporate three fully equipped workshops utilising four overhead cranes with up to 20t capacity capable of handling all types of fabrication.

Its mining and mineral processing services include:

- A wide range of structural packages
- Screening equipment
- Crushing equipment
- Conveyors
- Shuttles
- Chutes
- Mining consumables and tools
- Plate work fabrication
- Pipe supports and clamps
- Railway equipment
- Handrails, stairs, walkways
- Trusses
- Silo conveyors
- Monorail structures
- General steel fabrication

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9 Rivers St, Bibra Lake WA 6163
 P: 08 9418 5088 E: admin@archeng.com.au
www.archengineering.com.au

All workshops are fully equipped for all types of fabrication services.

Facilities incorporate three fully equipped workshops utilising 4 overhead cranes with up to 20 tonne capacity capable of handling all types of fabrication such as:

STEEL FABRICATION

- PLATEWORK
- STORAGE TANKS
- CONVEYORS
- OFFSHORE STRUCTURES
- SUBSEA STRUCTURES

WA'S STEEL FABRICATION SPECIALISTS



2 of 4 large variable speed centrifugal fans designed & built for the Insol open windtunnel facility, Invercargill New Zealand.

Air Management Experts

Fowlerex has been providing dust control and air pollution solutions to mine sites throughout Australia for more 50 years, and in that time, it has prided itself in staying ahead of the curve when it comes to the importance of dust control.

In that past two decades, there has been a substantial increase in the awareness of the possible environmental impacts of mining operations.

The industry itself has taken initiatives such as the Development Partner Institute of Mining to re-imagine how mining operations can interact with their surroundings and provide a strongly positive impact on local communities.

A matter of primary concern for mine operators is the impact of airborne particulate matter on the health of employees and any nearby communities — even communities over four kilometres from a site can have their air quality, and subsequently, their quality of life and well-being affected by dust and pollution.

Depending on their composition, particulates may pose a chemical risk to health, and this includes the effects of fumes that may be generated from an extraction process.

Air pollution control has consequently become a key element of mine

environmental management plans. Properly addressing sources of air pollution through implementation of a well-constructed environmental management plan (EMP) provides a number of benefits to the mine operator.

Benefits include a healthier workforce with higher morale, reduced illness, higher productivity, reduced litigation risk; reduced plant maintenance cost; improved relationship with nearby communities; reduced regulatory hurdles.

Fowlerex Technologies has been helping mine operators and mineral processors address air pollution issues for over 50 years, providing solutions at point sources such as crushing, screening and receiving bins.

Customers benefit from working with a company large enough to fabricate equipment to its own designs, yet small enough to be an excellent communicator, responsive, and dedicated to providing bespoke solutions to address site-specific needs.

The Brolton Group have found great success on their projects with Fowlerex.

“The collaborative approach, industry experience and practical knowledge shared by Fowlerex Technologies on our fly ash classifier project contributed significantly to us meeting the end client needs, securing the contract and completing a successful installation.”

Fowlerex design engineering teams in Australia and New Zealand analyse needs, design solutions, and project manage the production, installation and commissioning processes – a turnkey operation with minimal effort and disruption for clients.

Fowlerex’s factories in New Zealand build equipment to Fowlerex custom design, including baghouses, scrubbers, ESPs, multicyclones, fans, rotary valves, and waste-to-energy plants. It designed and built one of the southern hemisphere’s largest open wind tunnels.

Fowlerex knows how to manage air. In this current environment of logistical delays from the northern hemisphere and stock shortages, Fowlerex is finding that the local manufacture from sheet and plate steel provides a particular benefit to our customers through having a reliable supply chain, minimising supply risk.

Customer satisfaction and swift response time are high priorities for Fowlerex, says Doug Pigou, Managing Director of Fowlerex Technologies.

“What I have found is that customers really appreciate our after-sales support. As an example, recently in the late afternoon a customer in Victoria suffered a failure of a specialised food-grade component. We had an engineer on site early next morning troubleshooting a short-term solution until a replacement unit could be shipped from Italy.”

Fowlerex supplies solutions to Australia and New Zealand, as well as Africa, Asia and the Middle East.

Our society relies on minerals to maintain our standard of living. Mine operators and mineral processors can rely on Fowlerex Technologies to design, build and support engineered solutions that work, year after year.

For more information about dust control solutions, please visit <https://fowlerex.com.au/> **AMR**



FOWLEREX

DUST & FUME CONTROL

BESPOKE TURNKEY SOLUTIONS



- VERTICALLY INTEGRATED SOLUTION
- DEDICATED TEAM OF DESIGN ENGINEERS & PROJECT MANAGERS
- COMPONENTS FABRICATED IN OUR OWN FACTORIES
- AUSTRALASIAN SUPPLY CHAIN – AUSTRALIA & NZ
- SPECIALISTS FOR 50 YEARS
- GLOBAL REACH
- PROMINENT SUPPLIER TO MINING, MINERAL PROCESSING, TIMBER & FOOD PROCESSING

P: +61 2 8850 7611 | E: admin@fowlerex.com.au

www.fowlerex.com.au

Be On Guard, Breathe Safe



2021 has seen an increase in awareness of dust dangers and mitigation in the workplace.

From the new ISO standards to free lung testing for retired workers, there is an elevation in personal and corporate responsibility to prevent dust exposure.

For operator cabins, some pressuriser systems rely on HEPA filtration and positive pressure within the cab to keep dust out, but many rely on external auditing systems to support their claim.

In contrast to the old industry standard, Queensland-based air specialist BreatheSafe has developed a new system that continually

observes and records the quality of air within the operator cabin.

With this data, BreatheSafe's flexible computer controls the infrastructure installed to provide the best possible practice achievable to minimise exposure to hazardous particulate matter.

BreatheSafe director Nick Johnstone said the company believes the only way to ensure zero harm is to aim for zero exposure.

"We approach air quality with the aim of any exposure being unacceptable," he said.

Introducing OnGuard

In his pursuit for zero exposure, BreatheSafe

has created OnGuard - a new combined environmental monitor and pressurisation controller with innovative features meeting and exceeding ISO 23875.

Other typical air quality monitor systems measure CO₂ and pressure levels within the cabin, with a visual display and optional downloadable data.

The OnGuard system measures and records much more than that. It can measure HVAC dust levels, breathing zone dust levels and ambient zone dust levels.

As well as the traditional mass concentration levels, it also measures particle count, which BreatheSafe believes will be the focus of dust control in the future.

The OnGuard can also measure environmental and supplementary variables such as airflow, motor load, alerts and events, humidity, temperature and of course CO₂ and pressure, and any exceedances of safety parameters are logged and presented as audio-visual alerts to the operator.

Data logging is performed at a high frequency — once every second unless otherwise specified.

Users can examine this data in real-time using the OnGuard web interface and dashboard which offers extensive graphical visualisations, downloadable database, real-time live charts, and access to historical data.

The OnGuard web interface also provides a fine-grained access control hierarchy and long-term configuration tracking.

Efficiency and Automation

Having fully automatic data logging and alerting removes many opportunities for human error and is cost effective in the long term. Access to this real time data provides convenient visibility and allows managers to make informed decisions without undue delay, thus increasing safety and productivity at mining and construction sites.

With safety and costs in mind, the OnGuard has been designed to work either with BreatheSafe filtration and pressurisation hardware or any other brand, including OEM-installed ones.

BreatheSafe is dedicated to developing the best air quality products available on the market through ongoing innovation in its technology.

"We win if you win - systems are being sold where people believe they are being protected. We've designed a system to ensure they are being protected," Mr Johnstone said.

For more information about OnGuard and BreatheSafe's other air filtration solutions, please visit www.breathe-safe.com.au

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Know. See. Control.

The OnGuard displays data both in real-time dashboard display, colour coded for convenience, and as real time graphs.

Intelligent Air Quality Management

Know, see and control the air you breathe, and breathe safe.

This latest technology is optimised for gathering data for advanced system control and delivers unprecedented insight to the efficiency of any air quality management system.

BreatheSafe

Call **07 3276 7833** or email sales@breathe-safe.com

A Gold Standard for Dust Control



Tennant Company has a long history of innovation, manufacturing a commercial and industrial range of cleaning equipment solutions dating back 150 years.

Its first vacuum-equipped sweeper for industrial use was invented in 1947, followed by versatile combo sweeper-scrubber units and a suite of products that have kept up with the changes in both technology and safety like the new T16AMR in 2021 - the Industry's First Industrial robotic solution designed to work safely and efficiently alongside employees. Tennant has a diverse list of clients with workplaces of all sizes, including some of Australia's largest ports, mining and processing companies.

The dust control industry is developing swiftly, with new state regulations setting higher benchmarks of accepted exposure. Across industries, it is known that dust exposure, particularly to silica dust, is a serious on-site threat to the health and well-being of workers.

Silica dust is 100 times smaller than a grain of sand, and exposure can lead to serious respiratory conditions. Controlling the extremely fine dust is a complex task for industries alike, requiring both

proper engineering controls and effective housekeeping practices.

Tennant tools and technologies can play an important role in helping to manage the silica dust challenge. Tennant's solutions can support silica exposure control plans that help create safe, healthy, productive work environments, and work toward Occupational Safety and Health Australia (OSHA) compliance. Tennant has an assortment of industrial sweepers, ranging in size from the S10 walk-behind to large hopper, cab-equipped models like the S30 and 800 models. Many of Tennant's larger rider sweepers come standard with a unique combination of exclusive built-in dust control features like the SweepMax® Plus cyclonic air filtration system.

Dry sweeping with an additional final-stage HEPA filtration system is an alternate method in applications where other methods are not feasible. For additional operator protection, HEPA-pressurised cabs fitted with a magnehelic pressure gauge are available on select models (S30), along with external dual brush dust suppression skirts. Support your dry sweeping dust exposure control plan and work towards WHS compliance by choosing equipment with true HEPA filtration systems.

Supplier-tested and certified, Tennant's High Efficiency Particulate Air Filters meet strict industry standards, trapping particles as small as 0.3 microns and delivering at least 99.97% efficiency. WA territory manager, and 18-year industry veteran, Adrian Taylor said he has seen the company's equipment operating in some of the most challenging industrial environments, and it performs beyond expectation, day in -day out.

"Servicing is key to uninterrupted performance. Our onsite TennantTrue® service and maintenance program is genuinely the gold standard," he said.

"All our field technicians are company-trained, carry parts required on board and

not only do they know how to repair or service every single one of our machines, they know how to operate them too.

"There's simply no room for equipment downtime."

To learn more about the Silica Dust Business challenges and Tennant Australia's latest product innovations, check out the website or reach out to the customer service team.

Visit: <https://au.tennantco.com/apac-en/pages/solutions/silica-dust-solutions.aspx>
P 1800 226 843

E contactus@tennantco.com

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SILICA DUST SOLUTIONS

- DRY SWEEPING
- WET SWEEPING
- WATER FLOODING

SUPPORTING EXPOSURE CONTROL PLANS

Tools and technologies to support silica dust exposure control plans and help you work toward WHS compliance

- MAINTAIN AIR QUALITY
- HELP MAINTAIN WHS COMPLIANCE
- CREATE HEALTHY ENVIRONMENTS

TENNANT TENNANTCO.COM.AU

DUSTAC - Total Dust Control

With a wealth of experience behind it, including successfully solving dust control issues for some of the world's biggest mining and construction projects, DUSTAC is continuing to expand its service through its "TOTAL DUST CONTROL" offering.

The Australian Mining Review recently spoke with Glen Lee, who provided us with an update on the company's activities and an overview of why it is critical to have the best dust control solutions in place for the long-term.

"What is important to note, first and foremost, is that we offer wholistic customised solutions to clients, big and small, that target unique operational issues across a range of industries".

"All our products and services are premised on 3 core values – water wise, effective against dust, and intrinsically safe to people and the environment", Glen said.

"Dust is a tricky topic in that the negative impacts associated with dust are invariably hidden or intangible – this means the negative impact dust has is not always fully appreciated or understood. For example, the impact dust has on the health of employees who breathe it in is not immediately obvious – it can take years for the impact to be realised, the impact dust has on the efficient operation of machinery and equipment is not immediately obvious – this builds up over time, and the impact mining and industrial dust have on the natural environment is not immediately obvious – this too is a slow burn".

Glen adds, "Our team has many decades of experience managing various types of dust from iron ore in the Pilbara, coal in the Hunter, Illawarra and Bowen, to hard rock dust in the Goldfields and fugitive dust on residential and commercial sub-divisions across Australia and New Zealand."

Glen insisted it was important for people to understand who DUSTAC are as a company - "Our vision is to be recognised as the most practical and effective partner for customised dust control solutions in the mining, civil and construction industries in Australia".

"Our mission is to produce the highest quality dust management solutions for mining, civil and construction companies by employing the best people, by developing and utilising the most efficient and up to date technologies and incorporating the best quality inputs to develop relevant and applicable dust control solutions that add value to our clients operations and save water".

"Our business model is simple – we work with your team to ensure dust is totally controlled in a safe and sustainable manner that best suits your operations. We offer a number of services and products, these can be engaged as a sequence or in individual packages – but they are all specific to dust control". "We are no longer just a road based dust suppression additive manufacturer, now we are a turnkey, total dust control specialist that can support anything from mine operations to port facilities and everything in between".

DUSTAC's Core Competencies include:

- Site Dust Assessments and Reports
- Onsite Dust Monitoring & Analysis
- Road Based Dust Suppression
- Materials Handling Dust Suppression
- Civil & Subdivision Dust Suppression
- Dust Suppression Equipment Hire (Water Trucks & Fog Canons).

"To give you an insight as to how we approach dust control let me elaborate gently on some of our core competencies" he says.

"Firstly, it is critical that we understand where the dust is coming from and how it is being generated. The origins of dust may seem obvious at first – for example one might simply say – mate the dust is coming from the road – well where in the road is it actually coming from? We would take a simple dust generation point like a road and identify whether the dust is coming from the crumbling of the road surface substrate, is it loose material falling off the haul trucks, is it blowing in from adjacent stockpiles, is it naturally generated fugitive dust etc. The same can be said for materials handling circuits – yes dust is coming from the crushing circuit, but where and why are the various dust levels being generated. It is often a combination of all of the above, but understanding them in isolation helps develop the most robust management strategy – we like to be on site to get this assessment done and we produce an investigative report as a result of this assessment. There is no charge for this service, it is FREE –this initial visit gives us a clear understanding of your issues and we believe it allows us to determine whether or not we can add value to your operation".

"Once we have identified the issues we go about developing what we believe are the most effective solutions – and we follow through till after implementation".

Roads – "We understand that haul roads and access roads vary from site to site. They can be made of different materials, of different sizes, made of material from different locations. The types of traffic that runs on the roads is different, the materials transported on those roads varies depending on the commodity being mined, and so we take great pride in having the ability to customise our road based dust suppression solutions according to the requirements."

Materials Handling/Conveyors – "Dust generation opportunities on conveyor circuits are multiple and we take into consideration aspects such as material (ore) specifications, belt speeds & widths, optimal moisture content, skirting technology, stockpile discharge parameters, ROM & ROM bin design, ship loader attributes, stacker/ reclaimers environment, stockpiles, existing dust suppression infrastructure and chute/transfer point design, production output and so on – consideration needs to be given to all these areas in order to design and implement what we would call a comprehensive and sustainable dust control strategy".

A significant benefit the DUSTAC solution offers is its local production.

"Not only are we proud to be Australian made - we think its hugely important that



Careful water management is a core value at Dustac.

we have local footprints too. We currently manufacture product in Western Australia, New South Wales and Queensland. Because we manufacture in Australia, we don't have to import finished product like our competitors. We are able to be more flexible in product design and we are able to provide solutions that suit local conditions and specific outcome targets.

"Whether it is increased moisture retainment in the road or conveyed material, a firmer road running surface, a stronger road surface bond, reduction in particulates on the ROM, fines containment at ship loading, or major changes in the overall project specifications - we can modify our solutions accordingly".

"We are looking at long-term relationships with clients who are genuine about controlling dust".

Major Issues

What is possibly not well understood is the wide range of severe issues related to dust that can lead to severe impacts on lives and business.

Glen says this can include health, operational, safety and environmental issues.

Health

"Dust can create serious health issues for your employees and the local community. The regulations are becoming more and more stringent, but change is not happening quickly enough. There are still many fully operational sites in Australia where employees are unwittingly breathing in fine dust particles everyday. The industry has a responsibility to ensure the health and well being of employees is guaranteed each and every time they front up to a shift. Part of our commitment to our communities is our FREE on site assessment. We feel by offering this service as a FREE service – we are playing our part in highlighting workplace risks and enlightening leaders in the industry on methods they can employ to protect their employees and the communities within which they operate. There is no obligation to pay us or buy anything from us – we help you help your employees and the community".

Operational

Then there are the operational costs.

"Dust has a direct impact on your machinery, leading to increased servicing and increased damage to vehicles and trucks. Plant is directly affected and subsequent dust related shutdowns can even lead to loss of production. Poor road substrate conditions leads to increased grading that in turn increases operational costs and affects efficient production".

Safety

In addition to the health and operational impacts, there is the physical safety risk. Dust may have a significant effect on visibility on the roads. "You would be surprised at how many roads there are around the country where two vehicles pass each other and visibility is completely lost. I was on a road in the Pilbara just last week and had to pull over as a road train went past. I could not see a thing for over a minute after it had passed me – how can we still be exposed to this on active public roads? We have solutions for this! Maintenance grading on

dry roads is another process that can be better managed with the correct tools – how often do you see vehicles going around graders and there is zero visibility ahead. Also, there are a lot of roads in the industry where vehicles travel into the sun, if there is dust on the road visibility is seriously reduced and it becomes dangerous – we can treat roads to make them more safe".

Environment

The natural environment is negatively affected by dust generated from current mining and industry operations – we need to be mindful of a number of factors that cause dust to negatively impact the local environment:

- Dust is being generated in areas where it was not necessarily generated before and the local waterways, fauna and flora have not adapted
- Dust is being generated at volume levels never experienced before in the local environment and local fauna and flora have not adapted
- Dust is being generated in particle sizes never experienced before in the local environment and local fauna and flora have not adapted
- The type of dust being generated now will be physically different to what may have been occurring in the natural environment before the current disturbance.

Dust from ore concentrates, tailings dams and processing circuits will contain minerals foreign to life on the surface and in the local waterways.

"We have an obligation to future generations to leave the environment in a way that is similar or better than when we found it".

Cost Savings

There are a number of potentially significant financial benefits of engaging DUSTAC.

Glen says water savings are huge – upwards of 60% and can be much higher. "Whilst you will always need water and water trucks to manage roads – we can ensure you conserve water AND money by utilising both these resources efficiently. On conveying circuits we can ensure you use the right amount of water and in the right way – to deliver your product to its destination- whether that be to a stockpile, a ball mill or onto a ship.

"Clients can also save upwards of 50% of their grading costs with properly surfaced roads". That can be a massive saving.

DUSTAC have products that can save up to 40% on road re-surfacing costs, products that can reduce erosion in areas like tailings dam structures and railway batters, and even sealing off waste dumps or fibrous material hazards.

"Any site that is running water trucks, sprinkler systems or employs nozzles of some sort to control dust – could benefit from what we offer. When someone is looking for a dust control solution, we want them to think DUSTAC"

With so many risks involved with not having the right dust control solutions in place, it is good to know one company is taking it very seriously. **AMR**

Eradicate dust. Save water. Reduce costs.



CUSTOMISED AND INTEGRATED DUST MANAGEMENT

DUSTAC provides solutions for total dust control on mine sites, roads, materials handling and process circuits, stockpiles and ROMS *and* port handling facilities. All our dust control solutions are premised on three core values: **effective against dust, water wise** and **safe for people and the environment**.

We work with your team to address site specific dust issues and understand that dust problems vary from operation to operation. Through comprehensive site assessments and analysis we have the ability to develop and implement sustainable solutions that suit your needs.

For more information, please contact Managing Director, Glen Lee on 0451 447 683 or via email on glen@dustac.com.au and mention this advertisement for a **free, no obligation** site assessment and report.



DUSTAC.COM.AU

EnviroMist Dust Suppression Technology Application



EnviroMist has been providing high energy micro-mist dust suppression systems to Australian mining companies for the past 12 years.

Systems are installed in both above and below ground mines and have proven to significantly reduce dust emissions when compared to other dust suppression systems.

Due to the nature of EnviroMist high energy technology, EnviroMist dust suppression systems are able to work in environments and locations in which low pressure dust suppression systems are rendered ineffective or utilising very high volumes of water.

Examples of such systems applications are in large truck dump ROM bins, on underground continuous miners, on longwalls, off the end of large stacking conveyors and in process plants.

EnviroMist systems have been proven to use less water than low pressure dust suppression systems for the same application. For example, an iron ore ROM bin dust suppression system replaced an existing low pressure dust suppression system which used 250% more water.

The EnviroMist system not only used less water, it also significantly increased the dust suppression at the ROM bin, reducing dust levels over 90%.

EnviroMist systems:

- Give small (10-60 micron) water droplet size without the need to add air (ie compressed air dust fogging nozzles)
- Reduce the water droplet size to match that of the dust particles, increasing the chance of capture compared to large water droplets
- Produce large volumes of small droplets giving a much higher chance of water droplets hitting dust particles, and therefore capturing the dust
- Are able to work with normal mine water without any additives. Potable water is not required for operation.

In ROM bin systems, the energy behind the spray stream creates a pressure curtain which captures the majority of dust liberated

during dumping operations and thus keeps the dust within the dump pocket unlike low pressure dust fogging systems.

The captured air is contained for sufficient time to ensure all the dust liberated from the ore has been suppressed.

The photos below show before/after pictures of a ROM bin with an air enhanced dust fogging system compared with the same bin with EnviroMist system installed. The photos are taken at the same periods during the dumping cycle (see figures 1 and 2 below).

At BMC's South Walker Creek mine, EnviroMist was commissioned to install a dust suppression system around the ROM bin, feeders, crushers and transfers.

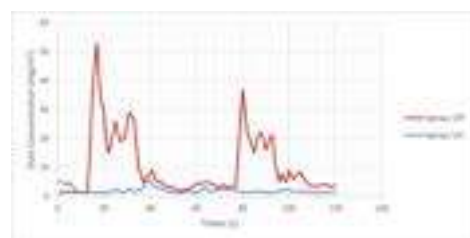
The ROM was found to have respiratory dust levels in excess of the legislative requirements and was five times in excess of the 2mg/m³ mass average allowable limit.

Following the introduction of EnviroMist Dust Suppression system, the dust levels were reduced to within legislative compliance. Testing confirmed a reduction in total dust particle mass from 10mg/m³ to 2mg/m³.

The graph below shows online testing data for the dumping operations.

The data spikes relate to the front-end loader dumping product into an empty bin and have been reduced from 52mg/m³ to 5.4 mg/m³.

In addition, the reduction in air borne dust saw a marked reduction in cleaning with a further benefit of keeping the dust entrained in the product stream where it can be processed.



Dust concentration measured with and without the dust suppression system operating.

Early longwall production at Anglo-American Coal's Grosvenor mine highlighted areas of excess dust emissions.

Of particular concern was the BSL discharge point, where coal is loaded onto the longwall section belt.

Static monitoring conducted by both Grosvenor and GCG hygienists indicated that the BSL discharge contributed to the intake respirable dust concentration by up to 2mg/m³/shear.

Additionally, reduced visibility was significant and noted as becoming more prevalent as production increased to near nameplate capacity. Prior to commencement of the EnviroMist project, there were existing controls in place, including a scrubber and various water sprays; however, these systems were unable to completely eliminate the dust liberated. In response, a solution using EnviroMist's micro-mist technology was pursued.

The solution to the dust issues around the BSL was the application of EnviroMist's innovative high-energy micro-mist dust suppression technology.

These systems use specially developed nozzles operated at pressures in excess of 100 bar to produce a high-energy mist with controlled droplet size, velocity, water consumption, and spray angle.

A system such as this allows dust capture to be maximised whilst reducing negative side effects generally found such as belt flooding, overspray, and unwanted dust diversion.

The figure below demonstrates the high-density mist that is produced by the EnviroMist nozzles in comparison with a standard nozzle that is commonly used for dust suppression purposes.



The EnviroMist high-energy micro-mist system was installed, resulting in an immediate and significant reduction in dust around the BSL area.

Monitoring following the installation of the system showed the average respirable dust concentration due to the BSL discharge was reduced by approximately 75%, down to approximately 0.33 mg/m³/shear.

Evidence from the main gate operators on shift following installation also supported the claim of such a dramatic dust reduction.

Maintenance

One main maintenance advantage of the EnviroMist system is that nozzles rarely block and the high-quality components last for years.

EnviroMist only use certified stainless steel in their spray blocks and nozzles, with the nozzle material selected for greater wear life. Experience with installed systems have shown that a correctly filtered system will result in nozzles that last for years without needing replacement.

EnviroMist nozzles are manufactured using the latest in machining technology and have never failed during operation.

EnviroMist dust suppression technology is currently being used in surface mining, underground mining, drill and blast operations, transfer chutes, materials processing plants and ship unloading operations.

Systems are individually designed for each task with 3D models produced to ensure the system is compatible with the existing equipment and to ensure clients understand the design prior to manufacture.

EnviroMist has numerous spray bar designs and is always developing new designs to improve the output or to meet specific space, material or site requirements.

For more information:
www.enviro-mist.com.au
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Figure 1

Air enhanced dust fogging system during truck dumping – dust is escaping through the spray.



Figure 2

EnviroMist system during truck dumping at same time periods – the dust is contained.



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- Transfer Points & Chutes
- Construction Machinery

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Dust Safety and Solutions

Wheel generated dust from haul traffic is a significant contributor to overall dust levels at the mine. Investing in quality dust control program for your roads should not only reduce dust and improve mine safety, it should also deliver productivity improvements and reduce operating costs. Dust-A-Side offers proven road treatment technologies and a range of flexible application services for your mine.



Dust emissions from processing and handling transfer points such as ROM areas or stockpile discharge cause particular hazards and concern given their proximity to maintenance and admin facilities. Talk to Dust-A-Side about implementing an efficient, process friendly solution for capturing airborne dust, ore conditioning for dust prevention and surface area capping to control these applications.

Dust-A-Side Australia provides complete and integrated dust control management solutions that have been proven to increase productivity and safety, unlock cost efficiencies for a client's operation and benefit the environment. This "one-stop" dust-management shop delivers an operationally sound and cost-effective solution across your entire site.

As many stakeholders in the Australian mining industry are already aware, there have been recent legislative changes aimed at tightening occupational exposure limits (OELs) or workplace exposure standards (WES) for coal and silica dust in mining operations.

These policy changes were prompted by a spike in the number of mine workers being diagnosed with black lung disease and silicosis in recent years. A lack of adequate and effective dust control measures around mining activities has contributed to the increase in frequency of black lung disease and silicosis cases.

Silica Dust: On 1 July 2020, most states adopted Safe Work Australia's recommendation to halve the WES for respirable crystalline silica from an eight-hour time-weighted average airborne

concentration of 0.1 milligrams per cubic metre (mg/m^3) to $0.05 \text{ mg}/\text{m}^3$. WA was the last of the states and territories to move to this standard on 27 October 2020 with the exception of Tasmania, which has currently remained observing the prior standards set in 2018.

Coal dust: As of 1 October 2022, all coal mines across the country will need to adhere to a new dust respirable exposure standard of $1.5 \text{ mg}/\text{m}^3$, which is a reduction from the previous standard of $2.5 \text{ mg}/\text{m}^3$. Queensland has already moved to adopt these standards and most of the other states and territories are planning to implement well prior to the deadline.

For a summary of the current WES by state for coal, crystalline silica and other inhalable not otherwise specified (NOS) see table 1 below right bottom of this page.

It is an extremely positive sign to see that most states and territories are planning to implement the new coal OELs ahead of the October 2022 deadline. The changes to the legislation are ultimately designed to better protect the health of mine workers as well as the communities in close proximity to mining operations.

Both state governments and mining groups have come to recognise the critical importance of implementing these changes in order to eliminate cases of black lung disease and silicosis. This is a very positive approach to see.

