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TURNING THE TIDE ON

IRON ORE

Independent Australian iron ore producer Mt Gibson Iron has grown its flagship Koolan Island operation over the last four years, after high tides caused a wall slump and flooding to the Main Pit (pictured here) in 2014.

In a remarkable feat of engineering, the company rebuilt its seawall in 2017 and it now boasts the highest-grade ore reserve of any operating direct-shipping ore (DSO) hematite mine in Australia.

The *Australian Mining Review* speaks with Mount Gibson Iron chief executive Peter Kerr about the beginning of operations and what the future looks like for the company.

See story on page 64

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See our story on **Page 58**



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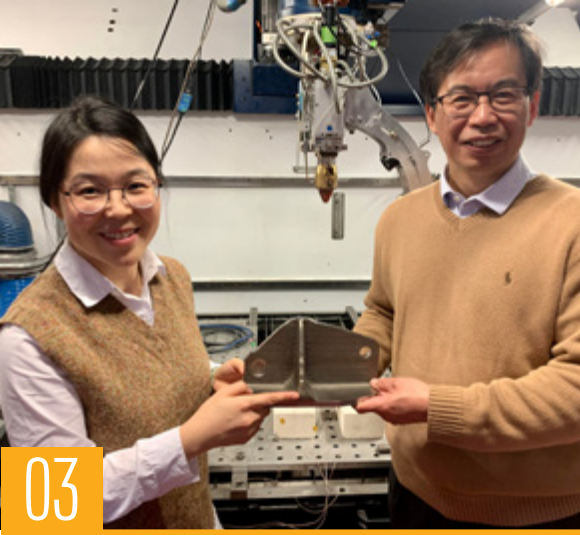
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MINES REOPEN ALL OVER AUSTRALIA

(Image source: Pembroke Resources) Pembroke Resources team celebrating the official moving of first dirt at the Olive Downs complex.

With the price of metals such as tungsten and gold increasing, mines across Australia are re-starting operations, helping to boost Australia's economy and create thousands of jobs.

Olive Downs

At the start of June, Pembroke Resources marked a major milestone with the beginning of mining at the Olive Downs complex in Queensland.

To reach the milestone, Pembroke engaged over 86 local Central Queensland businesses to develop the project. Construction is advancing to plan with rail, electricity and a processing plant underway.

Pembroke Resources chief executive Barry Tudor said the commencement of operations was a significant achievement.

"It's a rare opportunity to celebrate the beginning of mining for a new, world-class steelmaking coal project which is proudly implementing the next level of technology and sustainable mining," he said.

Olive Downs will have the first deployment of autonomous-ready 794 AC haul trucks, the first deployment of CAT's autonomous haulage system and autonomous drilling system in Australia.

These autonomous systems will enhance safety and productivity, improve energy consumption, lower carbon emissions and decrease Pembroke's ecological footprint. When in full scale production, Olive Downs will be one of Australia's largest producers of steelmaking coal.

Mt Bundy Gold Project

The Northern Territory is about to receive

a boost to its economy and workforce with the Mt Bundy gold project one step closer to reopening.

Granted major project status in 2022, the Mt Bundy project proposes to restart three mines — Rustler Roost, Quest 29 and Tom's Gully.

Proponents Primary Gold plan to restart open cut mining at Rustlers Roost and Quest 29 with the expansion of all existing open cut pits and the development of new two pits.

Early construction has begun at Tom's Gully with a new bridge constructed and the commencement of geotechnical drilling. Northern Territory Mining and Industry Minister Nicole Manison said the restart of operations at Mt Bundy is a boost for the economy.

"The Mt Bundy gold project is great news for local jobs and mining near Darwin, creating hundreds of well-paying jobs for the next decade," she said.

"Gold is needed not just for jewellery and investments, but for the creation of electronics, high tech health care and aerospace, and the Northern Territory has the supply the world needs."



(Image source: Group 6 Metals) Birdseye view of the Dolphin tungsten mine on King Island.

On average, the \$412m project is expected to produce more than 135,000oz of gold per year.

Dolphin Tungsten Mine

Previously operating between 1917 and 1992, the Dolphin tungsten mine on King Island near Tasmania closed due to low tungsten prices with around 50% of the known mineral resource yet to be mined.