"Dust-A-Side is uniquely positioned and capable within the Australian market to effectively address dust control issues from pit to port. Our range of product technologies and flexible service support options have continued to deliver results for our clients in the mining sector since 1973," said Vaughan Gray, national sales and marketing manager.

In addition to reducing WES, mines from the west coast to the east coast understand the importance of fostering goodwill among local communities by proactively controlling visible dust emissions.

Reducing both respirable and visible dust is a particularly prevalent issue for any mine located in close proximity to townships. While remote mines will need to adhere to dust OELs to keep their workforce safe, mines operating within or next to established communities also face the added challenge or reducing visible dust plumes that can threaten air quality and visible pollution in the nearby towns. These considerations have important consequences on a mine's social licence to operate and in building goodwill with community stakeholders.

How Dust-A-Side can help mines achieve reduced OELs for coal and silica dust and reduce visible dust emissions

Mines across the country are thinking more seriously about their dust control and mitigation strategies to meet the reduced OELs for coal and silica dust.

To achieve consistent site-wide dust control and to most effectively stay within mandated OELs, mines must address each dust generation point separately with targeted solutions. This includes every stage of the mining process from pit to port.

Many mines focus the majority of dust control efforts on haul road networks. However, it is absolutely critical for mines to tackle dust issues in relation to production/processing plants as well as activities where workers are directly exposed to dust in more confined spaces, such as underground mining and drilling or within processing plants.

Dust-A-Side Australia works with mines in all states to implement dust control solutions

for every single step of the material process flow and to provide targeted solutions at each critical point.

Our experts look at each mine site from a holistic perspective. Our philosophy is to not just simply supply clients with dust control products that they need to apply themselves, but to work together to provide effective and targeted site-wide systems and solutions.

With decades of experience to rely on, Dust-A-Side offers Australian mines the following solutions for actively reducing coal and silica dust levels.

"We are Australia's only dust control specialist with a certified management system for dust control and haul road maintenance. If you want the right outcomes from a dependable supplier that takes the time to understand how you operate, then please talk to us," said Mr Gray.

Standard and custom designed dust suppression systems proven to reduce levels of respirable sized dust by 80%+ in common applications such as ROM and tip areas, crushing plants and stockpile feeds.

Haul road maintenance programs and technologies proven to reduce operational dust levels by 90%+. Our range of revolutionary dust monitoring software helps mines to easily identify haul road defects as well as measure real-time.

For more information about Dust-A-Side's dust control solutions, please visit www.dustaside.com.au

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Table 1: WES respirable coal, crystalline silica and inhalable NOS by major mining state

State	Respirable crystalline silica dust (mg/m^3)	Respirable coal dust (mg/m^3)	Inhalable NOS (mg/m^3)
NSW	0.05	1.5 (FROM 1 FEB 2021)	10.00
QLD	0.05	1.50	10.00
WA	0.05	1.5 (from 27 Oct 2021)	≤ 10.00

Manage your dust OELs from Pit to Port.

Dust-A-Side is Australia's only holistic dust control and mine road management service provider. Our site-wide solutions have been proven to increase productivity and safety, unlock cost efficiencies and benefit the environment.

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Not All Dust Control Technologies Are the Same



DustTamer™ Windfences

Dust control in a mining and process environment has increasingly come under the spotlight over the last few years in Australia with exposure limit reductions and more frequent regulator inspections, often resulting in notices of improvement or even prohibition notices in some cases.

Unfortunately, most generic designs for dust control are generally poorly conceived, utilise basic technologies with little or no consideration for the material being processed, and will often be either neglected or switched off by operators to reduce handling issues or water addition to the product.

Dust generation points wherever the product is disturbed, such as at truck dumps and hoppers, crushers, screens, conveyor transfers, stackers and reclaimers, train loaders and unloaders, and shiploaders all have the potential to create harmful fugitive dust emissions and require an effective control method to eliminate the problem.

MARC Technologies' approach considers a holistic look at the plant, using best available technologies that combine to give efficient and effective dust control outcomes for each area, and often with less controls required further down the process as a result of upstream treatment.

No expensive chemicals are needed, nor extreme pressures, but well-engineered, tailored systems that are guaranteed to bring dust levels well within regulatory requirements and future proof the operations.

Dust Solutions Inc (DSI) Dry Fog™ systems use an ultra-sonic nozzle that uses low pressure air and water to produce water particles less than 10 microns in diameter, which scrub out fugitive dust by agglomeration of like-sized particles – they effectively bind with the dust particles and drop them out of suspension.

Dry Fog™ uses around 1/5th of the water used in a traditional water spray, producing a fog that is dry to touch and helps avoid associated issues with carry back and belt wear, and hence can also be used with moisture sensitive materials such as cement, phosphate and bauxite.

The low moisture addition, typically 0.05% by volume, also decreases thermal penalty in coal power applications. Blockages are rare at the nozzle as the venturi design within the nozzle means that the water and air orifices are relatively large, though these systems also have dual filtration as standard to factor out poor water supply.

Dry Fog™ systems effectively control fugitive dust where there is no opportunity to get moisture into the material, such as at truck dumps or shiploaders, they capture and reduce fugitive dust levels, down to respirable dust particle size, by as much as 90%.

NESCO™ pressure misting systems are cost effective systems that are tailored to the plant - designed based on the material type and throughput, with strategically placed sprays that aim to inject controlled amounts of moisture where needed, and atomised sprays to knock down fugitive dust where required.

Moisture control is paramount, and water addition is kept to a minimum to ensure there are no handling or carryback issues, but significant dust reduction using an adequate spray pressure to penetrate and coat the surfaces of the material, not simply wet the top.

Concentration of sprays at crushers where new, dry surfaces and dust generating fines are released, are target areas and if implemented in the right way lead to far less dust emissions further down the process. Single systems that are based on one skid can often service an entire plant, and will likely pay for themselves by reducing shipping weight with less water per tonne and less constant maintenance due to belt wear and carryback.

DustTamer™ Windfences are also an effective dust control method for larger areas such as stockpiles and tailings piles. Dust take-up from piles due to wind effect can result in liberated dust travelling large distances, into neighbouring properties and potentially nearby populated areas.

Controlling dust emissions from the top surface of the pile with water cannons offers limited protection, but this has to be constantly applied, and there are detrimental and unwanted effects with excess water on the material.

DustTamer™ Windfence Systems are designed to drastically reduce wind velocity and particle movement for a potentially large area such as a stockpile, thus minimizing fugitive dust emissions with consistent reliable results. The windfence is a permanent structure, and uses a

hard wearing, UV stable knitted polyester material that is strong enough to be used in cyclonic regions.

This material exerts a drag force on oncoming wind velocities, and allows a portion of the wind volume to penetrate through the screen as well as deflect the remainder of the wind to the surrounding sheltered area. Subsequently, the velocity lowers to below the point required to initiate particle movement.

Combinations of these technologies can produce spectacular dust reduction in even the dustiest of plants. It's time to get serious about dust control, not all dust control technologies are the same – give us a call to find out why. **AMR**



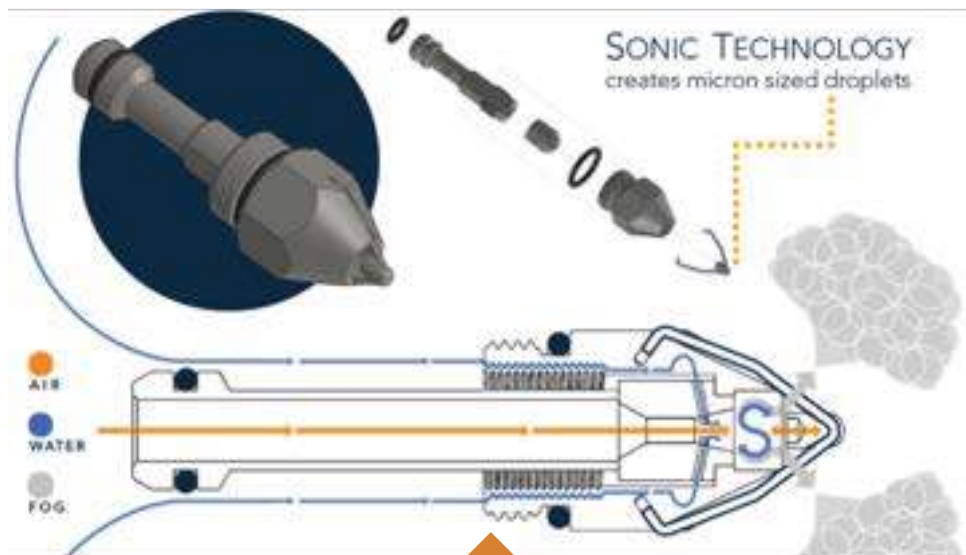
MARC Technologies has been successfully delivering dust control solutions to the mining and industrial sectors since 1995.
www.marctech.com.au



Dust Solutions Inc. provides innovative, tailored dust control technologies worldwide. www.nodust.com



Dry Fog settles out dust down to respirable levels without adding moisture.



Dust Solutions Inc (DSI) Dry Fog™ systems use an ultra-sonic nozzle.



IT'S TIME TO GET SERIOUS ABOUT DUST CONTROL



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Customer Care: The Benefits of a Preventative Maintenance Plan

Any instance of downtime - planned or unplanned - is costly for a business. Knowing you have the best, most reliable equipment is one thing but without ongoing care and service of that equipment, your business is constantly at risk of expensive reactive maintenance or repair shutdowns.

Preventative maintenance planning ensures even the highest quality products, designed and purpose built for their application and environment are given the utmost care and attention, throughout their life cycle.

It also adds an extra layer of protection beyond just having a fully warranted plant and regular scheduled shutdowns.

A preventative maintenance plan pays specific consideration to individual pieces of equipment, in the context of shutdowns, but also with regard to their constant ongoing care - 24 hours a day, all year round.

What is preventative maintenance?

True planning means care of your equipment is available whenever you need, on the phone or on site, wherever you are.

There are some misconceptions around this kind of planning, with tailored plans often thought to be lock-in contracts, with legally binding implications.

Suppliers that excel in service delivery understand that preventative maintenance is a critical component of their customer service - 'reliability' should refer to more than just the products - it must be inherent in the after-sale service and support that is

offered and delivered.

Preventative maintenance planning for Sullair comes in the form of their Customer Care Plans, customised for the individual business and covering all makes and models, around the clock and nationwide.

Powerfully, preventative maintenance planning enables a business to build their annual budget around the operations of the equipment - factoring in cumulative hours of running time, and the ongoing costs to maintain the unit, in advance.

One of the key benefits of this kind of forward-planning is cost reduction, with plans set at fixed pricing enabling a customer to accurately forecast servicing within OPEX budgets.

Customer Care plans also come with built in savings around priority part selection, and opportunities for reduced cost on listed spare parts, providing benefits to the customer against retail pricing.

Another significant advantage is the reduced administration of service needs, with set prices for 24 months allowing instant purchase order generation prior to work.

This means no time consuming back and forth administration around quotes and adjustments.

Shael Esler is National Service Business Manager for Sullair Australia, and she is passionate about how transformative preventative maintenance planning can be for a business.

"By working with our customers to understand the air demand onsite and collating the annual run hours of their machines we can then tailor a service solution to suit. This allows us to forward plan the servicing requirements, assisting our customers when building their maintenance budgets, and avoiding costly unnecessary breakdowns", explains Esler. Ideally the maintenance can be scheduled in line with pre-planned shutdowns, allocated to specific times best suited to our customer's production schedules to reduce the costs of unnecessary downtime".

Sullair's Customer Care Plans

Sullair has a three-tier preventative maintenance program in place, available to all of their customers and typically applied to Sullair or Champion products.

The care also extends to competitor equipment, and to whatever branded

equipment or parts are incorporated into the Sullair customers' compressor solutions (depending on the plan).

Sullair's plans are designed for your needs, customised to suit your business and the broader requirements of your industry. Plans are inclusive of all parts required to perform the service, labour, travel and consumable service parts (conditionally).

Sullair's commitment is to ensure not only that customers have the equipment they need, but they are comprehensively supported through the life cycle of their assets. **AMR**


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At Sullair, reliability doesn't stop with our quality products which are designed and built to last. Preventative maintenance planning ensures even the highest quality products, designed and purpose built for their application and environment are given the utmost care and attention, throughout their life cycle.

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Aussie's 4" 'Brigade Boss' high flow, high pressure fire pump in Mine Spec configuration, showing lifting bar and fire extinguisher.

THE AUSSIE MINE BOSS STORY

Warwick Lorenz, Managing Director of Australian Pump Industries, takes an insightful look into the past, present and future of Australia's mining equipment manufacturing industry.

It's tremendously encouraging to see companies who use to be Australian manufacturers now seriously re-evaluating going back into the building of mining and construction equipment right here in the country! The honeymoon with cheap third world products at irresistibly low prices seems to be coming to an end!

Some of us are old enough to remember leading manufacturers of mining and construction gear coming to Australia in the 50's, 60's, and 70's with a plan to build that equipment in Australia. Some of us will even remember that we had a home grown mobile machinery manufacturing industry, that felt it could do anything.

The country use to build Allis Chalmers motor graders at Bennets Green near Newcastle in NSW. At the huge Rydalmere plant of the old Tutt Bryant empire, they were building 150 tonne dump trucks and "Tourna-Dozers" (huge rubber tyred dozers to push coal around!)

In those days, manufacturers were protected by tariff barriers, some as high

as 55%. Getting import licences was also a challenge! We have to remember, thinking back to those days, the population was a fraction of today's and the wealth of the country revolved around Merino wool, not iron ore, coal, gas and gold!

As those tariffs came down, imports became substantially more attractive (relaxed import regulations). Australian manufacturers found themselves up against mass producers from the US, Europe and ultimately Japan! Great companies like Caterpillar, Euclid, Komatsu and Liebherr all entered the Australian market. They were followed by a horde of great excavator brands to replace the old Australian made "back-hoes".

The rest is history, with most manufacturers, even the innovative Chris Pannell (Pannell Plant compaction equipment) either became importers or simply disappeared.

THE NEW WAVE OF INNOVATION

What pleases us is to see a new generation of innovative companies building machines, based on the 'Australian Experience'. Who would have thought we would become the world's greatest miners? It seemed like the death and destruction of Australian manufacturing is not an entirely true story. Sure, we lost thousands of apprenticeships

but, we know that the innovators will ultimately win. Australia's Mining Review newspaper is full of them, emerging confidently, inspired by the industry.

WHAT AUSSIE MINERS WANT

What they really want is more time! Everything gets back to efficiency levels, cutting downtime, and more productivity! As a pump manufacturer, we've had experiences where mining companies have bought third world pump equipment, only to find out that there are problems with both the pump and engine. That can become a critical issue, particularly in so many applications that involve the transfer of liquid!

A flooded mine is not productive. Leaking pipes, can generate not only potential contamination but, in a situation of health issues, can even shut down the mine. System blockages and pipes, often through a build up of material inside the line, can ruin efficiencies, generate system failures, and have catastrophic results.

Production is everything and mining equipment suppliers work every day to generate solutions to combat those potential problems. Most of all, we see a growing unrest and distrust of cheap third world products and a tendency to move with products that are well known

for their reliability, safety standards and ethics. It may sound corny but, when it comes down to it, miners, unions and mine owners all want the same thing! A safe, productive environment for a successful outcome!

THE AUSSIE PUMP APPROACH

Here at Aussie Pumps, we've got a simple formula. We want to build and supply pumps and pressure cleaners for miners that we would want to use if we were operating in those potentially dangerous and demanding environments. Having faced that, and after lots of contact and feedback from mines of every type, we gradually evolved a product line that is truly Australian.

The products include self priming centrifugal pumps that are ultra reliable. We even warrant our pump ends for five years from the date of supply, something we've noticed none of our competitors have been courageous enough to do. Traditionally, we matched them to first world diesel engines, to ensure that our customers only get the very best, in terms of aftermarket support.

That's right, the engine is the responsibility of the engine manufacturer, traditionally, whilst the OEM, in this case, Australian Pump Industries, is responsible for what we bolt onto it and for the match testing to make sure that it runs smoothly and

within the power range.

We work with great companies like Kubota, Yanmar, Hatz and Deutz to make sure what we're putting together is the 'perfect match', product to engine.

A VERY SUCCESSFUL FORMULA

Mixing up the ingredients for our concoction of products is simple. First of all, we worked to develop the world's best pump package. We got great support from engine manufacturers and only worked with the best.

From there, we set out to develop products that began as semi agricultural pumps and turned them into products suitable for what we think is probably the worst operating conditions on the globe. To get that feedback, we didn't only work directly with miners but, with great hire companies like Coates, who have been deeply involved in the mining industry for decades. Coates' reputation is based on reliability and performance and having kit that works.

As a result of that continuous evolution of experience, we started building machines which were designed for the roughest conditions. We started with trash pumps!

ENTER THE MINE BOSS

2", 3" and 4" engine drive trash pumps use to be regarded as disposable items on sites. We heard stories of pumps being buried if they failed. Today, we build them super tough.

The first experience was with our big 3" and 4" heavy duty trash pumps, powered by Yanmar 10hp electric start diesel engine. Our engineers put together frames that were tough enough to look like they came out of a North American blacksmith shop, hot dipped gal'd and with huge integrated lifting bars. We threw a lot of steel at them.

To comply with mining requirements and with a plan to keep operators safe, we realised the necessity for battery isolation, E-stops in the event of an emergency and loads of fluorescent tape. We wanted these machines to be highly visible! From there, we moved upwards to big 6" trash pumps that could deliver 6,000 lpm of dirty water!

The answer there was simply to put more cost into developing heavy duty open impeller pumps that were capable of passing 3" spherical solids. A big front mounted clean-out port, is fitted to all our pumps, making them 'too easy' on site. An added touch was extended running fuel tanks and fire extinguishers in the event of an incident.

MORE HEAD PLEASE

Aussie's Mine Boss trash pumps are a rugged crew, in a range now from 2", 3", 4" and 6"! Their only weakness is that being fitted with big open impellers for solids handling, they are not capable of performing high head applications. We solved that problem by adapting a fire pump range of big pumps designed for village fire protection into the Mine Boss formula as well.

Available in 3" and 4" configuration, these machines, part of the original fire pump "Brigade Boss" line were converted into Mine Boss configuration. Yes, that meant heavy duty galvanised frames, E-stop, battery isolation and fire extinguisher.

Integrated lifting bars made them easy to move around and they were able to handle heads as high as 70m! That combination of high flow and high head meant we were able to achieve numerous chores around mine sites with a portable pump, powered by a 10 hp Yanmar diesel that weighed in at around 110 kilos. These pumps, with closed vane impellers, are capable of achieving performance figures that were considered to be quite remarkable. 400lpm and 50m head for a self priming pump (that's right, no priming devices needed), in a portable pump that can be moved easily on site was an instant success.

Bodies are manufactured from aluminium. Heavy duty cast iron pumps and even 316 stainless steel versions are on the way!

MORE FIRE POWER

Although the Aussie Fire Chief was regarded as the world's best lightweight portable fire pump, building it as a Mine Boss version had some challenges. We powered it by an L48 Yanmar 4.8 hp diesel engine, but built it into a super heavy duty stainless steel frame with integrated balanced lift bar.

The frame with sub base and anti-vibration mounts, like all our Mine Boss machines, was accompanied by battery isolation, E-stop and the essential fire extinguisher. The pumps were a huge success and were quickly followed by twin impeller super high head versions, capable of delivering up to 90 m head, and flows as high as 450lpm. They are compact, reliable and all backed by Aussie's free extended warranty!

The latest development, currently going through prototyping, is a big 4" cast iron semi trash pump, the Aussie GMP model B4XR-A, fitted with Hatz air cooled diesel engine. The big 4" pump, made of high SG cast iron, has it's front clean-out port integrated into the design. The pump will handle flows up to 2100lpm and heads of up to 30m.

The good news is that a stainless steel version of the same pump will quickly follow and will come out first and foremost in Mine Boss configuration. That stainless steel will be cast 316 and suitable for some of the toughest and most corrosive applications in mining!

WHAT'S THIS GOT TO DO WITH AUSTRALIAN MANUFACTURING?

That's simple, at Aussie Pump, we prove that by developing products for the tough Australian conditions, we can build machines that are as good as those built anywhere in the world or better. More so than importers, we equip these products to provide the mining industry with not only safer OH & S friendly product but, pumps that perform and are guaranteed by unique extended warranties. It's a sign of our confidence and the quality of the product.

Here at Aussie Pumps, we are focused on Australian design, using only first world components. That way, we plan to develop machines which are targeted to be the best in the world. That sounds pretentious but the Aussie Mine Boss fire pumps and our high head product lines are already in service all around the globe.

We are so proud of the Aussie Mine Boss product range and it gives us hope for Australian manufacturers. We just simply have to be better than imports, provide product which is more suitable for all the applications and put them on the market at

a reasonable price. It's a challenge for all of us in the manufacturing business. However, if you're going to be manufacturing, you can't just decide you will try and cut costs to beat importers.

We believe we have to produce something which provides real value. We know we will never beat competitors who build vastly larger volumes than we do, unless we produce a more 'fit for purpose' product.

On the other hand, we can be better. At Aussie Pump, we have the luxury of not being concerned about a bunch of shareholders from big multinational corporations demanding dividends. Our function is the user of the product. From interviewing and dealing with mining sites, not only in Australia, but from Kenya to Mongolia, we know that it's our down to earth approach of constantly learning and applying what we learn that works.

THE FUTURE OF AUSTRALIAN MANUFACTURING

We believe there is a future for Australian manufacturing, but only if we choose to be better, more innovative and more adventurous. We have to be prepared to take the risk of building better products to help grow Australian jobs. The mining industry accounts for \$300B of export sales. On that basis, it's worth us giving that industry, Australia's biggest single earner, every bit of attention we can.

Aussie Pumps prove every day that Australia isn't just a producer of raw materials, food and fibre. We ship our products to the world and believe many other innovative Australian companies can do the same.

For further information and the continuation of the Mine Boss range applied into high pressure cleaning, see the next edition of the *Australian Mining Review*. **AMR**

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The heart of Aussie's 'Mine Boss' pumps.



A production run of Mine Spec pumps at Aussie's 2 1/2 acre factory in north west Sydney.

Turn To Your Local Manufacturer

A Hamersley reel and Waterlord hose ready for deployment.

The worldwide pandemic has illustrated the vulnerability of the global supply chain and has forced many businesses to review their supply chain strategies. News of events that are pushing the global supply chain to the breaking point has many economists and shipping specialists worried. The new wave of Covid-19 in China and Asia, flood waters in Germany and China, and the increase of cyber-attacks worldwide since the start of the pandemic are causing disruption in the global supply chain.

Companies who rely heavily on their main and secondary suppliers from China are, according to Deloitte's 2020 report Covid 19 - Managing supply chain risk and disruption, experiencing significant disruption.

The report goes on to suggest things may get back to normal around April 2021, unfortunately, that optimistic forecast for normalcy has just taken another turn for the worse. Wuhan, the highly industrialised province where 200 of Fortune 500 companies have some type of link, has been brought into a severe lockdown once again, further crippling the supply chain.

Fortunately, turning to local manufacturers

can help take out the worry of the impact of supply chain disruption for many industries. Crusader Hose, Australia's local manufacturer of layflat hose, hasn't missed a beat. As an essential service, Crusader Hose has kept its doors open and delivered well over 500,000m of hose to the mining, industrial, agricultural and firefighting sectors since the first major lockdown.

Local manufacturing is key in these times of uncertainty. For the timely delivery of the products you need, Crusader Hose should be part of your business strategy.

Crusader Hose, an Australian-owned company, has been manufacturing layflat hose for over 35 years and has grown from a small, family-run business to a medium-sized business of over 40 employees.

It struggled for many years to turn a profit due to the competition and volume of imported hose on the streets, but by working relentlessly to improve its manufacturing plant to produce world-class hose, it is the name many people trust.

Working closely with industry, Crusader Hose has been designing, manufacturing, and supplying the mining sector with layflat

hose for mine dewatering and bore water pumping. Add to the list, reel systems to assist in the safe and efficient deployment and retrieval of multiple lengths of hose.

Waterlord®, their heavy-duty layflat hose, is ideal for mine dewatering. Manufactured in large diameters of up to 12", Waterlord® moves large volumes of water in quickly and safely, assisting in keeping mining operations efficient and on-time.

The high-pressure reliability of Waterlord® comes from the world's-best manufacturing process of the TPU (thermoplastic polyurethane) thru-the-weave extrusion encasing a robust textile reinforcement. It is manufactured in one continuous length of up to 250m and can handle high-working pressures; its tough exterior can withstand rugged terrain. Both flanges and couplings are available, which can easily connect to existing pipelines.

Many mine operators are asking for Waterlord® layflat hose reeling systems because of its inbuilt properties - keeping multiple lengths compact, making layflat hose easy to handle and easy to deploy.

Although short lengths can be unrolled with

little manpower, for long runs up mine walls and across pits, hose reel systems are the ideal solution. Interchangeable reels make it quick and easy-to-handle multiple lengths of hose.

Flexibore® flexible rising main is the choice of many dewatering projects where water extraction from deep depths is required. The revolutionary Flexibore® 400 can handle high pressures of depths of up to 400m.

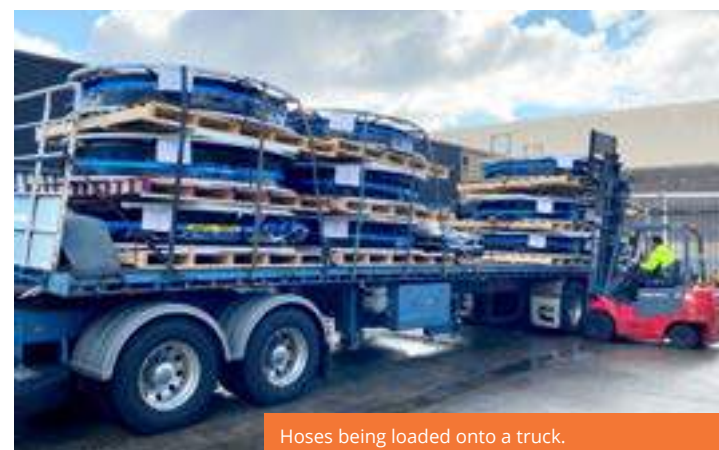
The technology required to manufacture what is believed to be a world-first, is state-of-the-art. The ease of handling layflat versus rigid pipe, reduces installation time by days, making Flexibore® the efficient and cost-effective choice for many mining engineers.

"We have seen the importance of supporting local manufacturers in the preservation of the supply chain for successful business", said Francois Steverlynck, Managing Director of Crusader Hose.

"Buying from an Australian producer gives you peace of mind regarding back-up, quality, quick turn-around and excellent customer service. We stand by our products so your needs will be looked after." **AMR**



Custom-made interchangeable reel systems are available.



Hoses being loaded onto a truck.



Large reels and hose assemblies being manufactured.

Risks Of Offshoring Fabrication

DMMeng tailors locally fabricated sections to the assembly sequencing and transportation requirements of remote locations.



DMM Engineering (DMMeng) 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 onsite or workshop-based machining, and a fabrication division that can tackle all jobs big and small from site repair, installation to erections.

Australian Mining Review talked to DMMeng director Brendan Pyle about the risks of offshoring fabrication.

"Before COVID, we saw a lot of fabrication moving offshore as clients felt it was a no-brainer," he said.

"Well, how quickly things changed during COVID, where we are now picking up major fabrication work again.

"We always tried to be competitive as a local manufacturer with the obvious time saving arguments but now our local quality and reliability is offsetting any pricing differentials.

"We have heard stories of materials not supplied to specifications, or offshore materials supplied to specification actually not meeting Australian regulation requirements.

"But what else happens is incorrect fabrication offshore turns into local assembly cost blow outs trying to make things fit together. No one is happy with the backup service and lack of recourse offshore."

Mr Pyle said with DMMeng's commitment to continuous improvement, the company challenges itself to seek innovative or better ways to solve a problem - be that in a cost, performance or time saving manner.

This approach has enabled DMMeng to be competitive as a local fabricator based in Victoria delivering projects interstate.

"We tailor our fabricated sections to the assembly sequencing and transportation requirements," Mr Pyle said.

"Our team have more than 100 years of trade experience.

"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."

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.

More information can be found at www.dmmeng.com.au or by calling Brendan Pyle on 0498 330 030. **AMR**

WE GET TRUSTED WITH THE HARD JOBS

DMMeng's unmatched expertise provides the complete balance of project deliverables from risk and safety assessment through to fabrication solutions being developed and pre-tested off-site to minimise interruption to customers' operations on site.

With our commitment to continuous improvement, we challenge ourselves to seek innovative or better ways to solve a problem - be that in a cost, performance or time saving manner. This approach has enabled DMMeng to be competitive as a local manufacturer and be awarded more and more jobs that previously went offshore for manufacturing and returned for local assembly.

Our customer satisfaction guarantee involves meeting client deadlines, while not leaving the site until the installation or serviced equipment is proven.

Our expertise is sought across Australia.



CALL BRENDAN PYLE TODAY
0498 330 030

"WHAT WE PROMISE.....WE DELIVER."



dmmeng.com.au



76 Tailings Best Practice

INDUSTRY FOCUS



KLOHN CRIPPEN BERGER (KCB)
SENIOR GEOTECHNICAL ENGINEER
BRETT STEPHENS

Best Practice Planning in Tailings Storage Facilities:

A Q&A with Klohn Crippen Berger

Tailings dams and tailings storage facilities (TSFs) can last the entire life-of-mine, including closure and rehabilitation, if they are planned, designed, built and maintained properly. The *Australian Mining Review* spoke to Klohn Crippen Berger (KCB) senior geotechnical engineer Brett Stephens about the importance of integrated planning and design of TSFs according to latest best practice guidelines.

The Hidden Valley tailings storage facility (TSF) in Papua New Guinea.

What are the key planning, design and engineering considerations for TSFs?

Tailings dams are dynamic structures which are progressively constructed throughout the life of a mine; usually 20 years, but some may operate for over 50 years.

These dams must safely contain mine tailings and process water not only for operations, but for perpetuity.

The progressive construction of a tailings dam benefits both the owner and designer but also adds to complexity and requires an increased focus on planning throughout the life of the structure.

Tailings planning starts with appropriate sizing of the dam structure.

Planning should balance capital cost and regulatory needs to reduce the footprint, with a minimum dam size and area to support practical tailings operation, without constraint.

In planning, easements around the perimeter of the TSF should be included to support future stabilisation or environmental works if required.

These easements also allow for closure planning.

Understanding where, and when, construction materials for embankments will be sourced is key.

Tailings dams use mine waste, and sometimes the tailings themselves, to reduce costs and limit resources required to place embankments and manage the tailings.

The design engineers for the TSF must work with the mine planners to integrate all the mine waste streams. These plans should be conservative and ensure that the tailings plan does not drive the mine plan.

The TSF engineering and planning should start with the end in mind – and this is closure of the facility.

The operation of the dam should work towards the final closure landform.

This should be considered in the tailings planning and should include pond management, staging of the dam construction and integration of waste placement to support TSF construction and closure.

Finally, TSF planning should also consider future conditions for the mine and TSF.

For projects in remote areas of developing countries, it is common that small communities are constructed near the mine over time.

These changes impact the consequence category of the dam. Future mining resource should also be a consideration.

Projects based on a business plan of 20 years, but with resources which are more significant should consider expansion of the mine in the upfront planning and decisions on location and size of TSF.

Why are the earliest planning stages for TSFs important and can you provide examples?

Mining projects evolve and require an integrated specialist team to deliver projects that provide both value and environmental/community outcomes which both stakeholders and investors seek.

Repeated cycles of engineering and planning are required to deliver this value.

So, the earlier this process begins the better.

As tailings dam engineers, we understand that the designs will continue to evolve as information about the mine reserves, processing, site, and environmental condition improve.

The objective is to ensure that our designs include provision and contingency for these expected changes.

Early planning informs the mine planners

and identifies the key risks and costs to be addressed, and preferably eliminated or reduced through the engineering process.

This provides a road map for the project and supports effective allocation of resources through concept and feasibility studies into construction.

The true value of the planning is to allow the business to see the true cost of tailings management for the full lifecycle and not just from a start-up capital cost.

Talk us through Klohn Crippen Berger's process of TSF planning, design and engineering.

Application of dam engineering technology to the design of tailings dams has always been a focus at KCB.

These designs need to consider the role of the tailings as a structural element of the dam, as well as the environment aspects storing this mined waste product.

Also integral is a solid understanding of mine processing, and a pragmatic approach to the application of technologies available to the mine, and the environment which the dam is to operate.

Through learned experience, KCB has a strong focus on clear and consistent documentation to support the engineering and planning process.

This is essential for TSF projects which have a lifecycle of decades and an industry with a transient workforce.

Documentation should include compilation of all factual data used to support the engineering, the basis of design and the results of each stage of the engineering.

As each stage of the engineering proceeds, the prior decisions can then be reviewed to ensure that assumptions made remain valid.

The engineering should endeavour to provide a design which reduces complexity

of the operation, which usually coincides in a TSF with lower cost, risk and impacts to the environment.

How do you integrate TSF planning in the broader whole-of-site life of mine (LOM) planning?

The strong preference is that TSFs should never be a constraint to mine production.

TSF planning should work to decouple the mine plan and TSF construction where possible.

Scheduling of mine waste should provide sufficient contingency in construction materials and bottlenecks.

As a TSF designer, you do not want to be on speed dial to the operation.

Where do you think the future of TSF engineering is headed – or should be heading towards?

The Global Industry Standard on Tailings Management (GISTM) has focused industry attention on tailings management and governance, which will provide long term benefit for our industry.

As part of this process, we already see improvements in surveillance of dams associated with automation of instrumentation on dams, remote sensing using satellite technology and the implementation of GIS to store and efficiently retrieve data for dams.

This is on top of technology improvements in testing of tailings in the field and the laboratory and step changes in our ability to predict behaviour.

In the short term, we will see pressure on resources as we all endeavour to meet the 2025 deadline for its implementation.

Over the long term, I foresee that these changes will provide a framework which will improve not just dam safety, but all operations around tailings for mines.

These changes are only the beginning of the journey. **AMR**



Klohn Crippen Berger



For 70 years, Klohn Crippen Berger has participated in some of the largest and most challenging engineering, geoscience and environmental projects across the world.

KCB was among those to revolutionise modern tailings facility design over 50 years ago. Today we continue our pioneering role through coupling our mine waste designs with environmental, socioeconomic and water management solutions. We have worked on hundreds of mining projects worldwide and bring practical solutions to your mining challenges.

We are proud of our legacy, and continue to build a better world through excellence, innovation and teamwork.



WWW.KLOHN.COM

Submersible Pump For Large Particle Handling

Weir Minerals' Multiflo® Mudflo™ 150 pump.

Weir Minerals, global leader in the provision of mill circuit technology, dewatering solutions and services, has launched the new Multiflo® Mudflo™ hydraulic submersible slurry pump.

Engineered for abrasive applications and large particle handling, the Multiflo® Mudflo™ pump features a hydraulically driven wet-end specifically designed to efficiently and safely reprocess and relocate tailings ponds, maintain water retention dams and manage slimes and sludge ponds.

The innovative solution combines the Warman® MGS pump-end, Multiflo® CB32 hydraulic cutters and ESCO® excavation teeth to provide efficient pumping of highly charged and abrasive slurries.

Weir Minerals' unique Ultrachrome® A05 chrome alloy impeller ensures high wear resistance and the specially engineered suction strainer minimises the risk of clogging by preventing large solids & debris from entering the pump. Drawing on decades of Warman® pump design experience, the Multiflo® Mudflo™ pump is capable of pumping between 150 and 1200m³/h, up to 82m head.

The Multiflo® CB32 hydraulic cutters feature market-leading ESCO® Ultralok® tooth system to prevent premature breakage, avoid tooth loss and protect the integral locking system to ensure the continuous operation of the pump.

Engineered by the Weir Minerals dewatering pump experts in Australia, it is now available for global customers.

Dewatering Weir Minerals APAC director Cameron Murphy said the Multiflo brand was synonymous with high quality and long-lasting equipment.

"In designing the Mudflo™ pump, our dewatering experts drew from the very best Multiflo, Warman and ESCO technology and used advanced hydraulics to create an innovative and cost-effective new solution for mine dredging applications," he said.

Weir Minerals Dewatering Specialist Geoff Way said the company understands that success is built from enduring partnerships based on close collaboration and a mutual commitment to safety and

technical excellence.

"It is not uncommon for sites to use a combination of pumps, shovels, excavators and trucks for dredging applications," he said.

"When one of our long-time partners in Indonesia contacted us about developing a custom solution for the slurry build-up in their sumps, we knew we could provide a better solution.

"We're problem solvers. We considered our customer's pain points and engineered a new solution to efficiently and safely manage their site processes."

The Multiflo® Mudflo™ pump can also be retrofitted to competitor OEM equipment: the quick-hitch plate attachment ensures convenient installation and removal from hydraulic excavators.

The Multiflo® Mudflo™ pump can be assembled on land, eliminating the safety risks associated with assembling pumps over water.

Furthermore, the new hydraulic hose management system reduces the risk of hose entanglement and trip hazards, all the while providing a reliable hose bend radius to ensure smooth oil flow.

Discover more at
<https://info.global.weir/mudflo>

About Weir Minerals

Weir Minerals engineers and manufactures world-class equipment for mining, sand and aggregates, power, and general industrial markets around the world.

Together with Weir ESCO®, Weir is the only global provider of premium mining solutions from extraction to concentration. Weir Minerals is a global leader in the provision of mill circuit technology and services as well as the market leader in slurry-handling equipment and associated aftermarket support for abrasive high-wear applications.

Weir ESCO® provides highly engineered ground engaging tools (GET) used in global mining and infrastructure markets. ESCO® is the global leader in GET for large mining machines. **AMR**



A Weir Minerals engineer on site with the Multiflo® Mudflo™ pump in Indonesia.



A Multiflo® Mudflo™ pump and dredge unit before installation in Indonesia.



Reduce CO₂ by tens of thousands of tons?

**ENDURON®
HPGR**

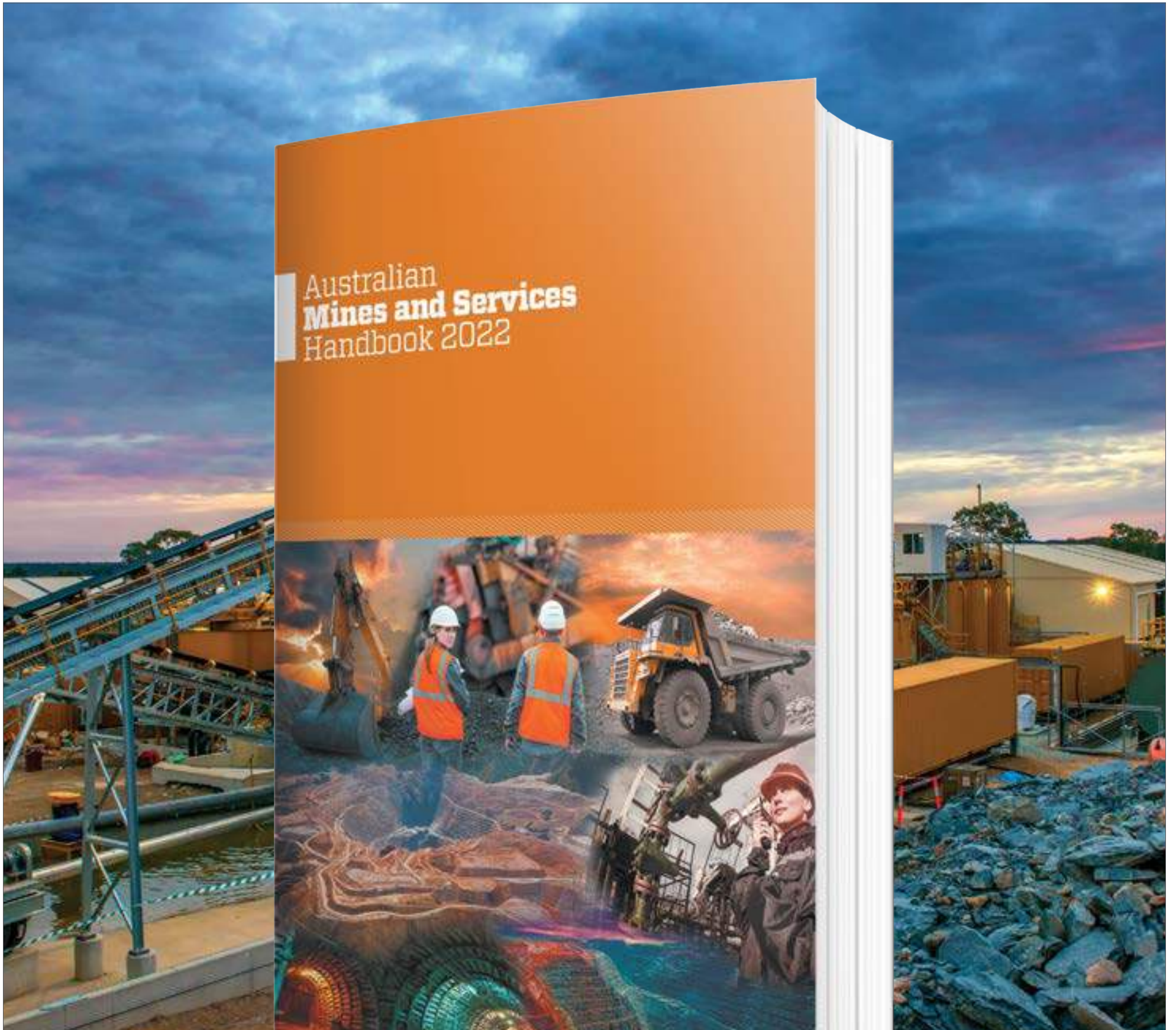
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The answer is Enduron®

We all know HPGR technology exists. Why have we not moved to a more sustainable approach? The Enduron HPGR uses up to 40% less energy without grinding media, compared to traditional solutions. Combined this could reduce your CO₂ by tens of thousands of tons annually. Plus, with our exclusive skewing and bearing system, you'll increase your mine's performance, reliability and efficiency. The real question isn't why should you make the switch, it's why not?

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TRACKING WITH PLUG AND PLAY FLEXIBILITY AND THE COMPLIANCE OF INSTALLED IVMS



Digicore Advanced IVMS (In Vehicle Monitoring System) Portable Units offer clients a vehicle tracking solution with plug and play portability and full compliance with installed IVMS specifications.

Because of this, our units are already accepted on many of Australia's largest oil, gas and mine sites.

CUSTOMISED SOLUTIONS TO FIT YOUR NEEDS

Digicore build custom looms and boxes to fully comply with the IVMS specifications of any site in a format that is easily transferred from vehicle to vehicle.

This makes our units a great option for contractors going from mine to gas or oil sites.

NO LOCK IN CONTRACTS

Coupled with the easy portability, our no lock in contract policy means that units can be activated and deactivated only when needed so you won't be paying for tracking you aren't using.

CHOOSE ALL THE FUNCTIONS YOU NEED

A Digicore portable IVMS solution also gives clients the option of utilizing any or all of these functions:

- Enforceable Driver ID
- Panic button with send immediate messaging over email and SMS
- Seatbelt pickup and monitoring with optional in-cab alerts
- Plug-and-play Iridium communications functionality and upgradability
- Hundreds of geo-zones with the option of their own speed-zones storable on the unit
- Fatigue/journey management with optional in-cab warning and alerts
- Monitor harsh events such as cornering, acceleration and braking with optional in-cab alerts
- Top speed with optional in-cab alerts
- Impact and rollover detection with send immediate messaging over email and SMS
- Maintenance scheduling based on km travelled and/or time intervals
- Vehicle utilisation reports

HOW TO TRACK DOWN YOUR IDEAL IVMS SOLUTION

Contact Digicore's friendly sales team on (03) 9945 2244 or sales@digicore.com.au with your specification requirements for a free no obligation quote and let us show you just how affordable staying IVMS compliant can be.



Check out our range and expertise at www.digicore.com.au



Fleet Management Solutions

The mining and resources sector is driven by dynamic technology and diverse, driven people, and as such it's constantly evolving with the times. Site digitisation, the obsolescence of older technologies and practices, safety, waste minimisation and workforce safety are all hot topics, and for good reason.

They go to the core of good, efficient business practice, which demands the strategic applications of technology, valuing community, safety, diversity, quality, and the needs of the customer — core aims of global tracking and asset management company, Fleet Complete.

Fleet Complete has built a stellar reputation and reach in the Australian market through an in-depth understanding of the specific needs across Australian sites. When operating in this unique landscape, the needs of your fleet will require tailored solutions for optimised safety and efficiency. The remote fleet management solutions from Fleet Complete are specifically designed

to put your team's safety and efficiency at the forefront of your business model by providing you with real-time information and satellite coverage. This can support a company in keeping their workers safe and optimising their fleet's efficiency.

Fleet Complete's remote fleet management (powered by Geotab) is well suited for large outback sites where conditions are harsh, and the workforce is diffuse and often isolated. It has many inbuilt features for safety — personal duress buttons, digital risk assessments and an escalation process for check-ins, to name a few. The industry spotlight has been on worker safety and well-being in mining and resources, and Fleet Complete has solutions and products for ensuring high standards across the board for your workforce.

Automated and remote processes can assist in minimising risk factors such as fatigue, isolation, burnout, harsh conditions and risk-taking behaviour. Monitoring and tracking technology matters that much more in an

Australian context, given the sheer size and scale of many operations.

The Fleet Complete Story

Fleet Complete was founded in 1998 (originally Complete Innovations) by Tony Lourakis and Andrew Merisanu, and it presently operates in over a dozen countries globally. It has a distinguished history of providing forward-thinking tracking and monitoring solutions and being an Internet of Things provider, with a brand focus on safety and efficiency. Fleet Complete provides mission critical fleet, asset and mobile workforce management solutions.

For more than twenty years, Fleet Complete has been providing dispatching, fleet tracking and mobile resource management solutions to over 40,000 companies worldwide.

Having Acquired Adelaide fleet-management company, Securatrak, Fleet Complete has a local presence in Australia, and an understanding of the unique

Australian economy and work culture, while maintaining global operations that are well-networked for development and innovation.

By valuing not just innovation, but communities and people, Fleet Complete was internationally named as a top employer in 2020, as well as its founder and CEO, Tony Lourakis, winning awards for technological entrepreneurship in 2019. Fleet Complete has its own suite of telematics hardware and software solutions, and it remains a reseller of Geotab, technology for tracking and monitoring fleets through GPS.

Fleet Complete is also a distributor of Guardian by Seeing Machines and integrates with partner JESI for the ultimate mining, oil and gas solution. —The Fleet Complete vision is to connect everything, everywhere, bringing global customers the best solutions on the market. Fleet Complete works with original equipment manufacturers, as well as large telecom companies to make sure that you are always in the best hands.





PRODUCTIVITY

Maximise fleet productivity

With comprehensive reporting and analytics, you can keep your fleet moving. Monitor routes in real time with live tracking and dispatch drivers remotely.

HARDWARE

Go anywhere, stay tracked

Satellite connectivity expansion available for unbroken communication, even when workers go remote.



Remote Fleet Management

The digitisation of the mining industry is a rapid and ongoing process. Updated practices create new opportunities for safety and efficiency, while also rendering older technologies obsolete. This seemingly sudden obsolescence can impact site performance drastically, especially in the management of remote fleets in the outback, which depend on reliable network connection for tracking and monitoring.

In Australia, the “sunset” of 3G network will have significant effect on the fleet tracking capabilities of many pre-existing telematics in use, most of which rely on 3G networks. Telstra’s full shutdown of the 3G network began in December 2020 and will be complete by June, 2024. Tracking and monitoring solutions that are not 4G LTE or 5G compatible could suffer a sudden and dangerous shut down in their capacity to manage a fleet.

Fleet Complete has a variety of options for upgrading devices to maintain communications and network connection. Aside from the faster connection that comes with 4G LTE and 5G, upgrading your devices makes good business sense — from worker safety to savings on emissions.

Fleet Complete understands a fleet’s growing needs, therefore it includes options such as video telematics along with journey management, Electronic Diary and Driver Vehicle Inspection Reports that give fleets plenty of options if they are looking to maximise their driver training and fatigue management.

Fleet Complete’s fleet management solutions go above and beyond standard In Vehicle Monitoring Solutions by delivering additional information, creating an immersive experience which allows remote operators to feel that they are physically “behind the wheel”. The advanced reporting suite provides in depth analysis to allow for more informed fleet and personal management so that safety and efficiency is measured and delivered to the most detailed level.

New technology brings new benefits: better features, higher processing power, lower latency, more storage, and improved reliability that makes it easier to handle complex services and collect detailed data across your fleet, such as GPS tracking information. This gives you the ability to complete a more thorough analysis of your fleet’s performance, leading to better

business decisions and increased cost savings. It’s also a good time to assess whether satellite modems need to be added or removed, depending on how long each of your devices spends in or out of network connectivity.

The use of iridium satellite networks and smart switching technology allows Fleet Complete’s fleet management solutions to continue monitoring vehicles whenever they leave the coverage of cellular network — this switching capacity is automatic, near instant, and provides seamless, uninterrupted asset protection and fleet visibility.

Workforce optimisation, remote control and in-vehicle assistance can give a site the stability and competitive edge needed to take full advantage of the myriad opportunities in mining and resources, ripe in the coming years.

Maximising the resources boom while minimising waste

Mining has long been a robust and indispensable industry in the Australian economy. With the resource sector accounting for 60% of Australia’s exports, some call it the backbone of Australia’s economic expansion into global markets, and a factor in the high standard of living.

As Australia recovers from the COVID-19 pandemic, fleet management, monitoring and tracking are vital components in building an efficient and safe workforce.

Fleet operators now expect to have information easily at hand in order to make critical decisions. Fleet Complete provides this insight in many ways including configurable reports and dashboards available to them at a touch of a button whether on their computer or operating on their mobile device

Remote fleet management is just one of many solutions and services that Fleet Complete can offer for your site or project. There is also a commitment to helping organisations build the specific tools they need to increase efficiency and cost cutting. Recovery from the COVID-19 pandemic and a maximisation of efficiency are all contingent on finding the right monitoring and tracking technology, and Fleet Complete has a suite of solutions that can be tailored to your project.

To find out more, please visit www.fleetcomplete.com.au

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HARDWARE

A device for every asset

The Geotab GO9 fits every on-road vehicle. For heavy-duty assets, we have the IP67-rated GO RUGGED. Track every vehicle in the fleet to drive productivity.

SOFTWARE

Manage the driver risk

Geotab’s Driver Scorecards help you turn data into insights. Coach or intervene in poor driver behaviour, reward safe workers and reduce overall risk.



OPTIMISATION

Keep the fleet on the road

Make better use of your business assets by minimising downtime. Drive efficient use of your vehicles by scheduling preventative maintenance using data analytics.

SOFTWARE

Geofence every operation

Unlimited, customisable zones of any shape, not simple rectangles. Set alerts as vehicles enter or exit zones around your sites, customers, and more.

SAFETY

Monitor seatbelt compliance

Detect and report on seatbelt usage. Help keep your team safe behind the wheel.





Visibility, Safety and Efficiency

One of the most valuable commodities a company can possess for the efficiency, productivity and safety of a mine site is accurate, up to date information and data.

Tracking and monitoring across vast sites requires innovation and unflinching connectivity, and since 1986 MICROMINE has been a provider of intuitive software solutions to the mining and exploration industry.

It is a brand trusted by industry leaders in over 90 countries, and across over 2000 sites. Its Pitram fleet management technology is setting a new standard across renowned sites such as the Argyle diamond mine, which recorded its last day of mining in November of 2020. Pitram has been quoted as the “backbone” of the mine’s operation and management systems for over 10 years.

MICROMINE recently acquired Queensland-based technology company, Precision Mining, which is best known for its flagship mine scheduling software, Spry. This acquisition will see an expansion in the reach and depth of expertise within a market of mining expertise already well-known and served by Micromine, providing a wider suite of solutions for your mine site. Spry provides a dig scheduling, dump scheduling and mine haulage software environment that gives complete tracking results with little wait time.

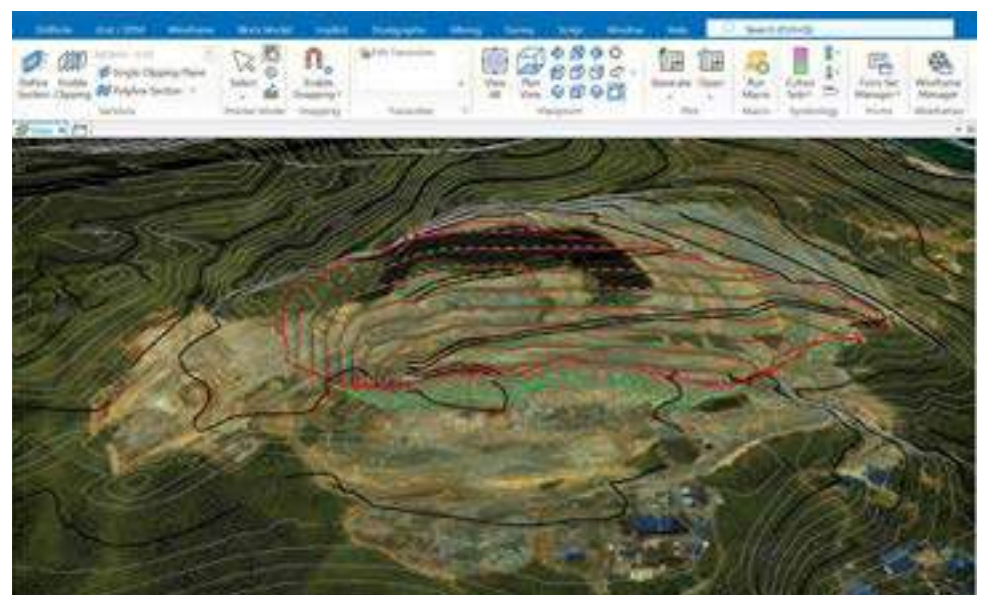
“Mining software developers are faced with the challenge of providing seamless

integration between products that are custom built to meet specific needs.” Said Australian Regional manager, Adam Brew “The acquisition of Spry is a result of bringing best-of-breed products into our existing software suite to fast track and streamline integrations to grow with the needs of today’s connected mines.”

Managing risk and transformation relies on us having the right information at our fingertips and being confident in the accuracy and relevance of that information. The quicker that workers can access quality data the more efficiently they assess, analyse and integrate it with other sources and start unlocking the ability to make quicker, more precise, and insightful decisions.

Pitram 6 is the most recent offering from MICROMINE, and it offers enhanced location monitoring and comprehensive pre-start capabilities. It provides near real-time location status, optimised control room conditions, production maximisation, reduced paper waste and data-point integration across systems. Pitram 6’s tracking and monitoring technology reduces unpredictability and information lag and enables companies to meet their production targets while identifying improvement opportunities.

The concept of a connected and integrated mine is relatively simple - if all your systems can speak to each other, your information is always complete, accurate and up to date. It means you can quickly and easily combine data to create better insights and have



more confidence in the facts you are using to base your business decisions, taking out the guesswork and minimising the risks. MICROMINE is continually improving the implementation of its own tracking solutions, and values collaboration between skilled teams to enable the success of your project or site.

Mr Brew understands the need for trustworthy data across all aspects of a site, especially as teams rely on this information.

“What we’re seeing is a continued focus on putting trust back into data and working towards solutions that deliver on accuracy. It’s becoming standard practice to have

visibility on where every piece of equipment is at any time and how well it’s performing against the short and long-term mine schedule. Teams are also expected to be able to act on this information in near real-time and adjust daily, weekly and long-term plans accordingly.”

MICROMINE’s systems can be tailored for the unique needs of your site, delivering enhanced location monitoring and comprehensive pre-start capabilities. Scalable and field-tested options are available. For more information on MICROMINE’s tracking and products and solutions, please visit www.micromine.com/

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NEXT-GENERATION TECHNOLOGY FOR MINING



Secure, reliable and flexible geological data management



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Real-time fleet management and mine control



Flexible mine scheduling and mine haulage

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SOLUTION TO MEET YOUR NEEDS

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Electrical Testing Equipment Calibration Services

Multimeter usage is vital amongst laboratory and field professionals, with results used to make key decisions on valuable mining equipment.

What are multimeters used for? What do they measure?

Multimeters are used to measure two or more electrical values, typically voltage (volts), currents (amps) and resistance (ohms).

The calibration of electrical instruments such as multimeters are important in order to mitigate the risk of equipment damage.

HK Calibration Technologies Pty Ltd (HKCT) offers electrical calibration services at minimum cost – a small price to pay for the maintenance of expensive equipment.

Its laboratories are equipped with state-of-the-art precision electrical measuring instrumentation with highly competent technicians performing the calibration of electrical instruments.

Strict adherence to certification credentials ensures all multimeter calibrations are

performed to various Australian standards including:

- AS 1024-1971: Direct recording electrical measuring instruments and their accessories
- AS 1042-1973: Direct – acting indicating electrical measuring instruments and their accessories
- AS 1284.1-2004: Electricity metering - general purpose induction watt-hour meters
- AS 1284.11-1995: Electricity metering - single-phase multifunction watt-hour meters
- AS/NZS 1284.13:2002: Electricity metering - in-service compliance testing

A wide range of other electrical equipment is also serviced and calibrated – all within good turnaround time (same day or next day service).

Calibration services include but are not limited to ammeters; decade boxes;

energy meters; LCR meters; power meters; process instrumentation; scope meters; volt meters; current transducers; digital storage instruments; graphical chart recorded; multi-meters oscilloscopes (multi channel); power analysers; process meters; signal generators; and watt meters.

Electricals include appliance testers; earth resistance testers; insulation testers; portable appliance testers; current transducers; hi-pot testers; mega ohm meters; power meters; and voltage transducers.

Electrical instruments include amp meter; cable tester; calibrator; clamp meter; current supply; earth tester; flash point tester; frequency generator; kW meter; phase rotation meter; megger; RCD tester; resistance box; testing and tagging unit; and safety kits.

All challenges related to measurement,

The calibration of electrical instruments is important, such as in multimeter usage.

calibration and validation requirements are welcomed at any of the convenient locations in Sydney, Brisbane, Melbourne, Perth, Adelaide or Hobart.

HK Calibration Technologies offers a four-hour response for enquiries during trading hours (Monday-Friday 8am-4pm) and all calibrated items come with a 30-day warranty for the calibration status.

The company also offers a one-stop shop for purchasing electrical test and measuring instruments, all complete with current calibration certificates traceable to Australian National Standards.

Make sure that the tools of your trade are working as they should – get your multimeter calibrated at a minimum cost through HK Calibration Technologies Pty Ltd (HKCT).

See the advertisement below for contact details. **AMR**

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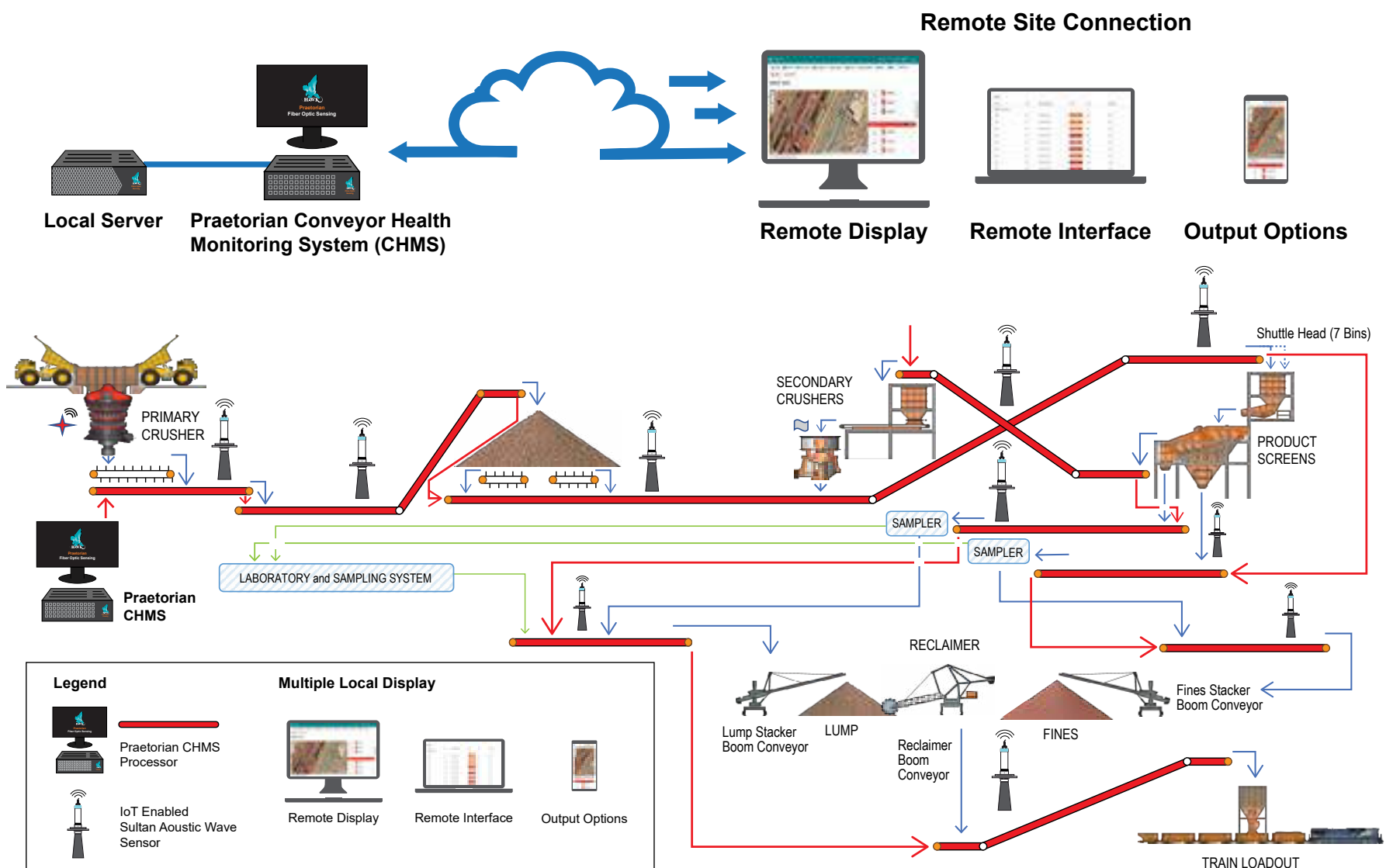




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Keeping Everything in Check

Keeping your equipment running smoothly and efficiently is a top priority for mining projects, but equipment needs maintenance, upkeep and calibration in order to operate optimally and meet quality system requirements.

Abstec Calibrations is a NATA Accredited (National Association of Testing Authorities) 100% Australian owned company which has been in operation since 1995, with the purpose of providing specialist technical services for calibration and maintenance, serving a large variety of clients from all over Australia and the globe.

The company performs calibration to ISO17025 under the NATA accreditation scheme. And holds accreditation for calibration of measuring and testing equipment for use in Force, Torque, Weighing, Hardness, Electrical, Temperature, Dimensional, Pressure and Speed measurement.

Calibrations on measuring and testing equipment are carried out by Abstec widely throughout the mining industry, as well as many diverse industries such as defence, aviation, medical, construction, oil and gas, manufacturing, research, education as well as food and beverage industries.

Within the mining industry, accurately calibrated equipment is vital to the safety

and efficiency of a site. Poorly calibrated equipment can allow for dangerous situations to arise as equipment overheats, pressure builds, maximum weight or force are exceeded, and electrical systems become over-burdened.

Mining projects rely on their equipment, and recent developments to the workplace safety standards across several states foregrounded the need for that equipment to be safe and well maintained.

Poorly maintained equipment not only presents a risk to your workforce — it can lead to a waste of resources as systems use more energy or take longer to complete processes than is necessary due to inaccuracy.

Productivity is reliant on accuracy and efficiency, especially in minimising unnecessary wear and tear to your equipment, and the wastage of time or resources.

Abstec Calibrations keeps your equipment and site running well within their optimal parameters so that you can keep costs down!

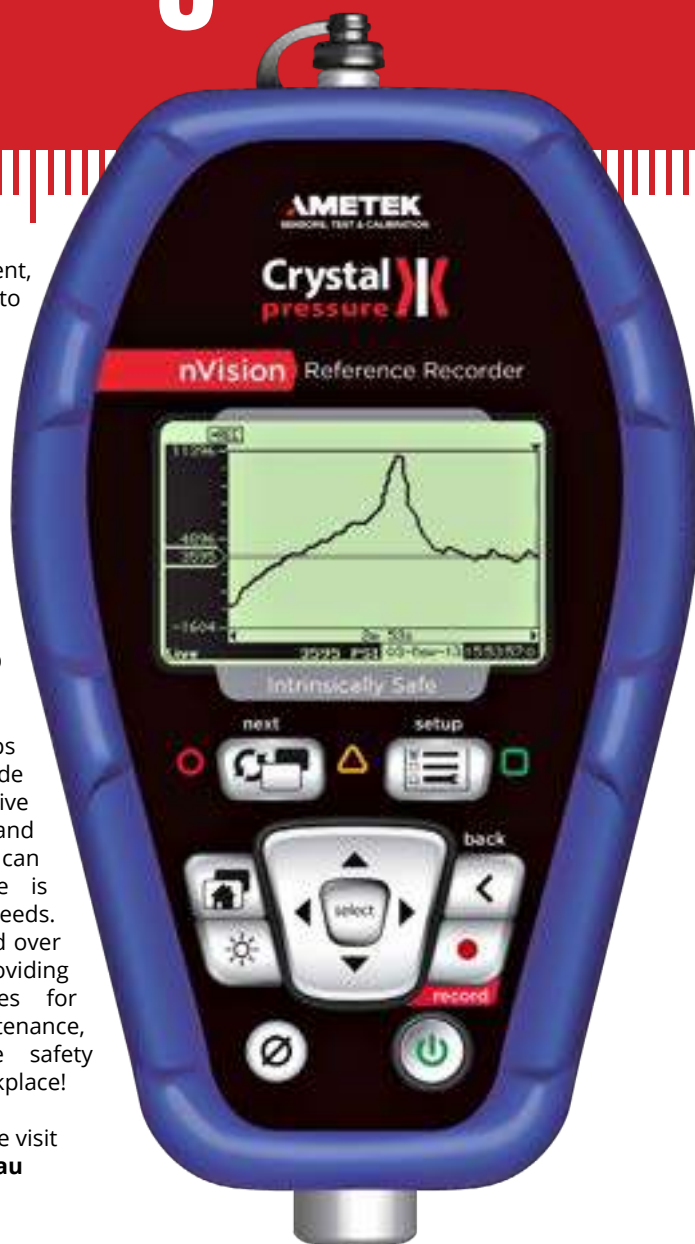
For Abstec Calibrations, the priority is always to repair your equipment and prolong its life, wherever possible. However, should that not be possible, Abstec can also supply

you with new equipment, fully calibrated and ready to operate.

Abstec Calibrations will only sell and recommend equipment of brands with a known history for quality, accuracy, reliability and customer support. Abstec is an authorised agent and distributor for Crystal Pressure, Ametek and Jofra Test and Calibration Instruments and A&D Weighing Equipment.

Abstec's strong partnerships with brands that provide reliable, proven and effective tools for measuring and calibrating means that you can trust that your workplace is getting the solutions that it needs. With NATA accreditation, and over 25 years in the industry, providing specialist technical services for calibration and maintenance, Abstec can optimise the safety and productivity of your workplace!

To find out more, please visit
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Rotating drum for easy discharge

Classy Concrete with Carmix

Are you looking for a solution for concrete supply on your remote located project, be it mine sites, road works, island or offshore batching requirements, or steep incline access for ski and mountain projects?

Resolving the supply of concrete on remote sites has always been a challenge and often at a high cost for a project.

Carmix self-loading batch plants can solve some of these problems.

These unique units are self-contained batch plants which load the aggregate into a load-cell mounted drum for accurate measurements shown on the in-cabin display.

Cement is screw-fed directly into the drum via the hopper.

Water is controlled via an onboard pump. The slump can be monitored via Pro-Mix option for quality purposes, and on completion, a printout is offered to register the batch.

The simplicity and accuracy make the Carmix unit unbeatable in remote regions where time and delays waiting for concrete cost huge amounts of financial resources.

A single Carmix 5.5XL can produce up to 45-60m³ per day. Once two similar units are used, this capacity goes beyond 100m³ per day.

The popular and versatile 3.5TT units can produce 30-70m³ per day as single- or double-unit teams.

This production range can cater for many civil, road or tunnel projects that demand production figures of this order.

Daily planning of concrete pours is totally in the hands of the customer and the frequent delays from commercial batch plants can be avoided.

Carmix Australia does not just provide a quality self-loading mixer dumper, it also provides concrete control.

Working hand in hand with parent company Pilecom, it has utilised and monitored the use of these Carmix 3.5TT units in remote applications for almost three years.

It can now convert this knowledge into a sales support function.

When you purchase a unit or units from Carmix, you get great local knowledge in helping you to set up system to match your needs, and you will get operator training and commissioning done on site and invaluable knowledge and advice.

Carmix assists with understanding your concrete mix design requirements and helps with quality controls and slump testing.

Taking all the above into account, it takes the approach of being a partner with clients as they become comfortable in batching and controlling their new batch plant.

Service packs, spare parts and verification of competency certificates are also in the support package.

The Italian-built Carmix unit is well proven with over 40 years of expertise in building concrete related units.

Various options can be offered depending on customer requirements, covering additional health and safety features that will bring the CE-rated units in line with the various Australian safety requirements.

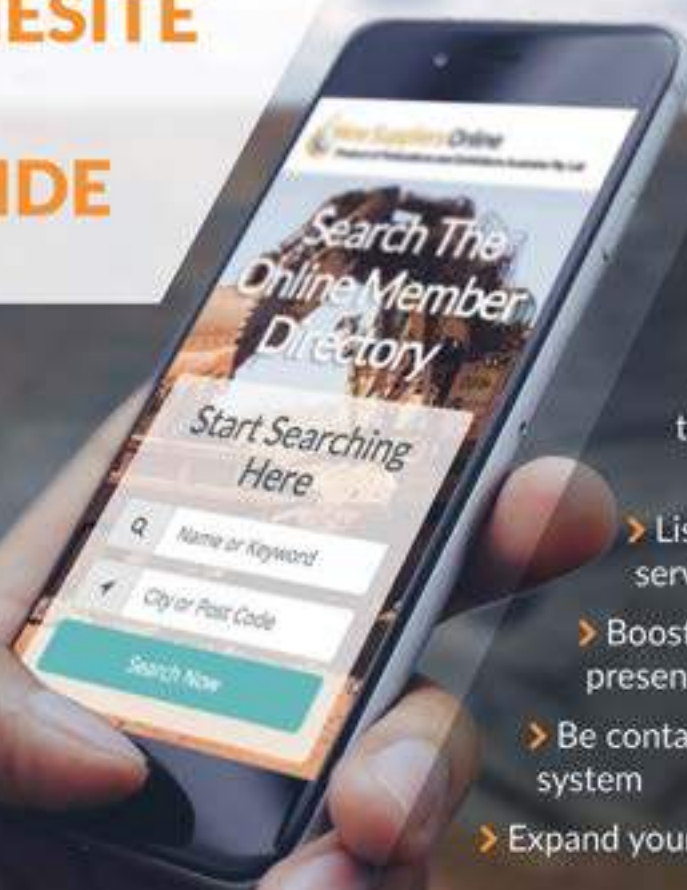
In terms of models and ranges, Carmix has six models of loader mixers to offer, along with four models of silos, both horizontal silo and conical hopper, and a compact trailer pump T15 (15m³ per hour).

Carmix can solve most of your concrete needs and help you control your concrete supply.

With offices in NSW (Gosford) and WA (Perth), Carmix is here to support you.

Contact Boyd or Bruce now. See the advertisement next page for contact details.
AMR

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Carmix offers the ideal solution for producing and delivering high quality concrete with low costs on any remote site.

These 4x4 mobile batch plants can mix and deliver concrete on any site, even in extreme conditions.

Carmix is perfect for contractors, developers or builders with projects that require concrete, grout or shotcrete.

If you want to avoid delays and high costs associated with ready-mix concrete, you need to consider Carmix.

Featuring the:

- Carmix 5.5XL: Mobile batching plant: 5.5m³ mix unit
- Carmix 3.5TT: Off-road batching plant: 3.5m³ mix unit

When both are combined, along with a 40t horizontal silo, this self-load batch plant can mix and place up to 80m³ per day.

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ARCEMY® metal 3D print system by AML3D.



CEO Andy Sales, at the recently launched AML3D Technology Centre in Adelaide.

Metal 3D Print Innovators

From its recently launched technology centre in Edinburgh, South Australia, ASX-listed AML3D Limited is making waves, leading the way for large-scale 3D metal printing using its patented wire additive manufacturing (WAM®) process.

Founded and established by Andy Sales in 2017, AML3D is a 3D metal printing specialist which uses wire feedstock with patented technology, proprietary software and PLC functionality, that enables manufacturing of certified industrial products with superior properties more efficiently.

AML3D has researched and developed what is known as Wire Additive Manufacturing or WAM®, which is a process “variant” to the well known WAAM (Wire + arc Additive Manufacturing).

The outcome results in a more efficient and sustainable approach to large-scale metal part fabrication.

Further developments around the WAM® process were establishing commercial

printing equipment, ARCEMY®, which encompasses the patented WAM® technology along with proprietary software, WAMSoft®.

This printing system provides not only geometrical and choice of metal feedstock capabilities, but is also enhanced by IIOT network capability, PLC feedback monitoring and processing, which enables the user to connect with AML3D’s HQ for operational, technical and software assistance.

Disrupting the medium to large scale casting, forging and billet machining industries, the technology behind the ARCEMY® includes AML3D’s patented method, PLC functionality and proprietary software, WAMSoft®. It provides faster lead times, economic size and shape variations, automation of welding and has been in development for several years.

AML3D’s WAM® process and WAMSoft® enables a “greener” solution, being energy-efficient, providing a lower carbon footprint, and a leaner manufacturing solution.

WAM® uses much less material and energy than traditional casting, billet and forging processes.

The ARCEMY® system can also operate in remote areas, enabling fast, low-cost parts replacement without the need for tooling costs and an alternative to relying on lengthy supply chain lead times.

Another benefit of WAM® is its geometrical flexibility and broad range of metals that can be processed. Alloys such as titanium, stainless steel, high strength steel, aluminium, nickel alloys, bronze alloys, and even invar for tooling.

WAM® technology is a standardised process globally. This means that the process is an acceptable method for manufacturing components, according to ISO, ASTM, AWS and BSEN standards.

Additionally, the WAM® process has been independently verified by third party organisations such as Lloyds Register, DNV-GL, BV and ABS.

The first company globally accredited by Lloyd’s Register for Additive Manufacturing of metal parts using wire feedstock, AML3D is also ISO9001 Quality Accredited along with DNV-GL accreditation. A key component of AML3D’s success is delivering high performance, high quality parts using an accredited, and patented, printing system, the ARCEMY®.

AML3D provides contract manufacturing services to companies in metals-based additive manufacturing and sells ARCEMY® printing units that enable the client to develop their own WAM® capability, where parts can be manufactured on-demand.

For suppliers of high-pressure parts, obsolete parts, wear parts and mining organisations looking to improve their supply chain costs and processes, AML3D invites industry to start the metal 3D printing conversation by sharing their challenges and sending part drawings through for WAM® assessment. **AMR**

YOU ASK... WE ARC!

ARCEMY®

Manufacturing challenges are a problem of the past with ARCEMY® and our patented Wire Additive Manufacturing process that combines robotics technology, metallurgy and proprietary software (WAMSoft®) with PLC interface, offering a certified metal 3D printing solution for part fabrication.

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950 kg High Pressure Pipe Fitting printed with WAM® DN300 Schedule 160 neck weld flange with a concentric reducer to DN400 Schedule 160 weld neck flange.

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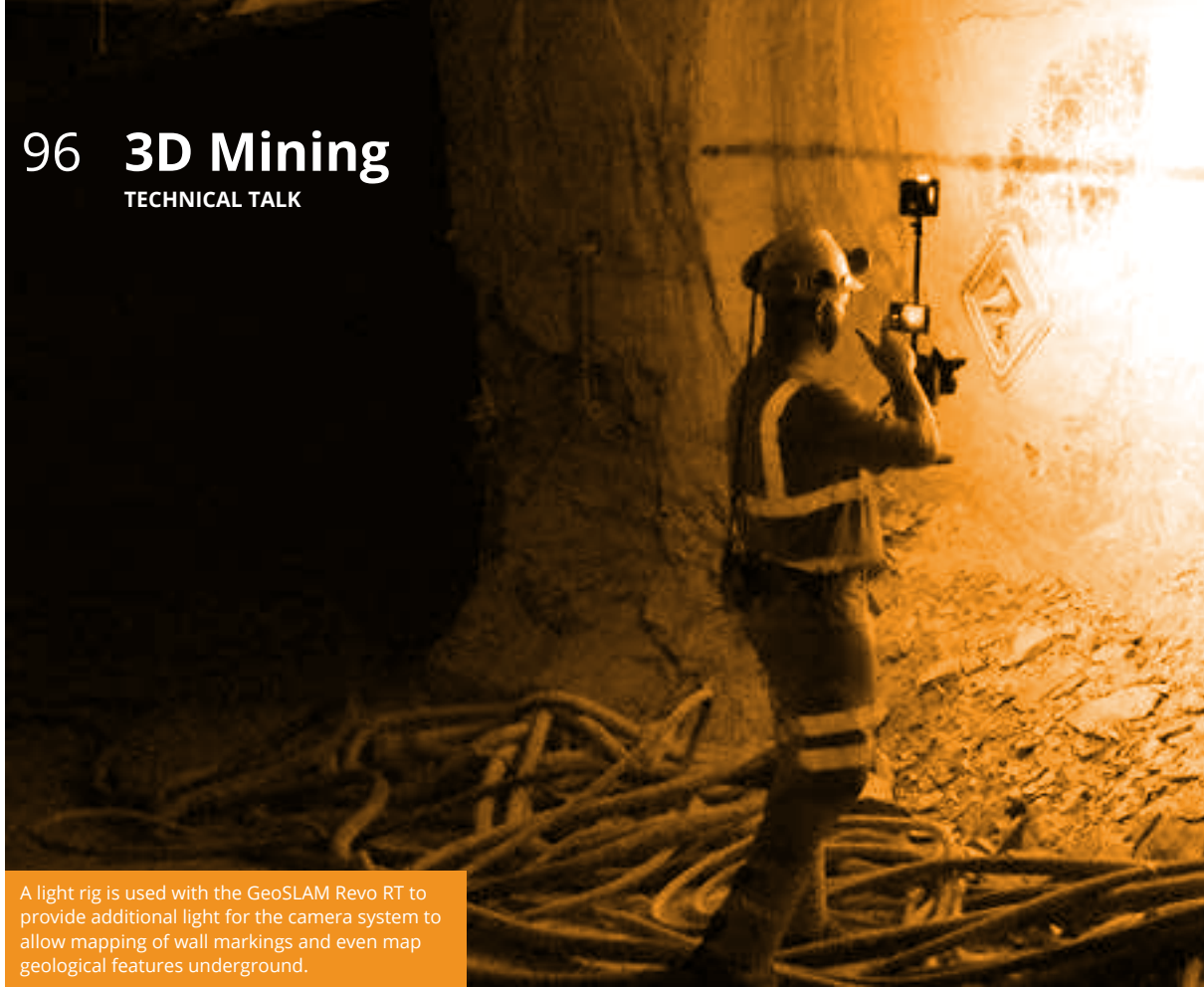
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WAM®: Wire Additive Manufacturing. Aust. Patent 2019251514. AML3D®, WAM®, WAMSoft®, ARCEMY® are all registered trademarks for AML3D®.



AML3D®



A light rig is used with the GeoSLAM Revo RT to provide additional light for the camera system to allow mapping of wall markings and even map geological features underground.

GeoSLAM Dunk

Georeferencing is the process of relating a system's own co-ordinate system (SOCS) of data and information objects (datasets, maps, photographs etc.), to a geographical location on the globe.

Using a known co-ordinate system, georeferenced data can be pinpointed to an exact location on the earth's surface.

There are many motivations for needing georeferenced data, and depending on the industry you work in, your needs could be different to others.

Georeferencing is an essential way of overlapping data on top of previous maps/images, to precisely visualise the changes of an area over time.

Georeferenced data is useful for mapping because it explains how other data, such as GPS points, relate to the imagery.

Georeferencing point clouds can also help scans suffering from drifting, helping to maintain the accuracy of a scan (especially on larger projects).

GeoSLAM

With the recent introduction and constant evolution of handheld SLAM (Simultaneous Localisation and Mapping) scanning, mapping has become safer, quicker, more automated, highly repeatable, and more effective.

GeoSLAM is the market leader in SLAM technology, making it easy to capture and connect data from the world around us.

From the built environment to the natural world, GeoSLAM technology gives people the power to collect geospatial data from some of the most difficult environments, whether they are indoor, outdoors, underground – everywhere.

Scanning Underground With SLAM

Historically, to capture a 2D map, a TLS (terrestrial laser scanner) would be taken into a mine, capturing data at known control points previously installed by surveyors.

Due to the complex nature and vastness of mine production, taking such bulky equipment into a mine is not only costly, due to the surveyor needed to utilise the equipment, but also not effective when it comes to repeating scans.

A surveyor could realistically enter a large mine on a weekly basis, with heavy equipment, taking them away from their analytical work that needs to be conducted.

In addition, a TLS scanner requires a tripod setup and the time to scan, therefore production can be hindered while a scan is being conducted, ultimately costing the mine money and time.

GeoSLAM offers a better way. Its ZEB SLAM scanners can map an accurate 3D model of a mine, without the need to be in line of sight of a GPS.

The ZEB scanners have their own internal co-ordinate system, so each scan starts at 0.0.0.

Using known control points throughout a mine, these scanners can be manually georeferenced using GeoSLAM's Adjust-to-Control feature in GeoSLAM HUB or automatically georeferenced using GeoSLAM's Connect software.

Connect is a powerful 3D Process Automation solution for processing and managing data generated by the ZEB-series of handheld laser scanners.

The results mean scans can be utilised in various solutions for mining, giving operators frequent high-quality data.

The ease-of-use and portability of the scanner means daily scans are no longer a wish, but a reality. Anybody can be trained to use a ZEB scanner – there is no longer the need to send surveyors into the mines, giving them more time to analyse the data being captured.

Ease Of Capture

A user only needs to walk and scan the area

they're mapping, to capture the data needed, stopping at control points to reference back to, for automatic georeferencing in GeoSLAM Connect.

Repeatability

The lightweight nature, portability and ease of use means that scans can be repeated daily.

This increase in data gives the mine operators more time to react to changes underground, making the mines safer and more cost-effective.

Speed

Without the need to stop and set up a tripod for each scan, it only takes as long as it takes an operator to walk around the scan area to capture it.

In addition, scanning around people is feasible, so there is no need to shut down operations whilst a scan is being conducted.

Processing

Georeferencing scans using GeoSLAM Connect is automatic.

Georeferenced data is more accurate, and by using third party software, it can be overlapped on top of plans or previous scans to show changes over time – opening up the possibilities to new solutions.

ZEB Go

This is a handheld laser that offers a reliable way to map and understand spaces.

It's essentially the first step in SLAM handheld technology, so whether it's the first time you've looked at digital surveying, or you want each of your sites equipped with the smartest SLAM, the ZEB Go is the place to start.

ZEB Revo RT

Handheld, lightweight and easy to use, the ZEB Revo RT allows users to rapidly build highly accurate 3D models within minutes, while on the move.

The complete solution allows users to start

mapping the world around them today with any WiFi enabled device.

Scan, visualise and process simultaneously, as you walk.

ZEB Horizon

The ZEB Horizon is an ultimate mobile mapping tool which boasts effortless data capture.

With a range of 100m, the ZEB Horizon is great for outdoor use including spaces where features are positioned further apart. It's lightweight and compact design also make it perfect for indoor surveys.

ZEB Horizon is your tool to capture, process and understand the world around you.

With a one-button operation, ZEB also captures survey grade data in minutes.

Process a pointcloud quickly using the intelligent point cloud processing platform GeoSLAM Hub.

GeoSLAM data is compatible with universal file formats (LAZ/LAS/PLY/TXT/e57).

Data from the ZEB Horizon can be exported from GeoSLAM Hub in all industry standard file formats, allowing users to import into preferred CAD programs or mine planning software.

In Conclusion

The innovation of SLAM scanning has revolutionised the way in which data can be captured underground, making it quicker, easier, safer, and highly repeatable.

GeoSLAM's automatic georeferencing provides accurate 3D data underground, that in turn unlocks the opportunities for new solutions to help mine operators be more cost-effective with their resources.

Forward thinking mine operators that have already adopted these solutions are already seeing the benefits. **AMR**



GeoSLAM Revo RT (Real Time) System showing the captured point cloud live on a phone in 3D during scanning to make sure all required areas are captured.



Georeferencing using adjust to control with the GeoSLAM Horizon, automatically capturing the control point sideways which will have the offset automatically calculated.



Volumetric calculations using a 3D scan captured by simply walking around the site with a GeoSLAM Horizon (also can be scanned via attaching to a UAV or car).



A point cloud from a rapid scan carried out with the handheld Zeb Horizon identifying rock structures before shotcrete and mesh was installed.

One Scanner, Many Solutions

GeoSLAM Production Progress Mapping allows operators the flexibility to make short-term operational decisions on newly-mined production areas in quick time in a 'mining-to-plan' process.



Global geospatial mapping specialist GeoSLAM recently expanded its mining offering, building on its world-leading reputation in the sector to provide advanced underground mining solutions.

The news follows the unveiling of its automated processing platform, GeoSLAM Connect, which provides users with the flexibility to process their data to their exact specifications through a series of interactive customisable script-based workflows.

Many features of Connect are particularly useful for the mining sector, including the automatic georeferencing.

Underpinned by the software, and backed by the company's expertise in the mining sector, the new innovations comprise production progress mapping, convergence analysis and vertical mine shaft inspection monitoring - all of which will sit alongside the existing solutions already available and in-use across the globe, including GeoSLAM Volumes for stockpile volumetric calculations.

With GeoSLAM Volumes, mine operators can easily calculate and measure stockpile tonnages within a few minutes, and see change over time.

GeoSLAM's powerful mobile mapping technology enables users to build high-density 3D volumetric models within minutes.

The market-leading, handheld laser scanners can determine accurate stockpile volume measurements, silo reserves or mining tempos, without the need for GPS.

Walk and scan, or attach the scanner to a trolley, drone, pole, UAV or vehicle for remote monitoring of hazardous environments.

The volumes software instantly turns data into actionable 3D information for rapid real-time decision making.

So now you volume mass at all stages of the supply chain can be verified as frequently as necessary. Train staff in minutes, slash survey times and drive down costs.

GeoSLAM CEO Graham Hunter said the company had worked in the mining sector for a number of years, alongside the industry's major worldwide players to understand their needs and challenges.

"I'm delighted to announce our latest offering, supported by our state-of-the-art Connect software, that will continue to bolster our mining offering," he said.

"Our aim is to help mine owners and workers overcome the number of hurdles they face in their day-to-day occupations; improving accessibility to ensure worker safety, speeding up operations and giving mining teams foresight into the changing underground environment by delivering precise and real-time data, as well as

keeping costs to a minimum while producing maximum output and driving revenue.

"These innovations are designed to be operated using our existing ZEB family of scanners and, best of all, the ease of use means they can be used without any prior training.

"In just a matter of minutes, with no interruption to the mining teams, mine owners can have reliable and accurate data at their fingertips, saving both time and money in what is an already demanding sector."

Production Progress Mapping

This new application, when coupled with a ZEB scanner and its own internal co-ordinate system, allows operators the flexibility to make short-term operational decisions on newly-mined production areas in quick time in a 'mining-to-plan' process.

Once the data from each scan has been automatically processed and georeferenced using GeoSLAM Connect, it can be uploaded to any compatible third-party software.

Operators will be able to overlap collected data and precisely visualise changes of an area over time to compare with project plans - giving mine owners the freedom to analyse, make real-time decisions and avoid production hold-ups.

Convergence Analysis

Mining has long been viewed as a hazardous occupation, but digital technologies like this are reshaping this outlook by providing mine owners with a rapid and cost-effective way to understand the environment while keeping miners safe.

Utilising GeoSLAM's unique SLAM (simultaneous localisation and mapping) algorithm to create clear 3D visualisations, mine operators will be able to quickly measure rock support - including detecting failure points, the velocity of change, potential slope and areas of displacement - all while remaining at a safe distance, and without the need to disrupt crews, due to the speed of capture.

Shaft Inspection Cradle

Completing the trio is GeoSLAM's cradle, built for collecting data during inspections and analysing change.

From above ground, it allows users to understand the erosion of a shaft wall, view blockages and identify hanging points for ore in hard-to-reach and dangerous vertical shafts.

Issued as standard with each ZEB sale, its support package, GeoSLAM Care, offers mining customers unlimited access to hardware and remote software support, the latest software releases and access to GeoSLAM Academy: a portal of resources for customers to use including user training, videos and best practice information. **AMR**



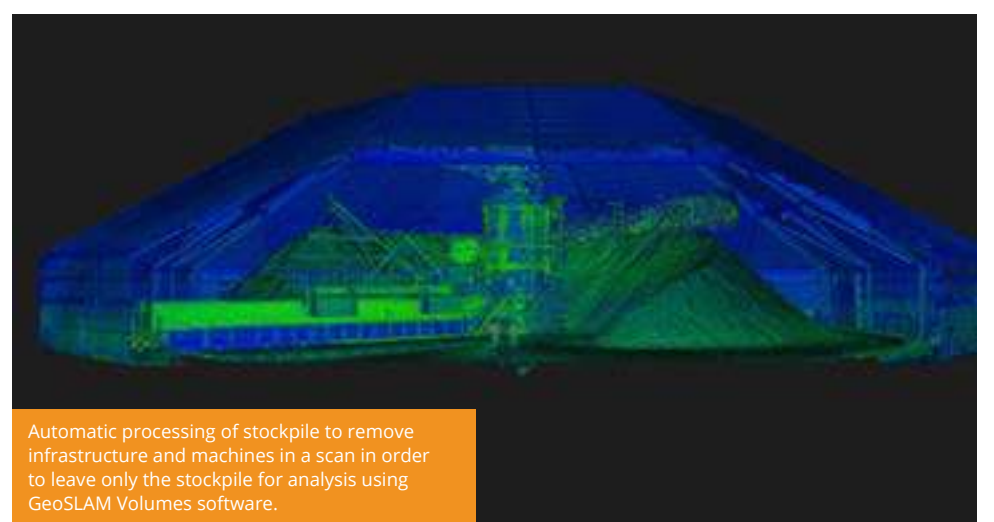
GeoSLAM's Convergence Analysis provides mine owners with a rapid and cost-effective way to understand the environment while keeping miners safe.



With GeoSLAM Volumes, mine operators can easily calculate and measure stockpile tonnages within a few minutes, and see change over time.



The shaft inspection cradle can identify dangerous vertical shafts.



Automatic processing of stockpile to remove infrastructure and machines in a scan in order to leave only the stockpile for analysis using GeoSLAM Volumes software.

FAN-TASTIC

It goes without saying that for safety reasons, solid ventilation systems need to be in place in mining environments, whether above or below the ground.



A CAD model of a 2300mm axial fan.

Ventilation is the control of air movement, its amount, and direction, and although it contributes nothing directly to the production phase of an operation, the lack of proper flow can cause lower worker efficiency and decreased productivity, increased accident rates, and even absenteeism.

Air is necessary not only for breathing, but also to disperse the chemical and physical contaminants such as gases, dusts, heat, and humidity.

Underground mine ventilation provides a flow of air to the workings of a mine of sufficient volume to dilute and remove dust and noxious gases (typically nitrous oxide, sulphur dioxide, methane, carbon dioxide and carbon monoxide) and to regulate temperature.

The source of these gases are mainly the equipment that runs on diesel engines, the explosives used for blasting, and the orebody itself.

In Australia, as well as in most of the world, mine ventilation practice is heavily regulated, aimed at diluting factors such as the diesel emissions, blasting fumes, radiation, dusts, battery emissions, and many other contaminants.

To ensure adequate ventilation of a mine, provision is made for suitable paths (airways or air courses) for the air to flow down the mine to the working places, and suitable routes out of the mine when it has become unsuitable for further use.

The primary ventilation system thus consists of an intake structure through which the fresh air passes, the mine workings, and an exhaust system where the air passes after having ventilated the working places of the mine. Mine fans are vital to control the air flow, and are installed on intake airshafts, return airshafts, or both, either on the surface or underground.

Fitzpatrick Engineering

The largest component of the operating cost for mine ventilation is electricity to power

the ventilation fans, which may account for one third of a typical underground mine's entire electrical power cost. So it's essential that when a mining company builds fans at its sites, it gets value for money: it needs to ensure the fans operate at maximum capacity suited to the working conditions of the respective sites.

That's where Fitzpatrick Engineering comes in.

Established in 1984, the Sydney-based company has earned a worldwide reputation for designing and producing a wide range of quality centrifugal and axial flow fans, dampers and silencers for industrial, mining and minerals processing, both in Australia and overseas.

According to company spokesman Steve Tran, Fitzpatrick manufactures fans ranging from small units weighing around 100kg with a motor power of just a few kW, to fans weighing 20t with a rotating impeller mass of 4800kg.

Types of fans

The company's centrifugal fans use wheels normally mounted in a fan or blower housing.

The air enters the housing inlet, turns 90° and is exhausted out of the housing discharge. They're all robust, welded with steel sheets and plates and reinforced with angle iron frames.

Steve said the company's fans included models with aerofoil, radial tip, and backwards-inclined blades, all of which are suited to varying operations. "One could be a high mass flow fan, one could be a high pressure fan," he said.

"They are used in different applications, depending on what the customer requirements are. "For mining specs, the sites usually involve moving large volumes of air, but we're not limited to one industry or the other. "We can do just one massive fan,

or radial and backwards inclined blade fans that can move large volumes of air."

Material Handling Impellers

These fans have straight radial blades with open impellers arranged like a paddle wheel, mostly used in materials-handling operations.

Eight designs cover high to very low flow rates, including the RM series high flow rate standard units for 5kPa, the RMB high flow rate with backplate for handling stringy material, and the MH series for low to very low flow rates.

Radial-tipped Blade and Radial Blade Fans

Also termed curved blade fans, Steve said radial-tipped blade fans are used in moderate-volume flow rate applications when the pressure requirement is moderately high and erosion resistance is preferable.

This design reduces the potential for dust build-up on the underside of the blades in applications with medium amounts of gas-borne dust.

"It offers higher pressure and more compact design than aerofoil and backward-inclined impellers in exchange for lesser efficiencies and increased power demand," Steve said.

These rugged fans offer high pressure capability with average efficiency, and are often fitted with erosion-resistant liners to extend rotor life.

They're generally used when high quantities of abrasive dust are present in the gas stream, or when very high gas temperatures are expected. The radial tip series models that Fitzpatrick manufactures are applicable for a range of high flow rate pressures up to 12kPa or low flow rate pressure up to 20kPa

Backwardly Inclined Aerofoil Blade and Plate Fans

Aerofoil impellers provide uniform, high volume airflow with low power consumption for optimum efficiency using the same aerodynamics that create flight.

As air approaches the blade's leading edge, the stream splits and travels above and below the blade.

It is then deflected across the convex curve along the top of the blade and along the flat or concave curve on the bottom, flowing downward over the sharp trailing edge as it leaves the blade.

The lift developed from the blade is a contributing factor to reducing power consumption as it rotates which is why it has the highest efficiency compared to other centrifugal fan designs.

"Aerofoil fans are the most commonly used to move large volumes of air," Steve said. "At higher flow rates, they become more efficient compared to other types of blades."

As the fan rotates a pressure difference is created on the impeller blades. On the leading, convex side of the impeller blade, a positive pressure is created as the rotational motion of the impeller imparts a force in the air.

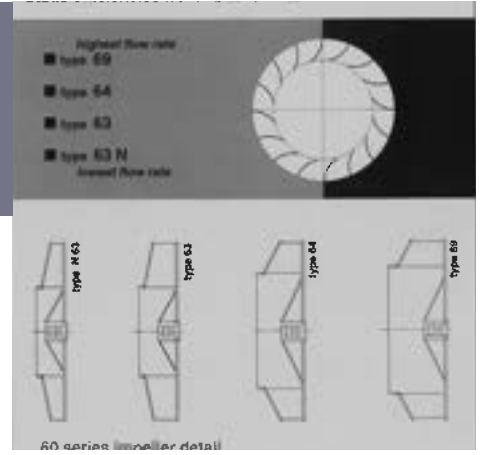
The blade pushes the air outwards, exiting in a radial direction. On the concave side of the impeller blade, a negative pressure is created as the fan rotates, drawing air into the space between the blades.

This air is then picked up by the following blade and forced outwards radially in a continuous process. The suction side of the impeller blade draws air from the centre of the fan which results in a directional change of the airflow between the inlet and the



A silencer unit used for fan sound suppression.

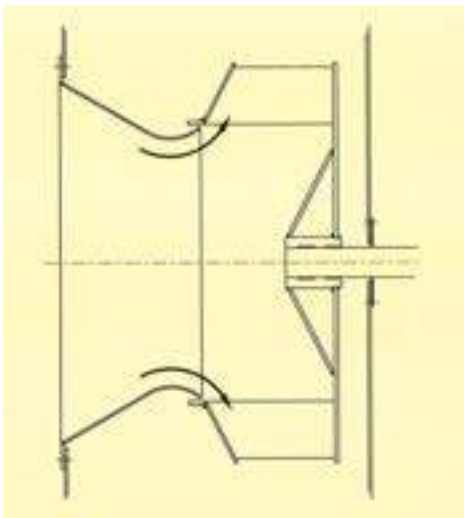
60 series radial tip fans have straight radial blades and are used on applications where dust or material has to pass through the fan. Straight radial blade materials handling fans are the most resistant to material build-up of any centrifugal fan type. All of these fans are designed for lower flow rates.



60 series impeller detail



The model 6360 curved plate fan, which offers low flow rate pressures to 18 kPa.



54 series aerofoil blade fans, which are designed for high flow rates, with pressures to 12 kPa. The versatile design can be used for both direct drive and vee belt drive applications for moving clean air and light non-sticky dust loads.

55 series backward-inclined plate blade fans, which incorporate high flow rate standard designs to 5 kPa. The backwardly inclined plate blade fan is designed to handle large volumes of relatively clean air, commonly used for industrial air supply and exhaust applications.

exhaust of 90°.

Steve said these fans were used extensively for continuous service at ambient and elevated temperatures in forced and induced draft applications in the metals, chemical, power generation, resource recovery, incineration and other industries throughout the world.

The backwardly-inclined plate blade fans, meanwhile, are designed to handle large volumes of relatively clean air, commonly used for industrial air supply and exhaust applications.

Fitzpatrick Engineering ensures they are constructed heavily with hardened alloy steel plate. They have a performance air flow of 344,300 CFM (584,965 m³/hour), and are capable of coping with non-sticky abrasive dust loads.

This design is a cost-effective alternative to the aerofoil design, but with flat plate blades instead of curved, resulting in a slightly lower efficiency, compensated by the easier fitting of liners and manufacturing process.

Fitzpatrick is in the house

Steve said that the company is 100pc Australian-owned and carries out all design, development and manufacturing of its products in Australia.

"All the fabrication is done in-house, including rolling, pressing, welding, as well as the machining and painting," he said. "This gives us the flexibility and capability to take on custom projects within the air building fan industry or outside.

"Also, this means that if there's a shutdown or emergency, we have room to allow for that sort of work." The company boasts around 40 standard aerodynamic fan designs, with the list continuing to grow as it develops new designs or adds further options to existing designs to enhance their performance and versatility.

The workshop has two areas of operation: steel fabrication and machining, and design and manufacture. Both combine to improve the ability to reduce production cost and allow the manufacturing process to run more smoothly and effectively. "Executing these two areas under one roof

has resulted in much quicker turnaround," Steve said. Qualified engineers are employed to ensure customers choose the right fan for their application with minimum supply lead time and best-in-class performance.

The centrifugal fans are engineered to operate with high aerodynamic efficiency, smooth running low vibration/noise levels and a compact, low profile footprint.

All Fitzpatrick products are manufactured within an ISO 9002 quality control system, airflow and sound-tested in DIN 45635 chambers, and balanced to ISO 1940 standard G2.5 and G6.3 where required. The company acknowledges that the customer is king, and can manufacture units to the clients' wishes.

"If a 1m diameter blade fan is not sufficient, we can scale up to 2m," Steve said. "Generally though, the bigger the blade, the less you need to run the speed, for safety reasons. "For example, you can run a 1m fan up to 3000rpm ... but using something bigger, something that fast, is asking for a disaster.

"For something around 2m, we might go up to 1000 rpm; it's certainly something we take into consideration in the calculations."

Indeed, when it comes to gauging performance, the company provides performance graphs to clients for each model which depicts their ability to push at certain flows at particular pressures.

"We match fan requirements with the models to make selection easier," Steve said. The company also incorporates some special features into their fans. "We incorporate the effects of the operating environments into the build," Steve said. "For example, we ensure our underground fans are explosion-proof rated.

"We use brass cages around whole components and moving parts to avoid steel-on-steel contact. "We are aware that any spark or gas leak could lead to a catastrophe, so we make sure the fans are certified, mining-spec approved and made of anti-sparking material."

The company can equip EXD electric motors for the fans, which are specifically made to be explosion-proof and are used widely at

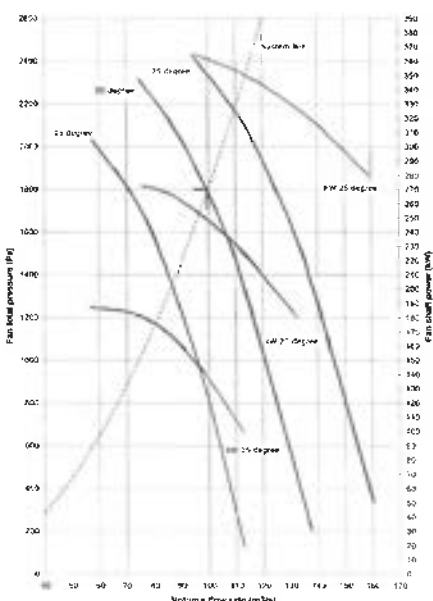
mining sites and other hazardous areas. "Motors range in size from small to huge, from 7.5kw to 1000kw, which of course would move a large amount of air," Steve said.

GLOBAL FOLLOWING

Fitzpatrick Engineering is proud to claim that it is one of the country's leading manufacturers of high quality in-house industrial fans, backed by qualified engineers with extensive experience in leading technology innovation. It boasts robust engineering reliability, quality systems, and supplies products to anywhere in the world.

With that sort of uncompromising quality and wide support from various resource sectors, you might even say that there are literally many, many fans of this company's many, many fans. **AMR**

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A fan performance guide for axial fans, showing the effects of fan total pressure on volume flow rate.

100 Mine Ventilation

TECHNICAL TALK



Overcoming the “Blood Sucking” Cost of Ventilation Down-Time

Hidden away in an underground mine operation’s OPEX is the significant downtime created by a regular need to run ventilation maintenance.

Efficient ventilation is a necessary evil for the safe operation of the mine, but according to Justin Reed, the Managing Director at Polyline Industries, it is something that can be easily and better managed through the initial or subsequent choice of materials in the construction and ongoing maintenance of the project.

Perth-based Polyline Industries is an innovative leader in the fabrication of High-Density Polyethylene (HDPE) and it is this expertise that is proving a “game changer” in mine ventilation.

Justin says durable and quality made ventilation systems are paramount as they provide a controlled flow of air to the underground workings of a mine site.

“A hidden vampire in every underground mine site, sucking away at the life force of shift “Meters”, is the normally unmeasured cost of drive shut-downs due to ventilation duct repairs,” Justin recently told The Australian Mining Review.

“Every truck carrying ore that does not make it to the surface during a given shift is of course affecting the bottom line of the mine that day. 10’s of thousands of dollars per truck load can be missed, and that can add big costs to a mine’s bottom line.”

According to Justin, one simple solution to help companies meet their production quotas is by reducing down-time and truck hold ups by replacing vulnerable and weak vent bag tee and elbow fittings with Polyline’s semi rigid PolyDuct fittings.

“Satisfying negative pressure requirements and PolyDuct armor for frequently damaged straight sections of vent bag are also great candidates for improving mine efficiency,” he said.

“Not to mention the reduced running costs of fans and the greater than x 2 additional length that can be added to a vent duct run length from the existing fan.”

PolyDuct has a primary benefit to the client of being highly durable over a lengthy time frame.

Justin says that reliable up time due to high durability of the company’s product is winning over a number of operators.

“There is a noticeable Return On Investment (ROI) when a drive is not shut down. This is particularly noticeable when the product is utilized in highly vulnerable or

damaged areas.”

PolyDuct, comes in a range of standard sizes – 1065, 1200 & 1400 and it can also be custom fabricated to match any size requirement.

“The largest we have built to date is Ø3M elbows and straights made as light weight modular transportable sections.”

It is that weight advantage that is also proving to be a winner in reducing costs with Polyline having supplied products to nearly all major mine sites across Australia at one time or another.

There has also been a strong demand for civil construction projects, with the large Ø3M Duct recently used in Sydney metro tunnel project.

Founded in 1999, Polyline Industries has led the way in innovating new product lines to suit its clients’ operational requirements. Its services range from Design, Rotational Moulding (Rotomoulding), Poly Sheet Bending, CNC Routing, and Welding.

According to Polyline, ventilation products fabricated from High-Density Polyethylene (HDPE) are superior to their steel and fiberglass counterparts for a number of reasons:

Durable

HDPE is UV stable with a lifespan of 20+ years. It is excellent in damp and salty environments as it does not rust or corrode – making it a superior option to steel.

Impact Resistant

As polymers are long chain molecules they give plastics a memory resulting in high impact unlike steel or fiberglass that dent and crack on impact.

Lightweight

Enables installation/removal an easier task to perform, especially in tight spaces.

Size Efficient

Products are designed specifically for ease

of transport and to reduce shipping costs With Polyline’s specialist fabrication capabilities in primary ventilation for underground mining.

Underground ventilation

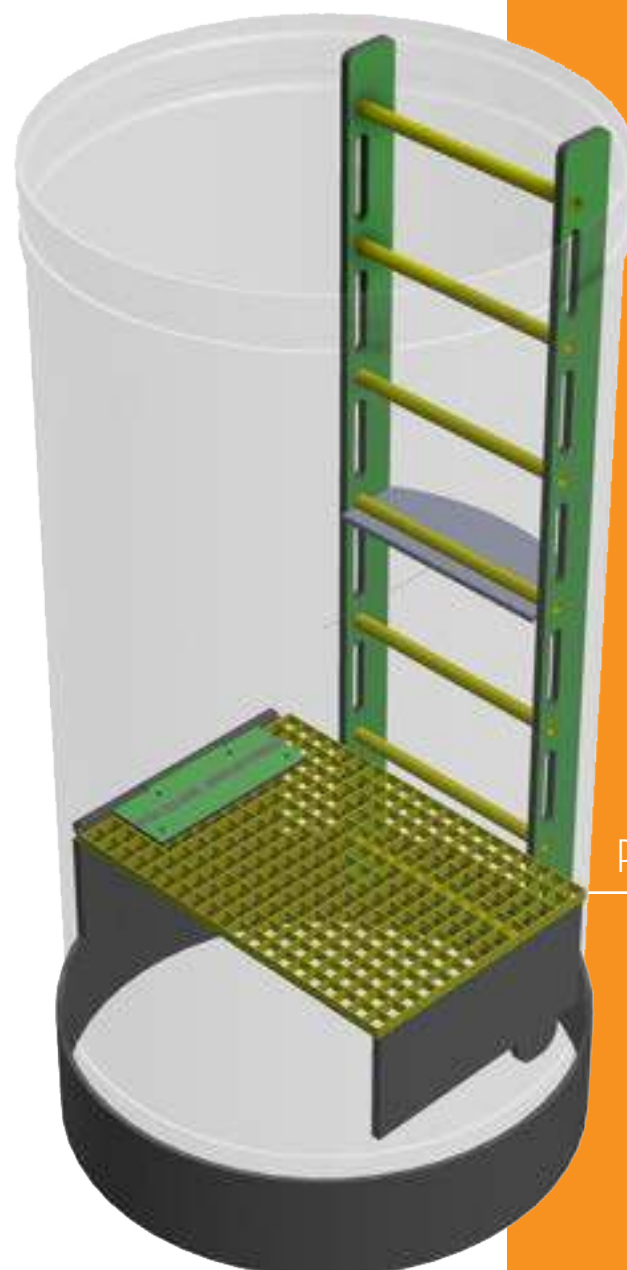
Polyline Industries has developed and manufactured an advanced range of moulded polyethylene products manufactured from linear Medium-Density Polyethylene (MDPE) and High-Density Polyethylene (HDPE) for custom duct.

Standard features of HDPE

- Inert - Will Not Corrode
- Flexible
- Inbuilt noise absorption
- Durable & impact resistant
- Lightweight
- Low maintenance
- Low air friction

Features of the moulded MDPE products A more robust moulded cylinder which is:

- Double vent bag Rings – Ensures vent bags will not blow off that even under the highest pressure
- Boltable Flanges for joining duct to fans and other duct
- Rubber band joiners for joining duct to duct
- -ve pressure solution



Polyline escape hatchway



Polyline can meet your ventilation needs, big and small



60°-Branch

Mine Ventilation 101

TECHNICAL TALK

Polyline has developed a unique sealed rubber joining system which is cost effective and very easy to use. It also allows the flexibility to create minor bends.

With its advanced fabrication capabilities, Polyline Industries can provide a wide range of engineered polymer solutions internationally for industries such as: Mining, Marine, Oil & Gas, and Civil.

Since 1999, Polyline Industries has built a reputation as a well-known and trusted industry leader in plastics fabrication.

It first gained traction in the underground mining sector by introducing a number of unique products into the industry

including polyduct, plastic detonator boxes, submersible poly pump floats and an underground poly pipe welding system to name a few. Our product range includes items that are now standard issue in the most productive underground mines.

“We continually push boundaries when it comes tough plastics fabrication and our many years of innovation in the marine industry is a testament to this,” Justin says.

“Polyline has introduced a number of high-density polyethylene (HDPE) commercial boats into the arena that are game changers. “Our design, functionality and standards for polyethylene vessels are world class and have been internationally recognised

by Ausmarine and Work Boat World magazines.”

With tough plastics proving to be a superior alternative to steel and aluminium in sectors such as mining, marine, oil and gas, Polyline has invested in continually expanding its capabilities.

Venturing into polyurethanes, rotational moulding (rotomoulding), CNC routing and sheet bending capabilities and with its well-known range of fabricated products produced from engineered plastics, the company is fully equipped and committed to delivering you solutions that work!

Polyline Industries is a specialist in the

design and fabrication of primary ventilation products for underground mining.

The company's durable and quality made ventilation systems are paramount are they provide a controlled flow of air to the underground workings of a mine site – while improving a mining company's bottom line.

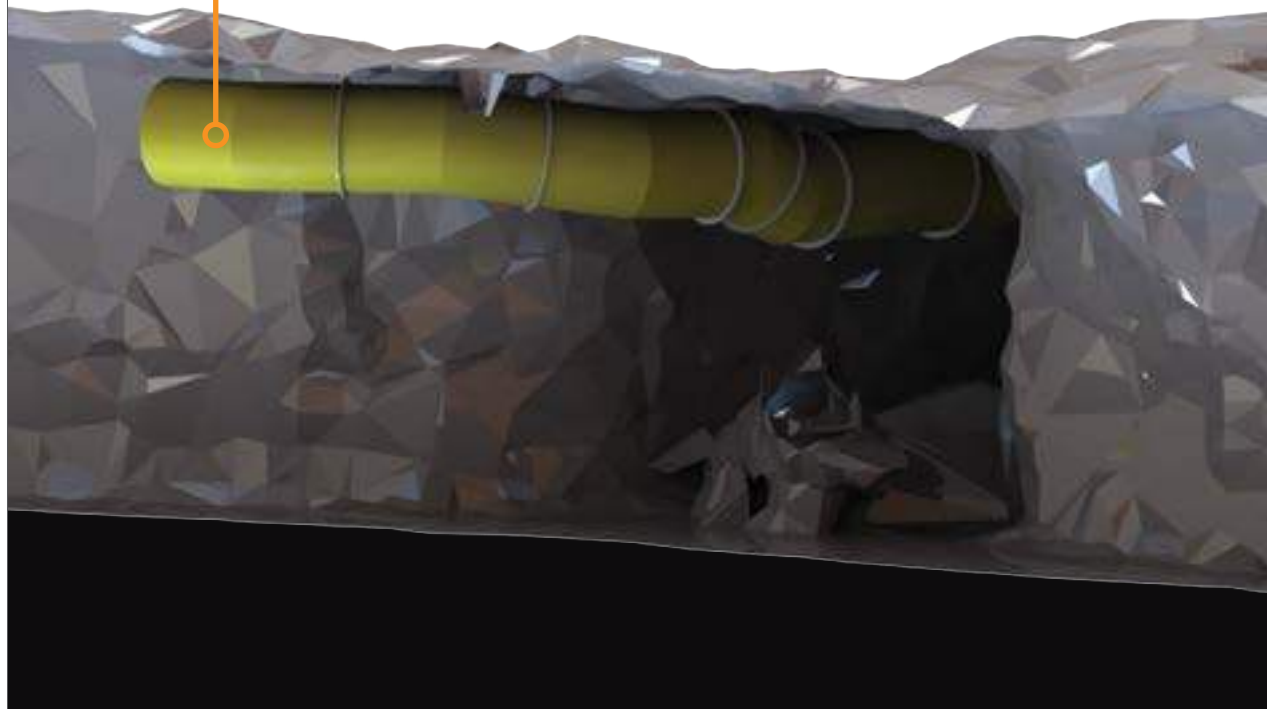
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Polyline Industries

Clearing The Air With Superior Ventilation Products

Polyline Industries is an innovative leader in the fabrication of ventilation products from High-Density Polyethylene (HDPE) which are **SUPERIOR TO THEIR STEEL AND ALUMINIUM COUNTERPARTS.**



Polyline Industries
Tough Plastics Fabrication

55 Cutler Road, Jandakot,
Western Australia, 6164

08 9414 1535
polyline.com.au

Specialised Knowledge Behind Roladuct

When your staff's lives are on the line, it is always reassuring to know that the company providing the vital equipment to keep them safe has a proven track record of supplying the best you can get.

That is something that Kemps Creek, NSW-headquartered mine tunnel ventilation specialist the Roladuct Spiral Tubing Group, has plenty of.

Established in 1988, Roladuct has built a strong reputation for both the quality of its products and its support service which has seen it undertake major ventilation projects right across Australia.

The Australian Mining Review recently caught up with Joe Abdullah, Roladuct's Marketing Manager, to discuss the company's history and its ongoing success.

Joe, who has been with Roladuct for nearly three decades, says that one of the strengths of the company is the considerable experience contained within its workforce.

That collaboration of specialized knowledge saw the company go from a 20-man team in the Kemps Creek facility in 1988 to an organisation with branches in Brisbane and Melbourne within 12 months of the company's launch.

"I think we were able to expand so quickly because we had a very strong team with a strong background in ventilation, with many decades of experience," Joe said.

To back up the strength of the company's management experience, all Roladuct employees undertake tailored in-house or external tertiary training programmes ensuring its advanced machinery performs to its ultimate potential, along with professional sales and administration back up.

Alongside that wealth of skills and experience in Roladuct's unique ferrous and non-ferrous, metal spiral lock and spiral welded duct, pipe and tubing systems.

"I think our product is definitely another winner. To start off with we use a relatively lightweight steel which provides great strength durability," Joe said.

"Secondly, we are able to create mine tunnel ventilation solutions to meet whatever the client's issues are."

The Roladuct method of manufacture involves a continuous spiral production process of weld and roll form (lockseam) tubular section.

Spiral weld tube and pipe is usually manufactured for high pressure and structural applications in a diameter range up to 1524mm.

Roll formed (lockseam) tube and pipe is manufactured for low pressure ducting and



Roladuct's ventilation systems are ideal for underground operations.

structural applications in a diameter range up to 3000mm.

A comprehensive range of bends, tees and reducers in welded and lockseam are fabricated in Roladuct's engineering work shops to complement the tubular systems as well as customer specials such as spool pieces, stiffening rings but there is no limit to the range and type of fitting that can be made.

Joe said the Roladuct tube and piping systems are highly flexible in design and very versatile in application and therefore it is often the case that the tube or pipe system is manufactured to meet a customer's specific need.

Roladuct also provides customers with engineering assistance during tube and pipe process evaluation and design as well as an onsite fabrication.

Joe said the importance of having the right ventilation system for underground mining operations cannot be understated.

"Without ventilation, they can't operate. That's the most important thing as far as the mine operators are concerned, as without ventilation they can't work and they can't make money," he said.

"You have two issues. One is dust. Another one is methane gas on the ground. That is especially so for coal mines where they may need to pump any methane out as a safety issue. So the right ventilation system is critical if they want to operate."

Joe says having a proven system is also critical in giving the mining company and its workforce confidence in the safety of their underground operation.

"I think the biggest thing is giving people the confidence that they have the right system in place, especially in this sort of work," he said.

Advantages of Roladuct Spiral Tube and Pipe Systems include:

- Spiral tube and pipe systems production is efficient and economical even for small production runs.
- The spiral method of tube and pipe manufacture has the ability to produce large-OD product.
- The systems are high strength, robust in transportation and storage and ease to install.
- The product range of diameters and wall thickness available is vast.
- Spiral tube and pipe can be manufacture in customer specific



Roladuct can provide the right solution for the right job everytime.

- lengths. Standard is 6m for spiral welded tube and 3m for lock seam, but up to 12m lengths can be produced.
- Spiral tube and piping system are manufactured entirely in Roladuct's own production facilities.
- Roladuct, as the manufacturer, sets the product standard through its quality control systems to ensure high quality product.
- Roladuct can provide an onsite manufacture service.
- Roladuct supports its piping product from design through to installation.
- The spiral tube and piping system can be manufactured with a variety of end profiles and customised length to suit application needs.
- Roladuct can fabricate spool sections in factory to save on instal costs.

Roladuct's track record of 30 plus years of providing successful solutions for some of the biggest civil and mining construction projects in Australia certainly provides the level of confidence potential customers are looking for.

Some of the significant projects the company has worked on in recent years includes:

- Glencore's giant Ernest Henry Mine in Cloncurry Queensland - ventilation ducting
- Anglo American's Moranbah North underground longwall mine in Central Queensland - ventilation ducting
- Sydney, Melbourne and Brisbane's Tunnel infrastructure projects - tunnel ventilation
- Glencore nsw - gas drainage piping
- The Hunter Expressway - piers, columns and isolation casing liners
- Orica Plant - air supply ducting
- UTS Sydney - air conditioning ducting.
- Esperance w.a Bridge voids
- Metropolitan colliery - gas drainage piping

- Darwin Prison - Anti climb barrel
- Eagle downs Qld -Ventilation duct
- Eastern water treatment plant - st/st piping
- Woodman Point w.a - st/st piping
- Derby detention center - Anti climb barrel
- Blackmans bay STP - st/st piping
- Christmas island - Anti climb barrel
- South 32 - gas drainage piping

Joe says no job is too big or too small for the company

"Our strategy is to provide a comprehensive and complete product line through to project supply, thus enabling our customers to simplify their supplier base," he said.

"Being a vertically integrated manufacturing organisation, all operations are inhouse in each manufacturing plant which allows us to reduce lead times and control quality to the highest of standards.

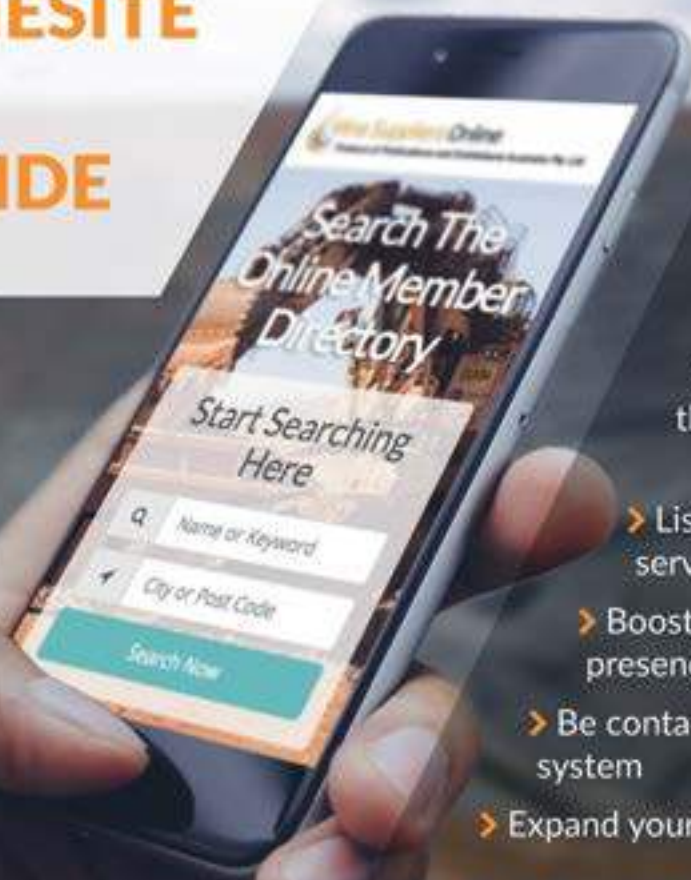
"Our continuing focus is towards customer satisfaction, especially with regard to order response and technical expertise. This is achieved through our commitment and care for the environment, the community and, most importantly, our people."

Joe said that Roladuct's aim is to remain prominent as market leaders in its field Australia-wide, well into the long-term future.

By providing the best equipment with the highest levels of training producing the best results, will ensure that target will be achieved. **AMR**

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LORCH
smart welding



Silverwater Shining Bright with its Welding Supplies

A wealth of experience, a dedicated workforce, a willingness to meet all the needs of its customers and access to best brands on the market are the sure ingredients for success and that is a recipe that has made Silverwater Welding Supplies one of Australia's leading suppliers of welding equipment for many years.

The Australian Mining Review recently caught up with Managing Director, Garry Bird, to hear about the company's impressive history of supplying top quality equipment across Australia, its plans to

move into larger facilities and what game changing technologies have impressed him of late.

Silverwater started as a family business over 50 years ago, repairing engines for Lincoln Electric Co mobile welders and progressing into the sales and hire of welding equipment.

After a lifetime dedicated to building a highly-regarded business, the elderly owners decided to get out of the game around three years ago, with Garry brought on board to ensure the company made it

through the transition seamlessly.

While Garry brought 14 years of senior experience with another highly regarded welding supply specialist to his role at Silverwater, he considers himself a relative newbie with his current employer even after three years.

"This a 50 year plus year old company, with the majority of staff members having many decades with the firm.

"There is a guy who has been here for 45

years, another with 30 plus years and a large portion of the remainder are in the 20 plus years range."

When you have that sort of dedicated long service across the board you know that a company must be doing something right.

Located in the well-known Sydney industrial suburb of Silverwater, Garry says his experienced team ensures the company can meet any requirements its customers have. This includes supplying a full range of the biggest names in welding equipment, new or used, consumables or other supplies.

"We have a popular range of products to suit all of a customer's welding requirements, such as; MIG equipment, TIG equipment, Electrodes, Hardfacing, Sub-arc, Grinding Wheels, Safety Equipment and Gasses," Garry said.

"We also keep a wide range of safety products, as well as some of the most well-known welding equipment brands in industry.

Those names include:

- CIGWELD
- LINCON ELECTRIC
- W.I.A
- MILLER
- UNIMIG
- FRONIUS
- HYPER THERM
- ESAB
- 3M ABRASIVES
- SPEEDGLASS

Silverwater's team of specialists have a great deal of experience in repair and maintenance, with the firm gaining a particularly strong reputation for its ability to repair diesel engine-driven welders.

"We support a lot of smaller guys outside the mines doing repairs and maintenance while we also manufacture equipment for the mines," Garry says.



Silverwater carries a vast range of welding needs.



With more than 50 years in the business, Silverwater is ready to fill all your needs.

According to Garry, one of the most sort after items is engine-driven welding equipment.

"The customers are looking for something that is the most efficient and can be used in virtually any situation or location.

"Most notably, engine-driven welders are a particularly powerful tool which is also very flexible."

Their power and ability to be used in remote locations make engine-driven welding equipment ideal for the mining industry.

Engine-driven welders are generally used when electric power is not available for arc welding; usually outdoor applications. However, engine-driven welders can also be used for indoor applications when it is not convenient to supply power to electric "plug-in" arc welders.

Garry says there have also been a number of game-changing equipment developments in recent years and highlighted a few that are currently very popular with customers.

Lincoln Electric HyperFill

Lincoln Electric's patented HyperFill twin wire MIG system has been particularly popular with Silverwater's customers over the past 12 months.

Designed to revolutionise heavy fabrication productivity, the HyperFill twin wire MIG solution allows for increased deposition rates without compromising puddle stability or weld quality.

Utilising a single power source, a single wire feeder, a single tip, and Lincoln Electric premium wire, this innovative solution delivers a wide, smooth arc cone that allows for deposition rates above 18lbs/hr | 8.2 kg/hr. (24 lbs/hr. | 10.9 kg/hr robotic) without added system or operator complexity.

HyperFill uses two wires or twin wires that use the exclusive Lincoln pulse waveform technology to bring them together as one arc.

The innovative twin wire design delivers a wide, evenly-distributed arc cone that allows for higher deposition rates – on average 50% higher deposition than a single wire – without compromising the weld quality or ease-of-use. This translates to a reduced number of hours spent welding a structure, which in turn, translates to more profit.

The HyperFill arc cone produces a smooth, stable puddle that is more favourable for the weld and makes the process easy to use at high deposition rates. The wide arc cone also leads to a more favourable and robust

penetration profile, improving the weld quality at high deposition rates.

Importantly, a manual welder skilled in single arc welding does not need to be retrained to adapt to using HyperFill and the technology can be welded by either a welding robot or human fabricator.

HyperFill was created to provide robotic-type deposition rates and put those deposition rates into the hands of the manual welder. At the same time, the system is simple to set up and operate.

There is one power source, one water cooler, one feeder and a twin welding tip. The welding torch is water-cooled to keep it light in weight and cool to the hands.

Furthermore, the HyperFill technology can be used with multiple wires: solid wires, metal-cored wires or flux-cored wires. It adds on to Lincoln's existing Power Wave multi-process welders and therefore harnesses the range of benefits that these machines provide as well.

Millers Maxstar DX 210 120-480 V

Another popular new item is the Miller Maxstar Electric DX 210 120-480 V.

This latest update to the industry-standard

Maxstar range provides a solution for a variety of needs; from simple to fully automated.

The Maxstar 210 series is well known for consistent arc times and enough power to get just about any job done, and the DX 210 is no exception.

The Maxstar DX 210 offers both TIG and stick welding modes, making it suitable for a wide range of work. The welder has features to make it safer and quieter, such as the built-in air cooling system.

The built-in fan not only effectively cools the machine, it also reduces noise and energy usage while also effectively keeping the machine clear of contaminants that can build up during use. Not only does it extend the service life of the machine, it also reduces running costs and downtime.

The Maxstar DX 210 allows the user to create and save preset controls for the most-used settings, which is not only convenient for the user, but also efficient at reducing setup time. **AMR**

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Silverwater Welding Supplies is one of Australia's leading suppliers of welding equipment.

Fully Engineered Solutions



Renteca is an industry leader in providing fully engineered solutions for trans-Tasman heavy industrial projects requiring specialist technical equipment. Backed by more than 60 years of industry experience, Renteca is recognised for our comprehensive supply solutions especially mine and construction site ready certified welders and weld automation products, rotating and positioning equipment, tank welding equipment, temporary power generators, electrical distribution, induction heating technologies and site support services.

Renteca is an industry leader in providing fully engineered solutions for trans-Tasman heavy industrial project.

The Renteca Advantage

ACCESS

We partner with our clients to design tailored solutions which add value to each project. Their experienced team understands that each job is variable, so the assessment phase accounts for more than just equipment hire. Overarching considerations include schedules, budgets, safety and compliance, logistics, and power and welding arc redundancy. Their customisable and scalable concepts have improved client performance and is backed by extensive industry knowledge and state-of-the-art equipment that their competitors cannot match.

DEPLOY

From simple dry hire solutions to intricate full-scale projects, we will deploy industry-preferred equipment which is performance-ready certified directly to site within tight project timelines. Multiple locations across

Australia enable customers to have trans-Tasman access to extensive specialist equipment holdings including the largest welding fleet in Australia, reinforcing their capacity to support clients with reliable resources spanning any project lifecycle.

MAINTAIN

Ensuring safety and efficiency is pivotal for all mining and resources projects, so they offer customers integrated maintenance safeguards for a broad scope of needs. They offer a range of continuation solutions including off-site remote support, on-site backup equipment, installation technicians and service support personnel.

MONITOR

Their experienced team is renowned for providing highly specialised and technical advice with industry-leading speed and consistency. Protect a seamless project plan with comprehensive equipment systems and strong preventative measures supported by faultless responsiveness and innovative solutions such as remote instrument monitoring.

New Facilities

Renteca has operated in the Western Australian Market for over 15 years providing equipment services to several large projects including Gorgon LNG Facility and Roy Hill Iron Ore Mine. Renteca continues to invest heavily into the Western Australian region with their new Henderson facility, new technology fleet updates from Lincoln and Miller as well as additional service staff to bolster their field services support business.

New Equipment

With an entire fleet of new or near new equipment across their entire range of welders and generators, they have made further additions to their range. For the welding range they have added the Lincoln Flextec 350X, Flextec 500X, Flextec 650X, LN25X wire feeders and dual operator Miller Big Blue 800X's with air. This new technology will increase efficiencies for their customers with new Lincoln cross link technology, dual operator equipment for heavy welding and gouging combined with staged low emission generator engines. Renteca only uses diesel generators with Staged engine ratings which are class leading with respect to fuel economy and low emissions. For power generation, the new additions to their fleet enables them to provide small or large scale power generation capacity options from manufacturers such as CAT and Inmesol. Their power generation fleet uses industry leading Comap controllers including the Inteligen 200 and 500 synchronising panels with remote performance and condition monitoring enabling them the scale customers power generation needs from 20KVA up to 5MW and above.

New Equipment and Technological Innovations

FLEXTEC 350X/ 500X/ 650X PACK BANKS

Whether in a shop or in the field, the Flextec X welder is built to perform.

Equipped with CrossLinc® technology, the Flextec X welder can be controlled from hundreds of feet away without expensive and inconvenient control cables. Desert Duty® and IP23 rated, it can withstand harsh outdoor conditions and outperform other welders in its class.

In the field, the Flextec X Construction is a

welder's most effective weapon. As a rugged multi-process power source, this model stays reliable and offers much more than other inverter-based welders in its class.

In the shop, the Flextec X Standard model is built to work with all 42V feeders for your factory applications. It is also compatible with Arclink® digital feeders to provide synergic modes and memories for quick setup and seamless connectivity.

The Flextec X PowerConnect model adds the ability to weld with any input voltage between 200 and 600 volts and adds **basic pulsed MIG** output as a standard feature. Renteca provides X welder banks in 6 pack or 4 pack sizes with options for customised sizes.

Lincoln Electric's Vantage 500 CE Released in Australia in 2019 for the Mining Industry, the Vantage 500 runs at 50hz meaning the Auxiliary Power can be used onsite where 60hz machines are not site compliant.

The Vantage 500 CE is one of the most compact and powerful engine-driven welders / generators in the construction, pipe or rental fleet market today. It is also super quiet with a smooth running 4-cylinder Perkins water-cooled diesel engines.

Use it for Stick welding with a large variety of electrodes, Lift TIG welding, CV welding with shielding gas or Inner shield wires, and arc gouge up to 10 mm carbons.

Features:

- Compact Case with Stainless Steel Enclosure
- Standard stainless steel roof, side panels and engine-access door deliver added protection and durability.
- Multi-Process Welding, Separate Arc Gouge Mode

Select one of five Process Modes, including CC-Stick, Downhill Pipe (for cellulosic electrodes), DC Touch Start TIG®, CV-Wire or Arc Gouging mode which maximises output with up to 10mm carbon rods.

VRD reduced OCV (open circuit voltage) in CC and CV welding modes for added safety. Reliable Engines - 4-cylinder 1,500 RPM



RENTECA SUPPLIES THE LATEST IN
LINCOLN ELECTRIC EQUIPMENT.



Another truck loaded with top-of-the-range equipment from Renteca.



THE POWERFUL DUO AIR PAK OFFERS DUAL-OPERATOR PRODUCTIVITY.

Perkins turbo-charged diesel engine runs smooth and quiet. Engine gauges allow you to monitor performance at a glance.

Specifications

Rated Output (40°C): 400A/36V@100%
450A/38V@60%
Output Range: 30-500A
Generator Output: 14.5 kW
Engine Type: Perkins 404D-22 Turbo
Horsepower: 38hp @

Miller Big Blue 800X Duo

The 800X is a 3-phase engine driven machine which features two independent arcs, with up to 400 Amps each, meaning 2 operators can work off one power source. As a result, a fleet of engine drive machines can be reduced, resulting in lower capital investment.

The 800X machine also reduces costs associated with engine servicing, fuel, compressor servicing and compliance testing, saving you money annually. With more arcs and better fuel economy the 800X also increases profits, with an estimated savings of 34% compared with single operator units. Overall, the 800X can save you money in more ways than one!

The 800X also comes fitted with vandal proof doors for extra security and has a Duetz turbocharged engine which consumes less. In addition, the 800X features infinite arc control, which allows the user to change the arc characteristics for specific applications in Stick, MIG and FCAW.

A special feature of the 800X is the Ingersoll Rand compressor. Ultra-reliable this rotary

screw compressor has a life expectancy of 30,000 hours resulting in longer servicing intervals. Another feature to mention is the electronic engine display, which simultaneously displays fuel level, engine hours, coolant temperature, oil pressure, battery volts, engine RPM, air pressure, compressor hours and engine diagnostics for quick and easy servicing. Seriously impressive!

The Big Blue 800X Duo Air Pak is a complete mobile welding air and power workshop for onsite maintenance and fabrication.

Is Renting a Generator Better Option?

Renteca recently asked the question, whether renting a generator is better than buying one?

For many contractors and construction companies, renting welding equipment makes sense — whether they rent exclusively or to augment their existing fleet.

As contractors weigh their available capital against equipment needs to determine which path is right for them, there are several key tipping points in the rent vs. buy discussion

Equipment utilisation and needs

How often you use welding equipment and how much welding equipment you need for any given job are two important factors that go hand in hand.

Is your equipment used monthly, weekly, daily, several times a day, or all day every day? Is having the right equipment immediately available critical for your project? For example, would you be unable to perform a repair in a remote location without a welder or generator available, thus disrupting the schedule? If you have very high equipment utilisation, then buying the equipment may be something

to consider however assuming you have the technical staff and labour capability to service and maintain the equipment. Renteca's long term logistical packages and fully maintained outsourced maintenance programs make sense when customer utilisation is high. Conversely, if utilisation is low — meaning that once a task is complete, you no longer need the equipment — then standard rental arrangements may be the right choice.

Many companies have core products within their owned fleet that are used daily. They often supplement their fleet with rental equipment for a specific project or jobsite need. This is especially common if work is relatively transient, and jobs are long distances apart. Often, it's easier to rent equipment in different cities than it is to coordinate logistics to move everything from job to job.

Owning a fleet of 200 welders requires maintaining, repairing and transporting them to the jobsite when necessary. In comparison, renting can offer flexibility and convenience — the contractor isn't responsible for maintaining, repairing or transporting those machines. Rental is a popular option for portable solutions, including engine-driven welder/generators and inverter rack systems.

How many welding power sources you need to complete a job is another part of the equation when deciding whether your company should rent additional machines to supplement equipment already owned. For example, building a power station or working on a scheduled plant shutdown may easily require 100 to 300 welding arcs. To meet this sudden increase in demand, contractors may prefer to rent rather than

incur capital expenses to purchase a larger fleet of equipment.

No matter if you rent or buy, when your operation needs large quantities of welders, running single inverter machines or inverter racks with an engine-driven welder/generator enables multiple operators to work from a single inverter rack or engine-driven welder — reducing costs and jobsite congestion. Renteca satisfies these requirements with customised welder banks and diesel generators to improve cost efficiencies, increase arc on time and reduce costs

Technology requirements

It's also important to think about the type of welding technology needed to get the job done efficiently. Don't limit your capabilities by owning equipment that doesn't help you optimise productivity.

If you routinely require equipment with more specialised needs — such as a premium multiprocess arc, lightweight portability or strong generator power contractors Renteca can provide current technologies in each category.

Industry trends may also dictate equipment needs. As more experienced welders retire, less experienced welders are entering the workforce, and these welders often have been exposed to new technology. As a result, you may need access to new technology to meet the demands of a more tech-savvy generation including weld automation products to reduce labour and increase productivity. **AMR**

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THE MINE "SPECCEED" VANTAGE 500.

The Invisible Enemy

PFAS are some of the man-made chemical compounds that are of concern to the environment and human health.



Waste water from a client site and filtered with MyCelx for a clean result.

BY TREVOR PICKETT

Water on a mine site is a precious resource. It is normally in short supply, and is often contaminated by mineral processing circuits, wash bays and camp facilities and is expensive to filter for re-use by conventional means.

Add to this the new wave of carcinogens contained in that water; called PFAS, the umbrella term for another 4700 + PFAS contaminates and there is much to think about for mine site operators from an environmental compliance, human health and liability perspective.

Assessing Water Balance

Conventional reverse osmosis (RO) plants are expensive to build and are costly to operate. RO does provide high quality potable water, suitable for most applications, but the cost per litre can make it prohibitive for wash plants, dust suppression, camp ablution and other uses where lower quality recycled water is acceptable.

A more proactive and cost-effective approach to mine site water management is to firstly assess the balance of water sources and applications, with a view to recycling as much water as possible and minimising the

demand placed on an RO system or other waste water treatment systems. This is the approach implemented by pioneering WA company, OLEOLOGY. The company is a world leader in a number of water filtration technologies; they made their mark in the oil and water separation field and are now at the forefront, internationally, of hazardous PFAS removal in collaboration with Dr Jimmy Seow, ENVIRON, a world recognised PFAS subject matter expert from Australia.

Wash bays are prime examples of where significant reductions can be made in the consumption of RO water. Recently, OLEOLOGY installed one of their unique filtration systems at a mine site, recycling 20m³ of water per hour (200kl/day) – water that was no longer being drawn from the RO system. As a result, this increased the operating capabilities of the mineral production circuit and reduced the draw from non-process infrastructure. Cost savings from this change alone were significant.

Oil and Water Separation

The assessment of water balance extends to identifying the individual sources of waste water on site. OLEOLOGY's philosophy is simple: it is more efficient, cheaper and more effective to treat each source individually,

rather than co-mingle all sources and treat it as a blended 'cocktail'.

Born from many years of experience processing water in the oil and gas industry, the approach is logical and proven in practice and in the balance sheet. Vehicle wash bays, tyre workshops, maintenance and lubrication stations and processing circuits each have separate chemicals and pollutants that need to be treated and removed, and it is far more cost effective to treat them with an appropriate system at source.

For example, fuel and stormwater waste is relatively easy to filter in isolation but mix them with degreasers, floor cleaners, glycols, greases and oils and the resultant emulsion is ten-times harder to treat. OLEOLOGY's MyCelx technology provides manageable, robust and remote-controlled systems, in high or low flow configurations, to treat even the most difficult to separate emulsions and avoid any non-compliance issues.

It is interesting to note that many emulsions will not separate by gravity – even after years of settlement. This can make conventional hydrocyclone separation, DAFs and the like relatively inefficient, compared to a tailored,

active filter system such as MyCelx.

MyCelx

MyCelx uses a unique fixed adsorption chemistry to capture and hold hydrocarbons, organics and some metals from water. The technology is infused onto a filter medium, has a high affinity for capturing targeted contaminants and is also hydrophobic (repels water). This ensures that pollutants are removed and are not released even when the filters are saturated (low break through).

Recycling Site Water

The OLEOLOGY system allows water from numerous contaminated sources on a mine site to be recycled and used in processes where RO water is not required. For example, treated water can be used for dust control and re-introduced into the wash bay circuit.

The system ensures that wash bays are fully compliant, without the need for hydrocyclones and removes solids down to 2-micron particle size. Naturally oils, greases, detergents, coolants and other contaminants are also removed.

This has a ripple effect of cost saving activities throughout the operation – simple



OLEOLOGY team provides in-depth knowledge in all facets of water treatment.

The "PFAS 7" treatment system built within two 20ft containers treats up to 865kl/day.

This modular system is designed by OLEOLOGY to simplify the install and commissioning stages.



recycling of water in this way has saved resources and tens of thousands of dollars per year for a number of OLEOLOGY's mining clients. Environmentally compliant wash bays are also mandatory for maintaining an operational mining license. Mining companies can now confidently advise their shareholders that they have reduced their carbon emission and environmental footprint in line with the regulatory environmental and social governance policies.

PFAS - the Invisible Enemy

In the 1930s, engineers were struggling with operational problems in a range of industries, including mining. High temperatures led to increased oxidation and the failure of fluids to function optimally. While attempting to control oxidation, there was also a desire to increase lubricity, to lower the internal friction of pumping and piping systems. The fluids' very chemistry was also under scrutiny as it needed to deal with acids, alkaline and solvents, which lead to seal embrittlement. It was around this time that Teflon was accidentally discovered and its ability to overcome these persistent issues led to its used in oils, brake fluids, downhole subsurface fracking agents and innumerable other mining applications.

The problem is that Teflon is a PFAS production compound, one of over 4700 known compounds that sit under the PFAS compounds umbrella. The great majority of these hazardous chemicals are still covered by intellectual property patents and, as such, cannot easily be laboratory tested or analysed. In fact, currently only 35 out of 4700 compounds can be analysed using commercial laboratory techniques.

PFAS - per or poly fluorinated alkyl substances, PFOS - perfluorooctane sulfonic acid, PFOA - perfluorooctanoic acid and PFHxS - perfluorohexane sulfonate are some of the man-made chemical compounds that are of concern to the environment and human health. They have a half-life of 40-90 years in water and can remain in the human body for up to seven years.

PFAS consist of long chain and long chain carbon compounds and are stable and not easily broken down however, some PFAS precursors do break down with time to shorter chain PFAS intermediates and end products such as PFOS and PFOA. Some of the breakdown PFAS intermediates have been shown to even more toxic than PFOA.

PFAS substances are also endocrine disruptors, which interfere with both animal and physiological functions such reproduction and fertility. An example is their impact upon fish fingerlings' survival and mortality rate - the ocean's next generation of fish stocks.

Current PFAS levels in the ocean have been measured at 5-10 pico grams (1/1000th of a nanogram). This may seem insignificant but PFAS is hazardous at parts per trillion or ppt (1/1000th of a millilitre in an Olympic swimming pool) and while we continue to discharge into the oceans at levels that should be avoided, these levels continue to rise. PFAS has now been detected in whales and even polar bears. They are highly pervasive and ubiquitous.

PFAS substances are everywhere, from Viton seals to firefighting foams, disposable coffee cups to fabric protection, coolants to lubricants. These products normally find their way into land fill and from there the chemicals leach into the water table, eventually finding their way into drinking water, rivers and ultimately the oceans affecting both the biota (and also food sources) and humans.

PFAS Removal on a Mine Site

This new wave of hazardous materials is already upon us and action must be taken if these PFAS compounds are to be removed from mine site waste. In Australia, policy management of sites contaminated by PFAS (ground and surface water, marine water and soil) is now guided by the Australian National Environment Management Plan (commonly referred as PFAS NEMP).

The policy is an Australian approach to deal with PFAS contaminated sites and also to comply with the UN Stockholm Convention for Persistent Organic Pollutants (POPs) of which Australia is a signatory party. As mentioned, a system to extract the diverse range of contaminants on site must be robust and tailored to each specific water source. The complexity lies in the degree to which PFAS must be measured and filtered, compared to those other contaminants.

For example, on a ship, it is permissible to pump water containing up to 15ppm of oil and grease overboard. On land, that level is 30ppm if pumping into a sewer. However, PFAS is measured and hazardous at parts per trillion, so mine site filtration must be capable of removing these substances to ultra low or even undetectable levels

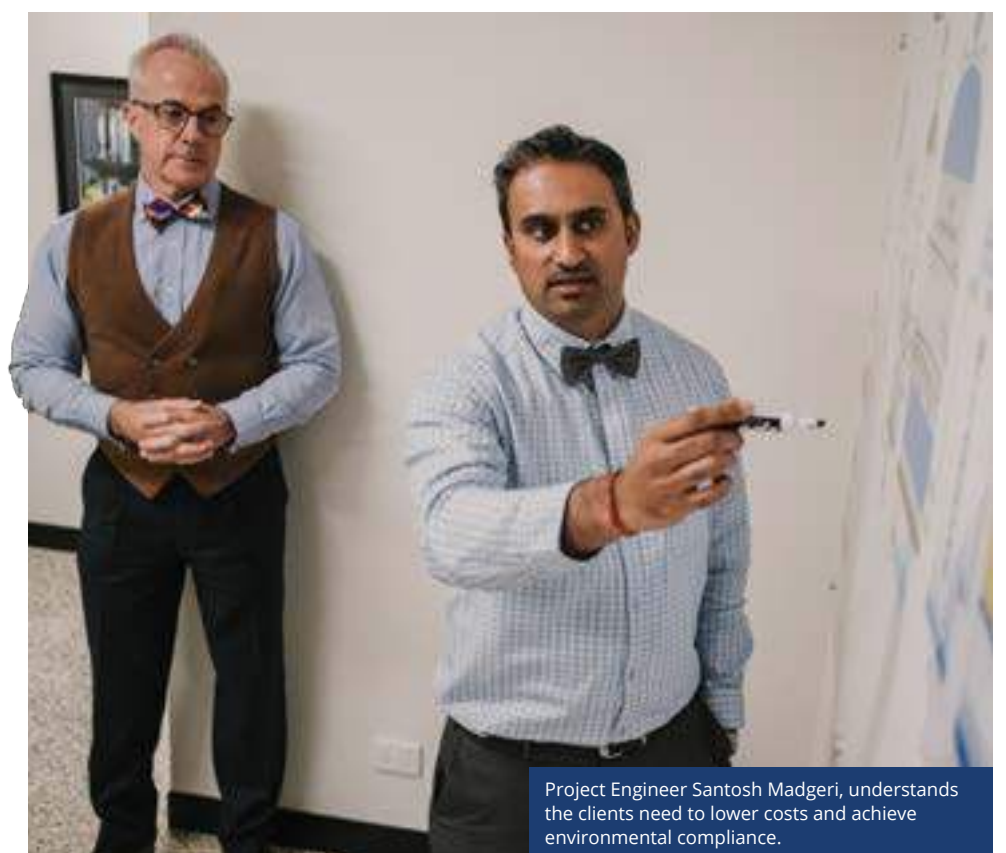


Dr Jimmy Seow is one of the world's most recognised specialists in PFAS assessment and testing.

PFAS the New Bad Kid on the Block is getting badder as new replacement PFASs for PFOS and PFOA such as Gen X, F 53B and ADONA are also of concern and are also detected in the environment.

Jimmy Seow PhD

Director: Environ Pty. Ltd.
Adjunct Professor Murdoch University
Adjunct Professor Curtin University



Project Engineer Santosh Madgeri, understands the clients need to lower costs and achieve environmental compliance.

110 Hazardous Waste

TECHNICAL TALK



OLEOLOGY Technicians provide support, training or remote monitoring to all its clients.

to comply to PFAS NEMP guidelines for discharge of PFOS, PFOA and PFHxS to water and soil. Once captured, these dangerous chemicals are removed forever, with no lingering liability for companies from potential leaching into the environment at a later date.

The OLEOLOGY system allows mining operators to treat known wastes on site and gives them the confidence that they can also deal with the new wave of hazardous wastes that are present in their processes but are yet to be identified. Ultimately, they will be and will remain compliant with the PFAS NEMP policy.

Once the PFAS has been extracted to these infinitesimally small levels, a concentrated hazardous waste is accumulated that must then be disposed of in an environmentally acceptable way. PFAS is not easily broken down due to its chemical stability. The common practical method to break down the PFAS C-F bond is via high thermal incineration/destruction at temperatures greater than 900°C.

Removal of PFAS from water is challenging, not easy and can be costly and time consuming depending on the PFAS cocktail make-up. There are a number of technologies proposed to remove PFAS from water and soil. The three most commonly used are GAC (Granulated Activated Carbon), Ionic Exchange and Adsorption for PFAS removal.

Each methodology has its advantages and drawbacks, however they have also been used in combination as a PFAS treatment train. One of the major issues for those methodologies, besides efficacy of PFAS removal, is the disposal of the removed PFAS waste.

Currently that waste is either stored for later treatment and disposal, disposed to landfill (which is limited and has costly acceptance conditions) or thermally treated (such as thermal incineration and now by electrochemical processes which are still at proof of concept stage). In Australia there are now licenced treatment facilities located in Queensland and Victoria.

MyCelx Technology Advantages

The OLEOLOGY process shines in a number of ways and overcomes the shortfalls of systems that have been in place for 150 years in some instances.

Firstly, the MyCelx media lasts between two and four times longer than GAC or Ion Exchange media, meaning that changes need only be done once a year in many cases. There is no longer a need for vacuum extraction trucks, cartage of toxic liquid waste or a week's downtime to change filters. MyCelx traps and holds the contaminants in a dry filter cartridge, which is much safer to transport. These filters can be changed out in a few hours to minimise disruption to production.

Secondly, the use of an array of filters, which sequentially reduce incoming contaminants, removes chemical spikes and takes the load off the final media stage that polishes the water and removes PFAS to below detectable levels – 0.0002µg/l.

The trapped PFAS materials can be safely and legally disposed of via thermal oxidation, without toxic emissions, and the oxidised material is reduced to only 5% of its original mass by solid. This material is totally inert and non-hazardous.

Thirdly, less energy is required to remove PFAS substances with MyCelx, compared to GAC or Ion Exchange extraction methods.

Finally, the MyCelx technology provides a relatively small footprint, there is a reduced need for onsite tank storage (which is costly and inefficient) and it is capable of treating large volumes of water.

OLEOLOGY have 20-foot containers with complete filtration systems inside, with high flow capacity and MyCelx filters able to contain 300% of their weight in contaminants. These are ideal for remote locations, have a very small footprint and take considerable load off existing RO systems.

Leading the World

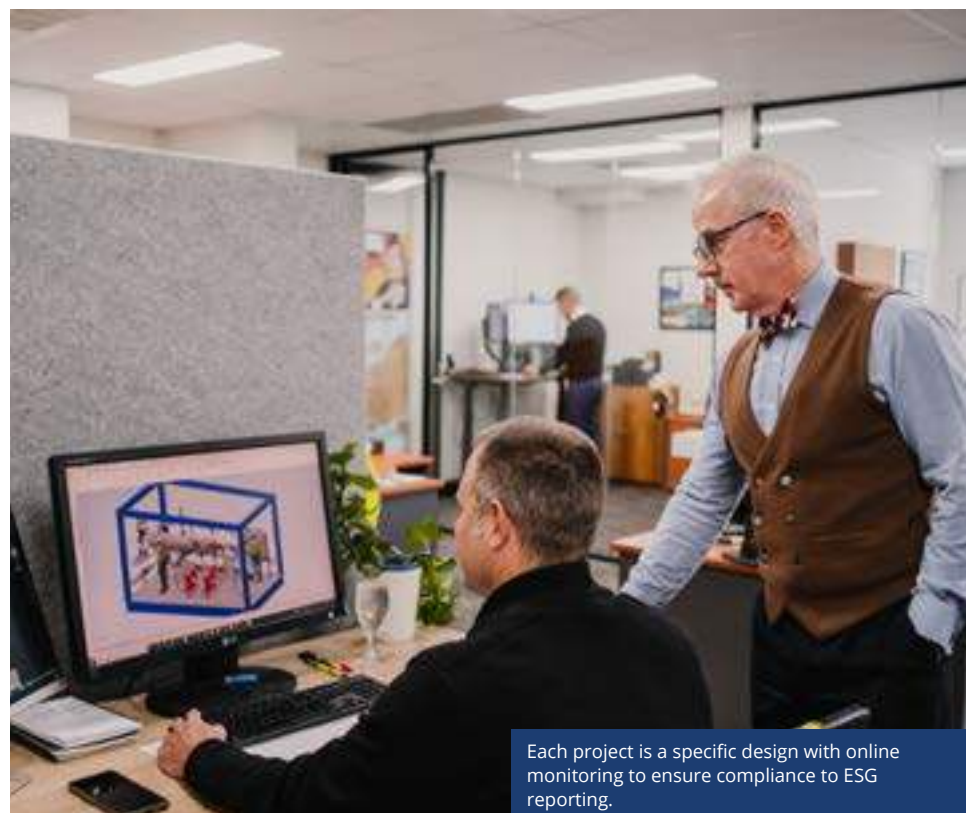
OLEOLOGY are at the cutting edge of PFAS removal in the world and this is demonstrated clearly by their involvement with the US EPA and representatives from over 40 US State EPA departments. In the US the USEPA Drinking Water Health guideline for PFOS and PFOA is 70ppt however, several states have lowered their drinking water health guidelines to as low as 6.5ppt (California Office of Environmental Health Hazard Assessment (OEHHA)) for PFOS and 2ppt for PFOA (Illinois Environmental Protection Agency). Clearly, we have some work to do from a legislative perspective and more weight needs to be placed on how serious these PFAS compounds are to the environment and the population.

The US EPA are looking favourably at the implementation of the OLEOLOGY system with MyCelx technology for the potential pre-treatment for PFAS removal for drinking water on site and to remove ground water contamination before that water is used for household supply.

PFAS contamination has already been identified as a half-a-trillion dollar problem in the USA and the list of those contaminants is growing constantly. In only two years, the number of compounds added under the PFAS umbrella has swelled from 2000 to over 4700, as identified by their CAS ID Number – this is without the certainty that all PFAS compounds have been identified.

Reducing Liability

PFAS compounds are found in almost every product we use and in many



Each project is a specific design with online monitoring to ensure compliance to ESG reporting.



Perth serves as the logistic hub for specialist oil and PFAS media filters.

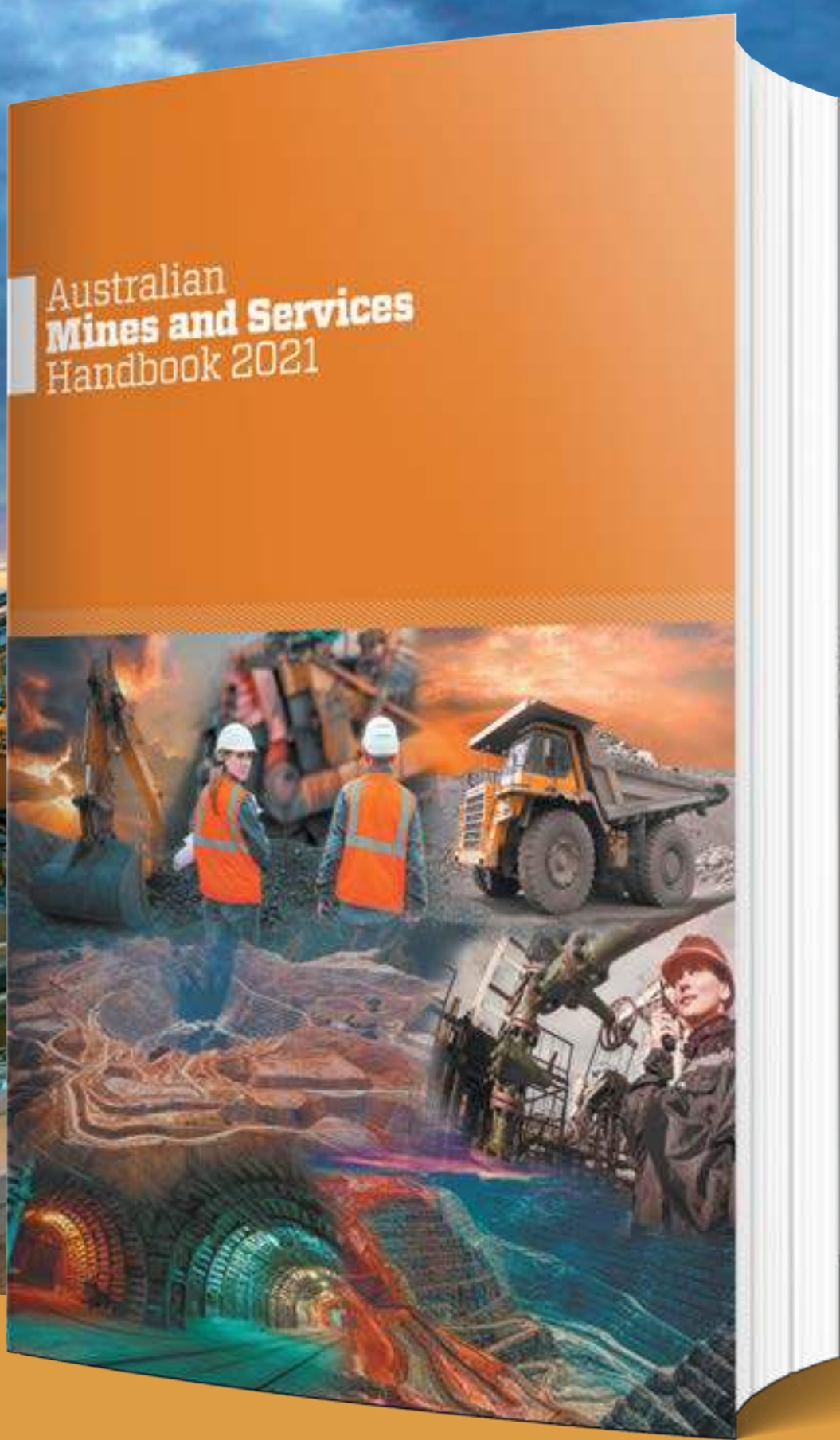
industrial processes. Their ingress into the environment, and particularly ground water, surface water and soil/sediment from mining operations is a concern for its employees and the public.

Mining companies would be wise to assess their own exposure and risk in this area and prepare for a new wave of hazardous materials that are potentially more dangerous and pervasive than anything currently on site. As awareness continues to grow about PFAS substances, legislation

will continue to tighten and the costs of removal, containment and disposal will fall with the polluters and users of PFAS. If the legislation is retrospective, the cost of clean-up and compensation could be enormous. The time for action on PFAS is now. **AMR**

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Anything, anywhere, anytime

Site-specific equipment deployed at Weipa, in Far North Queensland

REMONDIS Australia's commitment to waste management in mining communities

REMONDIS Australia is relied on to deliver unique waste management solutions that support mining communities. Sometimes the benefits go far beyond environmental gains.

KEEPING IT LOCAL

The tyranny of distance means that critical services in mining towns such as Weipa aren't always easy to come by. With a ten-hour drive to the nearest major centre (Cairns), locals and businesses try to keep things in the region, but often against many odds.

That's why the innovative Red Earth Industrial Services business is showing so much promise.

A 50-50 partnership between REMONDIS Australia (REMONDIS) and long-term Cape York operator JAI-MEC Rural Contracting (JAI-MEC), the offering is about boosting local waste management, industrial services and stimulating local employment.

Earlier this year, Red Earth Industrial Services stepped up to take control of twice-weekly domestic waste collections from nearly 3,500 residents in Weipa, Napranum and Mapoon. This was previously handled by REMONDIS on behalf of the Rio Tinto-managed Weipa Town Authority, and Mapoon and Napranum Aboriginal Shire Councils.

It's a big step up for JAI-MEC, whose previous role was maintenance of REMONDIS' local 20-vehicle waste management fleet.

To ensure a smooth transition of the collection services, REMONDIS has donated two trucks to the joint-venture.

By initiating the joint venture, REMONDIS has effectively established the region's first locally owned waste management company, and planted the seed for a far broader multi-faceted business.

WASTE MANAGEMENT AND MORE - STIMULATING A DIVERSIFIED INDUSTRIAL BUSINESS

The intention is for Red Earth Industrial Services to flourish into a dynamic business that offers so much more than waste management services. The additional offerings are likely to include vehicle maintenance, abrasive blasting, painting and electrical services wherever demand dictates, including in the mining sector. It's envisaged that the service will be offered right across the Cape York Peninsula, where such services can be difficult to come by.

None of this would have been possible without the backing of REMONDIS and the specialised skills of REMONDIS' Integrated and Managed Services division (REMONDIS IMS), which manages major customers with complex needs, including Rio Tinto.

INDIGENOUS OWNERSHIP AND EMPLOYMENT OPPORTUNITIES

Red Earth Industrial Services is all the more unique because it has indigenous ownership. Local diesel mechanic and highly regarded Weipa local Sandra Kirk - who owns and runs JAI-MEC with her husband Jai Christie - is a Torres Strait Islander descendent.

The indigenous element gave REMONDIS added impetus to get the entity up and running. Beyond empowering and providing a sense of pride for a respected indigenous figure, there's opportunity to open up indigenous employment opportunities. It adds enormous social value to the environmental and economic benefits.

A COMMUNITY ACHIEVEMENT

"REMONDIS IMS has an ethos of overcoming obstacles to deliver services in the most unlikely places, which is why we're particularly proud of the Red Earth Industrial Services business," REMONDIS IMS General Manager Nathan Radley said.

"Everyone wins with this. We have an important locally-based diversified industrial business in a key mining town that's poised to offer multiple services, with waste management at the forefront at this stage.

"We're talking about better environmental outcomes and critical local investment and jobs, things that mean so much to people in communities in and around Weipa.

"So many people from REMONDIS, Rio Tinto, JAI-MEC and other locals can take credit for bringing such a common-sense but smart initiative to life."

JAI-MEC's Sandra Kirk said the creation of Red Earth Industrial Services was a unique opportunity.

"Creating and keeping jobs in local communities is a priority, given how remote we are," Sandra said.

"It costs a fortune, for example, to call in the services we can offer from places such as Cairns or beyond, to the point where it becomes economically unviable.

"Given the range of industrial offerings we're



REMONDIS' Swanbank Renewable Energy and Waste Management Facility is licensed to receive hazardous and regulated waste, providing expert disposal services to the mining industry

looking at, the sky could be the limit in terms of business growth as time progresses.

"There are so many mainstream and odd jobs we can be involved in. We're in the process of committing \$400,000 for the blasting and painting side of this business, positioning us to repair and improve anything from handrails and mining equipment to something as big as a shipping container."

HAZARDOUS WASTE MANAGEMENT IN THE ALUMINIUM SECTOR

In Gladstone, REMONDIS IMS has expanded its partnership with a major resources company, securing a three-year term to provide full waste management collection services to an aluminium smelter.

The contract includes the management of about 3,000 tonnes of hazardous bulk waste streams that will be delivered to REMONDIS' waste landfill operation at Swanbank near Ipswich.

"Our customer is highly environmentally conscious and was strict on us coming up with a specialised process to deal with a range of hazardous wastes," Nathan Radley explained.

"Some of the hazardous waste encountered required special handling and we needed to undertake detailed lab work to determine the best method of treatment to ensure proper disposal

"No stone was left unturned in terms of coming up with the best treatment solution that didn't blow the cost out.

"The outcome was putting the waste through what's known as a fixation and stabilisation process, which means adding re-agents that bind hazardous materials so that they don't leach into the environment.

"That creates assurance that the waste can be disposed of safely, in accordance with all regulatory requirements."

DRAWING ON INTERNATIONAL EXPERIENCE

Radley added that although tapping into regional Australian mining communities and working hard to find out what local waste management solutions might be possible, REMONDIS' many decades of overseas experience always came in handy.

"REMONDIS was founded in 1934 overseas and now has more than 800 business locations in more than 30 countries across four continents," Radley said.

"We've also clocked up nearly forty years in Australia.

"With so much experience we have a 'can-do' approach, coming up with sustainable waste management solutions across all sectors of industry, from remote mining operations through to household waste management."

AMR

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REMONDIS®

WORKING FOR THE FUTURE



> REMONDIS INTEGRATED AND MANAGED SERVICES

We're Australia's largest environmental managed services provider

REMONDIS Australia's Integrated and Managed Services division provides tailored environmental management solutions to the mining industry.

We specialise in the management of waste, recycling and commodity streams, site remediation and environmental projects to mining sites, oil and gas operations and major infrastructure projects across Australia and New Zealand – including regional and remote locations.

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Uniquely, these professional services are delivered under a single management, reporting, invoicing, and continuous improvement umbrella. Our approach is transparent, independent and impartial with a strong focus on innovation, environmental sustainability and financial management.

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114 Rockbreaking

TECHNICAL TALK



Rammer Rockbreakers can be re-built over and over again, ensuring longevity of the product.

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The use of advanced hydraulics, materials technology, strength calculations, impact wave theory and production technology have cemented Rammer's position as the go-to rockbreaker solutions provider for the Australian mining industry.

Rammer, the most respected brand for hydraulic attachments, is a part of Sandvik Rock Processing Solutions business area that operates within Sandvik Group, the global engineering giant in mining and rock excavation, metal-cutting and materials technology.

With integrated smart technology and customer-focused product features, Rammer has created great experiences for its customers.

With powerful and durable rockbreakers equipped with the revolutionary RD3 remote monitoring device, 28-boom system options and specialty demolition attachments, there is a Rammer solution for virtually any demanding breaking application that requires a boom-mounted percussive tool.

The world's best-known and most-respected brand of hydraulic rockbreakers, Rammer offers a comprehensive range of powerful, productive and durable hydraulic rockbreakers that are suitable for carriers in the 0.6t to 120t operating weight class.

Manufacturing of Rammer-branded hydraulic rockbreakers started in 1978 – ever since it has grown to be a recognised world leader in the supply and support of rockbreakers, and other hydraulic attachments such as demolition tools and breaker booms.

The Rammer brand and its reputation is built on quality: quality of manufacture, proven by its ISO standards, quality of support through the professional, worldwide dealer network, and quality of exceptional people delivering the finest attachments in the mining and construction business.

The Excellence Line is Rammer's flagship line of hydraulic rockbreakers, which has been serving customers around the world for four decades.

These state-of-the-art hydraulic rockbreakers are ready for all rock breaking needs and all Excellence Line rockbreakers now include integrated smart technology for easier fleet management and more

efficient processes.

The line continues the tradition of delivering innovative rockbreakers designed to improve profitability, safety and performance.

The rockbreakers are fitted with membrane-type accumulators to assist with power strokes, whilst providing protection against hydraulic spikes, and they have field-replaceable lower tool bushing and a low maintenance design which ensures optimum rockbreaker uptime, higher availability levels and a reduced owning and operating cost.

The MyFleet Platform

The Excellence Line rockbreakers are now equipped with the first ever remote monitoring system for hydraulic rockbreakers - RD3. The system provides data about the operating hours, service intervals and GPS location of the product.

The RD3 monitoring device is attached to the rockbreaker and customers can simply log into the MyFleet platform to see all the data on operating hours, how the rockbreaker is being operated, as well as required service intervals: helping them manage service periods and minimise machinery downtime by scheduling maintenance during times of least impact on production.

Get all the needed data by logging into the MyFleet platform. With this data you'll achieve superior fleet management compared to standard tools, make your processes more efficient and, of course, you will profit more.

MyFleet means you eliminate guesswork.

You can know exactly how your rockbreaker is being utilised and you can have the real data you need to make informed business decisions.

It lets you collect and analyse a wide array of information to assist production forecasting. And it helps you ensure the most efficient use of your rockbreaker to maximise the return on your investment.

With detailed machine data on hand, users can optimise day-to-day operations and monitor, adjust and improve the performance of their rockbreaker.

This gives the information needed to proactively plan your maintenance schedule, and improve parts delivery, service

planning and productivity.

With MyFleet, there is secure 24/7 access to fleet data.

The user interface is clear and user-friendly, and can be customized to display the information which is most important for daily operations, so that all the necessary data can be seen in one quick overview.

Users can also use it to view the location of their fleet via the interactive map.

Service and Support

All rockbreakers need to be serviced on regular intervals, just like cars: for example, seals may last up to 1000 hours but then need to be replaced.

Rammer Rockbreakers can be re-built over and over again, ensuring longevity of the product.

Rammer dealers in Australia are Rammer-factory authorised and trained to service Rammer products. During the service, adapter bolts, hoses, greasing device, bushes, tool and tie rods are inspected, and if any wear is noticed, they will be changed,

with the rockbreaker going back to the site as new.

Failures can occur when the Rammer rockbreaker is incorrectly used, for example if they are put onto a too-large carrier that is not compatible with the size of the breaker.

Rockbreaker installation

Installation inspection is an essential part of commissioning a new rockbreaker, checking the compatibility of the rockbreaker and carrier and ensuring that flows and pressures are adjusted correctly.

Installation inspection together with correct operating methods guarantees reliable rockbreaker operation.

Trained service personnel

Rammer products are renowned for quality, performance and reliability but when your rockbreaker shows signs of natural wear, or the unexpected happens, users can turn to the professional dealer service personnel which are highly-trained, qualified and experienced, ensuring customers are never more than a phone call away from a Rammer rockbreaker expert.



Sandvik Group is the global engineering giant in mining and rock excavation, metal-cutting and materials technology.

The Good Oil

As part of Rammer's aim to help support more sustainable rockbreaking operations, Rammer has launched Rammer BIO Tool Grease, a high-performance biodegradable grease for hydraulic rockbreakers.

BIO Tool Grease has been developed in collaboration with key customers in mining, construction and demolition industries to help them actively reduce impact of their operations on the environment.

Sandvik Director of Product Lifecycle Management Matti Kotro said Rammer and Sandvik were committed to sustainability.

"We are very proud of this product launch as it goes beyond the achievements that we have already made in our own business operations and demonstrates our commitment and efforts to positively contribute to the environmentally-friendly and sustainable operations of our customers through our products," he said.

BIO Tool Grease is specially formulated to be biodegradable and environmentally friendly, making it safe for use in areas with strict building codes like urban and city sites, in underwater applications, and in environmentally sensitive locations like groundwater areas.

High And Low Temperature Applications

Traditional grease products are not kind on the environment and the standard biodegradable greases on the market have not been able to perform in high temperatures: essential when the temperature inside a hydraulic rockbreaker can reach up to 1100°C.

The special formulation of Rammer BIO Tool Grease includes a thickener, which together with the biodegradable synthetic base oils makes it suitable for both high and low temperature applications.

The grease also includes a complex soap structure to ensure high degree

of mechanical stability.

Excellent Wear Protection

Rammer BIO Tool Grease is a lithium complex thickened lubricating grease based on biodegradable esters and PAO. The grease contains antioxidants, corrosion inhibitors and EP/AW additives based on bismuth technology.

The specially developed bismuth additive package gives the grease a very high load carrying capacity enhancing performance in vibrating housings and helps prevent bushing wear and prolongs re-lubrication intervals.

High water resistance makes Rammer BIO Tool Grease suitable for underwater applications and provides a high level of corrosion protection.

BIO Tool Grease is suitable for automatic greasing devices Ramlube I, II and III for lubrication on Rammer hydraulic rockbreakers or for manual greasing on Rammer or any other breakers.

Australian Authorised Rammer Dealer Network

Rammer's product selection is supported by a dedicated global dealer network with ready access to genuine Rammer parts and a wealth of operational knowledge and experience.

This ensures that your Rammer rockbreaker continues to contribute to your company's profitability for its entire working life.

GroundTec in NSW:

groundtec.com.au

Walkers Hammers in Vic and Tas:

walkershammers.com.au

Total Rockbreaking Solutions in WA:

totalrockbreaking.com.au

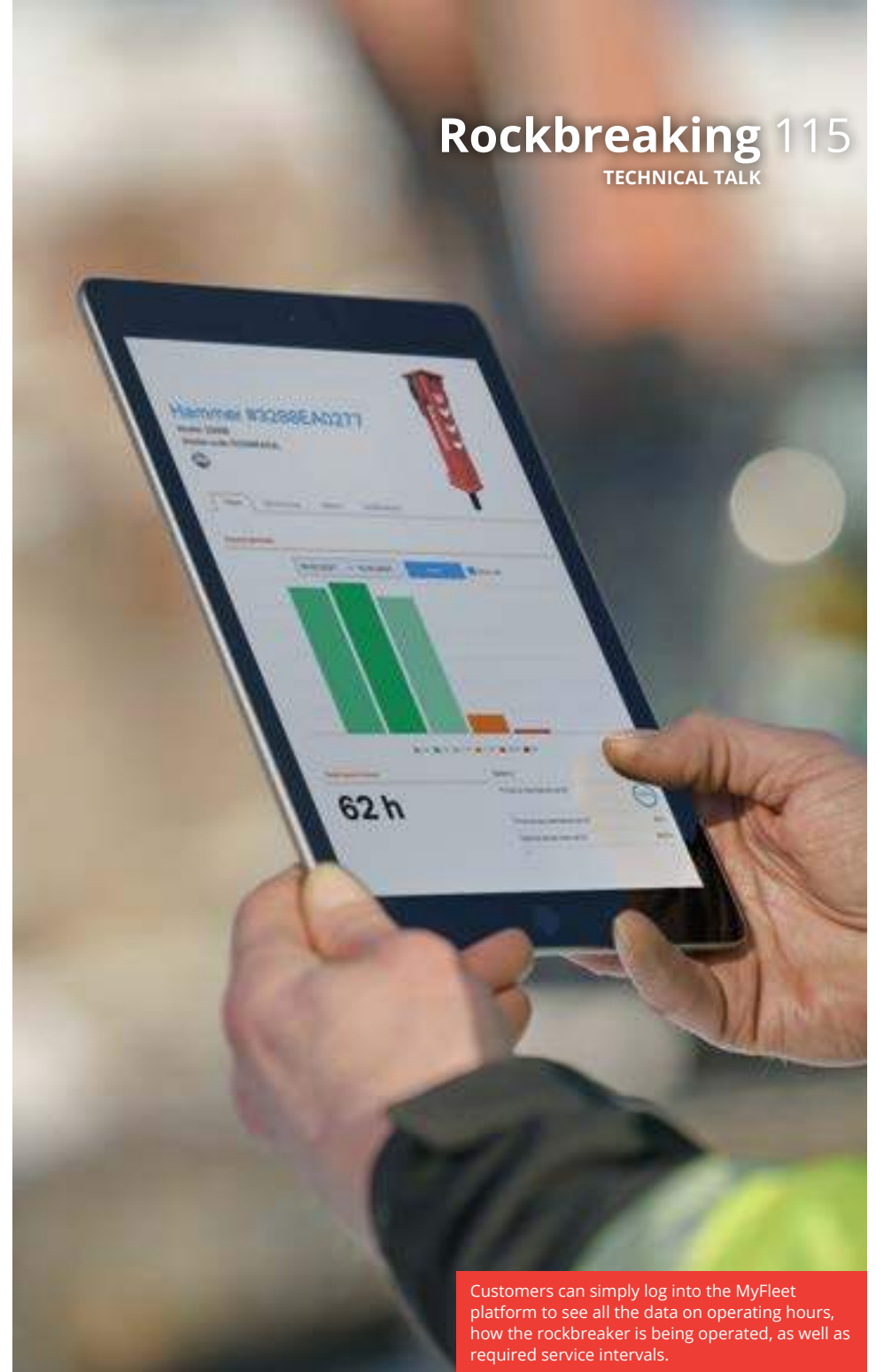
QLD Rockbreakers in Qld and PNG:

rdw.com.au/qld-rock-breakers

Renex Equipment in SA and the NT:

renex.com.au

AMR



Customers can simply log into the MyFleet platform to see all the data on operating hours, how the rockbreaker is being operated, as well as required service intervals.

BIO TOOL GREASE

HIGH PERFORMANCE BIODEGRADABLE GREASE

SAFE FOR USE IN ENVIRONMENTALLY SENSITIVE LOCATIONS I.E. GROUND WATER AREAS

- high load carrying capacity
- extended re-lubrication intervals
- good corrosion protection
- readily biodegradable
- excellent mechanical stability
- suitable for both high and low temperature applications

rammer.com



Dealer Network

NSW

Groundtec Equipment

(02) 9642 2030

groundtec.com.au

VIC / TAS

Walkers Hammers

(03) 9315 3788

walkershammers.com.au

QLD / PNG

QLD Rock Breakers

(07) 3715 0800

rdw.com.au

SA / NT

Renex Equipment

(08) 8345 0555

renex.com.au

WA

Total Rockbreaking Solutions

1300 921 498

totalrockbreaking.com.au

SVT Gives Answers for Shock and Vibration Problems

COMPACT VIBRATION MOUNTS -
FILTERING HIGH FREQUENCY RESONANCES



WIRE ROPE MOUNT - SM SERIES



CUPMOUNT - FAILSAFE VIBRATION MOUNT

In this modern mining era of increasing technology adaption and more intense monitoring requirements, the collating of operational data and digital field observations has never been more important.

Mine operators are increasingly utilising space-age technologies such as AI, unmanned vehicles and drones to monitor and run their activities on a daily basis and the importance of collecting the best data available is a key to running a profitable, safe and environmentally friendly project.

Arguably, one of the most important pieces of equipment used to help collect all that information reliably – and definitely the most under-rated – are the resilient mounts that the data collection and recording equipment sit on.

Without the right mounts and importantly correctly placed mounts, a company's chances of obtaining the best performance possible is significantly impacted and the reliability of equipment and information is degraded.

So it is critical that the most experienced and proven mount suppliers are involved at an early stage.

When it comes to knowing mounts inside and out, they don't come with a much more impressive background than Sydney-headquartered Shock and Vibration Technologies (SVT).

SVT brings to the table a lengthy history of supplying state-of-the-art mounting systems to the military and arduous applications across Australia and New Zealand – and you

don't get any tougher testing grounds than that.

The Australian Mining Review recently caught up with Mark Waterworth from SVT to discuss the company's impressive history and what goes into selecting the most suitable mounts for use in our mines today.

SVT has supplied the latest in shock and vibration technology to the defense industry for more than three decades and in the last 15 years has shared that knowledge with the mining sector.

THE COMPANY IS WELL KNOWN ACROSS AUSTRALIA AS AN INDUSTRY EXPERT IN NAVAL (WARSHIP) MOUNTS, HIGH DEFLECTION SHOCK MOUNTS, HIGH-PERFORMANCE ELASTOMERIC ANTI-VIBRATION MOUNTS, WIRE ROPE CABLE MOUNTS, SHOCK MOUNTING OF 19IN ELECTRONIC CABINETS AND MILEX 19IN ALUMINIUM TRANSPORT CASES.

"We provide mounts that protect against shock and vibration, which is pretty obvious, but the range of options that we can provide in terms of mounting solutions on mining equipment is far from obvious," Mark said.

"For example, we have undertaken some work quite recently with protecting video cameras. The client increasingly had issues with a previous mounting selection with the mounts continuing to fail at critical times.

"We were able to come up with a new mount selection and identified the correct mount stiffness and placement. This ensured the equipment was properly protected and the mounts haven't failed since."

Mark said quickly identifying the right

solution is critical when companies have fragile equipment operating in a mining environment that can often feature very harsh vibration and shock environments

"Very broadly the products that we sell provide a big increase in reliable service life and protect fragile equipment using mount attenuation to lessen the input energy into the equipment. So a longer, more reliable life for the electronics or screens or the fragile off the shelf commercial electronic equipment (COTS) that is being put into fairly arduous situations.

There are huge benefits to cameras, not only an improved longevity but also in the clarity of images captured.

Electronic equipment has the most harmful high frequency inputs attenuated, greatly improving the reliability of connectors, printed circuit boards and disc drives.

"I guess in general, the biggest thing we have going for us is the fact that we have this enormous military background spanning 30 years and are used to modelling mount performance against a large range of random vibration environments. There are all sorts of defense and commercial electrical standards that we have used to model the performance of our mounts in terms of vibration transmitted and the overall reduction in energy the equipment feels.

"We come from a background where every selection for defense has a detailed simulation report identifying optimum solutions. Our defense background definitely gives us a bit of an advantage when we are needed to provide a basis

of evaluation for a whole range of mining situations."

Listening to Mark, I was staggered by the varieties and sizes of mounting solutions that can be called on. Some of the materials are quite ordinary. They can start with natural rubbers but then the solutions may run through the whole spectrum to very exotic silicon formulations and rare recipes that are a page long!

"The modern silicon formulas or wire rope can be particularly effective in tricky situations because they're very highly dampened. That is an extremely good thing when you can never quite tell what sort of environment you're going to see." (Wide Range of Forcing Frequencies)

While the specially built and formulated materials that go into the make-up of the mounts is critical, it is equally important to use the correct mount placement, stiffness and deflection for shock

THE COMPANY'S UNIQUE COMPUTER PROGRAMME CREATES SOPHISTICATED NON-LINEAR MODELS FOR THE PREDICTION OF MOUNT PERFORMANCE TO MOST MILITARY AND COMMERCIAL STANDARDS FOR VIBRATION AND SHOCK.

"To the outsider a set of mounts might seem like a very basic piece of equipment in the scheme of things, but the reality is that the make-up of the specialised mounts SVT supplies can be as complex as the equipment it is built to protect – and the correct placement of that mount may also be extremely complex.

"For all of our customers, we will create a simple three-dimensional model on the



computer which will allow us to generate the vibration performance. It takes us an hour to create whatever the equipment is as a simple three-dimensional object in our programs.

"Then, because we know the stiffness, damping and the mass, we can then generate what's known as the Natural Frequencies of the isolation system for the six degrees of freedom of the system. This defines vibration performance in the frequency domain in each axis and the rocking modes.

"With defense we have done a lot of work with rubber tyred and tracked vehicles as well as electronic containers over the years. These vehicles and equipment are all subject to transport inputs such as Road (highway and corrugated dirt roads), Rail (including rail shunt) and Air Transportation. In addition both constant and transient shocks are part of the overall final selection that need to perform well with these multiple transportation criteria.

"It is quite easy for us to transfer that knowledge to mining industry situations."

With the growth in the use of remotely operated vehicles and un-manned trucks in mining and the proliferation of electronics that accompanies it there appears to be an obvious growth opportunity for SVT.

"Companies are going to have to have more and more delicate sensor equipment - and mounts - onboard things like un-manned trucks, control consoles and electronic equipment.

"There are a lot of electronics that are

controlling equipment in mines. GPS signals coming in and levels from lasers, and anything electronic that is controlling the fine movement that are on lots of pieces of modern equipment. For example, the use of cameras is becoming increasingly common."

On a recent mining contract SVT had to design mounts for cameras working in a particularly rugged environment.

"The mounts being used were too soft and placed too close together so whilst operating the cameras were in perpetual motion even with small inputs (swaying in the horizontal plane). Eventually the mounts suffered fatigue and had to be replaced.

"So, we worked on both the mount stiffness and placement to help limit the "sway space" while still providing good vibration isolation.

"Our aim is to identify the optimum stiffness rates, damping and repeatable deflection that we know work well for a particular type of vehicle or equipment.

"So, there is a lot of simulation work done on the computer beforehand, and there's also a lot of field history before we select mounts in a new application."

Over the years Mark has worked on a number of interesting jobs and provided a range of successful solutions.

"One contract was on a two kilometre long train, carrying a very heavy load of ore over thousands of kilometres and you wouldn't think that something that heavy would be greatly affected if it accidentally hit a buffalo.

"But hitting any large animal has the very



WIRE ROPE MOUNT - M SERIES

bad effect of ripping out lots of airlines and occasionally doing damage to the underside of the brake mechanism

"So Vipac engineers and scientists in South Australia developed a sensor in the front of the train to identify any large animals on the tracks and if the train had hit said large animal, We in turn developed a mounting system for the electronics module to ensure the reliability and longevity of the system."

Another classic example is some work SVT carried out on behalf of a South African company where large tracked dozers were working right down into the edge of the ocean at low tide pushing sand (with diamonds) up onto the beach.

To help the vehicles gain traction in the sandy conditions, the operator fitted the vehicles tracks with 18 inch spikes. You can imagine the amount of bouncing around those vehicles were doing from the compound to the beach each day on that hard ground with 18 inch spikes

At first the GPS Units only lasted about a week, however, SVT had previously come up with a mounting solution for a similar type of operation where an electronics module controlling the GPS position of the vehicle was placed on the top of the driver's cab.

"We selected a little , elastomeric dome mount that had already been proven successful on tracked vehicles with very harsh environments. It was what the GPS Unit needed to survive in that environment and it was a good result for the customer."

So, no matter what environment your equipment works in, Shock and Vibration Technologies has the experience and expertise to protect your equipment and keep it running in any harsh mining environments. **AMR**

SOURCE
Shock and Vibration Technologies
P 02 9771 0444
E sales@svt.net.au
W www.svt.net.au



Getzner makes the subgrade predictable while protecting the machine.

Finding Your Vibration Solutions

Melbourne-based Vibration Solutions Pty Ltd has built up a strong record of providing the right answer for solving shock and vibration issues across a range of industries.

As the representative for global vibration solution specialists including Getzner Werkstoffe (Austria) and AMC Mecanocaucho throughout Australasia in the construction and industrial markets, Vibration Solutions has access to best-in-class equipment and support.

The company also works closely with acoustic consultants, engineers and architects and has access to two very high-end engineering teams with the most sophisticated software and modelling tools.

Background

Getzner

Getzner has been producing materials for the insulation and isolation of vibrations and structure-borne noise since 1969. Getzner is the world's leading company in this respect.

Derived from our own in-house research, the high-tech materials Sylomer®, Syldyn®, Sylodamp® and Isotop® are used in the railway superstructure, for the resilient bedding of buildings and machinery, and also as structural components.

AMC MECANOCAUCHO

Since 1969 AMC MECANOCAUCHO has pioneered the manufacture and design of products for the attenuation of vibrations and noise. Today AMC is a market leader throughout the European union providing many high-end OEM's with engineered solutions in the reduction of noise and vibration. The company manufactures to ISO9001, ISO14001, DNV Approval and NATO Certification to ensure consistent high quality.

AMC design and manufacture an extensive range of products that reduce noise and vibrations in construction and industry. The range covers all facets of construction including the effective isolation in floors, walls, ceilings and building services such as HVAC and piping. All AMC products are produced in Spain and meet the most stringent European standards.

Customised machine foundation isolation Large, powerful industrial machines are a

significant source of dynamic excitation. This can cause damage to the machine itself, affect nearby machinery and sensitive equipment and even damage the surrounding building structures.

Moreover, people in the immediate vicinity can be affected by transmitted vibrations or greatly disturbed by noise. The machine foundation isolation should be designed away from the operating frequency of the machine to have amplitudes and velocities

below the limit. Getzner's Engineering Team will make sure that design requirements are met.

Therefore Getzner offers customised foundation isolation for various types of machines like mills, pumps, compressors, turbines, machine tools. The elastomer materials Sylomer® and Syldyn® are located under the machine foundation on top of the subgrade or alternatively on lean concrete.



Implementing a machine foundation isolation reduces the risk of negative effects.



Vibration Solutions knows it is critical to protect the equipment surroundings with vibration mitigation.



Large powerful machines have a big potential for vibrations.

Solution

- Getzner's Sylomer® and Sylodyn® is installed under the foundation in a full surface layout.
- Allowing in situ concreting directly on top of the material and eliminating the need for prefabricated slabs.
- Ensuring the fast completion of the foundation work.
- Solution is maintenance-free, eliminating the costly requirement to grant accessibility to the elastic elements.
- Side walls are used to seal the foundation, eliminating any potential problems with gaps.
- Tailored frequency by adjusting the number of installed isolation layers and used material grades

Typical applications 1: Making the subgrade predictable and protect the machine

EPCs (Engineering, procurement and construction), construction companies

and engineering firms responsible for foundation design are facing special challenges related to the subgrade. Making the subgrade capable of bearing the weight of foundation and machinery is an obvious requirement, but also the dynamic properties of the subgrade cannot be neglected in the dynamic foundation design.

Getzner's solution is the answer making a cost and time efficient foundation design independent of the dynamic subgrade properties possible. Recommendations are given by multiple codes and guidelines, which state that the resonance frequency of the foundation has to be shifted away from the operating frequency.

Benefits

- Defined bedding situation by usage of a predictable and calculable elastic layer.
- Cost efficient approach to avoid interference of subgrade dynamics with the operating frequencies of the machinery other options include

- subgrade replacements and piling.
- Fast and easy solution, speeding up the project schedule.
- Vibration isolation minimises the interference between machines.
- Technical support of the contractor during the design and installation phase.
- Plug and play install of the material not interfering with the overall construction schedule.
- Stamped dynamic calculations by leading external engineering offices.

Reference Projects

Centrifugal pumps, Jubail, Saudi Arabia
Centrifugal compressors, Abu Dhabi, UAE
Steam- and gas turbines, Delimara, Malta

Typical applications 2: Protect the surrounding providing vibration mitigation

Machines generate vibrations, which are introduced in their vicinity, leading to disturbance, damage and interruption of plant operations. Control rooms and equipment, the machine building itself but also offices are exposed to unwanted vibrations.

Elastic separation of the mill foundation from neighboring buildings reduces the vibration exposure of people in the buildings but also of the structure itself

Benefits

- Reduction of structure borne and airborne noise
- Protection of the electronic equipment and control instrumentation in the proximity
- Lower forces in the mill components resulting in lower life cycle cost of the machine
- Potential reduction of foundation dimension
- Fast and easy solution, speeding up the project schedule
- Vibration isolation minimizes the interference between machines
- Technical support of the contractor during the design and installation phase
- Plug and play install of the material not interfering with the overall construction schedule

Reference Projects

Vertical roller mill, Vizag, India

Ball mill, Panama City, Panama
Hammer mill, Machong, China

Typical applications 3: Passive isolation to protect the machine from vibrations from the surrounding

Machine borne vibrations are typical to a manufacturing environment. Implementing a machine foundation isolation reduces the risk of negative effects of vibrations on the operability of the machine, increases its precision and gives the user additional flexibility where to place the machines.

Benefits

- The inertia block reduces movements of the machine compared to a direct isolation under the machine
- Hard impacts are reduced increasing the product quality that can be reached
- Machines elastically separated can operate within tighter tolerances
- Machine manufacturers confirm the positive effects on the longevity of the machines
- Planning flexibility: Machines can be located in areas, where without isolation mitigation it would not be possible

Reference projects

Lathes, Kranj, Slovenia
Milling machines, Mosonmagyaróvár, Hungary
Roll grinder, Cernay, France

The answer to your vibration issue is obvious, Vibration Solutions Pty Ltd and Getzner. **AMR**

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Minimise Operational Risk with Satellite Internet

Mining projects in remote Australia present unique challenges to managing worksite risks and creating safe workplaces. Australian Private Networks (APN) connects permanent and temporary mine sites with vital external communications through our fixed and portable business satellite internet and WiFi solutions.

APN's internet and phone services ensure mining operations can maintain business-critical communications, monitor site safety and performance remotely, and on-site FIFO workers can stay connected with their families and entertained in their downtime.

Constant internet and phone services are critical to the safe operation of teams on-site, meaning remote mines without mobile phone coverage are inherently riskier than those in coverage areas.

Lacking the ability to communicate with emergency services in times of emergency, for instance, is a significant risk.

Often securing a pole for satellite dishes can be restricted on mine sites, where digging is prohibited.

APN's freestanding ground-mount option allows mobile teams to set up a continuous internet service at temporary locations without leaving any environmental footprint.

With nearly two decades of experience providing remote WiFi, internet and phone solutions, APN has identified some of the primary ways satellite internet services minimise organisational risk for mining operations.

Guarantees Business Continuity (DRP)
Satellite offers a perfect backup to primary microwave or fibre internet connections. Network downtime can be relatively common due to the isolated nature of mine sites and are incredibly costly – potentially resulting in production or processing downtime.

A DRP satellite solution mitigates the risk of disruption from primary network downtime. With DRP specific service options minimising standby costs when not in use, satellite internet is a cost-effective way of guaranteeing the connection to external networks.

Enables Worksite Safety Compliance
Providing effective communication for remote or isolated workers means ensuring they can access emergency assistance



if required, a basic necessity for a safe workplace.

For permanent or semi-permanent remote mine camps, communications can present a costly challenge.

APN's solutions provide remote workers with ongoing communications required to keep them healthy and safe.

Improves Productivity and Work Quality
Productivity is a significant concern for mining organisations, and ensuring effective FIFO worker productivity can be vital to meeting production targets.

Offering FIFO workers access to the internet to keep in touch with their families and provide entertainment in their downtime improves worker productivity and job satisfaction.

APN's user-friendly camp WiFi solutions allow organisations to provide worker

accommodation facilities with free, prepaid or PAYG WiFi hotspot access through a fully managed online service portal.

APN's WiFi solutions offer a cost-effective solution for providing workers with internet in their downtime. The cost of the solution can optionally be offset by workers purchasing data PINs and paying for the internet they use.

Solutions Available
Satellite communications solutions are available for permanent, semi-permanent or mobile sites with varying contention rates and SLAs depending on requirements.

Hardware can be mounted to a permanent structure, vehicle or trailer and is also available as a standalone unit.

For more information on how APN's satellite internet solutions can reduce your business risk, visit apn.net.au or call us on (03) 8566 8312. **AMR**



APN's portable satellite solutions can be easily set up on a freestanding ground mount, for sites where digging is impractical or restricted.



Portable satellite and WiFi solutions can be fixed to a vehicle or trailer for ultimate portability

Business Internet for Mine Sites & Temporary Workcamps

Australian Private Networks offers fixed and portable communications solutions for mining operations and remote work crews operating in regional and remote Australia.

Solutions Available:

- ✓ Unlimited Data
- ✓ Easy to Setup Portable Services
- ✓ Freestanding or Vehicle Mountable
- ✓ DC and AC Power Compatible
- ✓ Consolidated Billing of Multiple Services
- ✓ Support Options Available

Our portable solutions overcome the challenges of connecting isolated crews when working at temporary sites in remote locations.

With portable satellite hardware that can be set up and connected in minutes, workers can stay connected to the office, online tools and their families through LAN cable and WiFi connectivity, no matter where their work takes them.

For more information, call (03) 8566 8312 or email corporatesales@apn.net.au

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THE AUSTRALIAN
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MAXIMUM STRENGTH FOR GREATER IMPACT

TOP HAMMER DRILLING TOOLS

Achieve optimal tooling performance with Boart Longyear's rugged and reliable top hammer drilling products. The new DriftMaster™ line of rods and bits boasts increased load handling capability for maximum endurance.

Make an impact on your drilling results. Visit:
www.boartlongyear.com/driftmaster



INCREASED STRENGTH

Featuring premium carbide inserts, heat-treated, high-grade steel bits and RazorBack™ reamers pack a punch enabling more drilling time and more productivity.



BUILT TO LAST

Designed with a unique tapered thread profile and deep case hardening, DriftMaster rods maximise resistance to wear, reduce stresses, and offer superior rod-bit make-up and breakout characteristics.



EXCELLENCE IN SERVICE

Boart Longyear's service team is dedicated to supporting your production drilling requirements. Backed by a global workforce, you can count on the right technical experience and expertise to maximise your productivity.



CleanSpace®

R E S P I R A T O R S

A REVOLUTION IN RESPIRATORY PROTECTION



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