Today, the mine hosts the highest-grade tungsten deposit of significant size in the western world which is notable given that the Federal Government has classified it as a critical mineral.

Operator Group 6 Metals (ASX: G6M) plans to use a \$1.64m grant to assist with the costs of establishing the energy infrastructure needed to restart mining operations.

The redevelopment plan anticipates an eight-year open cut mine followed by a six-year underground operation.

Group 6 is also executing a plan to sustainably redevelop the mine in a way which preserves the environment.

First tungsten concentrate was produced in early June and marks a significant milestone for the company.



(Image source: Hillgrove Resources) Kanmantoo underground copper mine in South Australia.

Construction of the process plant is nearing completion with performance testing now underway to achieve 400,000tpa processing capacity.

Kanmantoo Underground Copper Mine

In the middle of the month, Hillgrove Resources (ASX: HGO) received formal positive investment decision (FID) to proceed with stage one development of the Kanmantoo underground copper mine in South Australia.

Stage one will focus on two of the nine known mineral lodes at Hillgrove that were either drilled or mined as part of the open pit. Both remain open at depth and along strike with drilling set to expand mine life and annual copper production.

Furthermore, underground development began in May with initial cuts validating the productivity and ground support assumption rates.

Hillgrove Resources managing director Lachlan Wallace said the decision to begin mining is an exciting milestone for Hillgrove.

"The formal decision to commence mining at Kanmantoo is an exciting milestone for the company," he said.

"The first underground blast occurred in May and the development rate has quickly ramped up to planned levels.

"Stage one represents the first step in developing the Kanmantoo asset and surrounding region."

Copper production is on track for early 2024. **AMR**

AUSTRALIA TO BECOME GLOBALLY SIGNIFICANT CRITICAL MINERALS PRODUCER WITH FEDERAL GOVERNMENT'S CRITICAL MINERALS STRATEGY

During the month of June, Federal Resources Minister Madeleine King released the Federal Government's Critical Minerals Strategy which highlights the country's way to grow the critical minerals sector.

The strategy aims to create diverse, resilient and sustainable supply chains, build sovereign capability in critical minerals processing and help Australia become a renewable energy superpower.

One of the first policy decisions will target \$500m worth of new investment into critical minerals projects via the northern Australia infrastructure facility.

Minister King said the strategy highlights the crucial role Australia can play in delivering the processed minerals the world needs.

"The new critical minerals strategy outlines the enormous opportunity to develop the sector and new downstream industries which will support Australia's economy and global efforts to lower emissions for decades to come," she said.

Modelling has found increasing the export of critical and energy-transition minerals could create more than 115,000 new jobs and add \$71.2b to the gross domestic product (GDP) by 2040.

If Australia builds downstream refining and processing capabilities, the number of jobs could increase by 262,600 and the GDP could increase to \$133.5b by 2040.

Minerals Council of Australia (MCA) chief

executive Tania Constable calls for an integrated policy framework to cement Australia's potential as a global supplier of choice for the transition to net zero.

"The stark reality of the monumental global net zero emissions transition is becoming clearer," she said.

"Global demand for raw minerals and metals over coming decades is staggering.

"Based on current mine sizes, by 2035 at least 384 new mines for graphite, lithium, nickel and cobalt alone are needed to provide the processed materials required to meet demand for electric vehicles.

"By 2027, copper demand for manufacturing electric vehicles is expected to increase by 1.7mt

"These rapid changes to raw materials supply-demand outlooks is why the list of critical minerals and strategic materials must also be updated regularly and inform policy decisions."

Northern Australia Ministerial Forum

Earlier in the month, Minister King met with representatives from around the country for the second northern Australia ministerial forum.

In the first forum to be held in Kununurra in almost six years, opportunities to strengthen Northern Australia's agriculture and biosecurity sectors, including identifying priorities for disaster resilience, were discussed.

Chaired by Minister King, the forum was

attended by Queensland Minister for Regional Development Glenn Butcher, WA Director-General of the Department of Primary Industries and Regional Development Heather Brayford and Northern Territory Minister Brent Potter attending on behalf of Northern Territory Deputy Chief Minister Nicole Manison.

Made up of Federal Government ministers with responsibility for the development of Northern Australia — and counterparts from Queensland, the Northern Territory and WA — the forum develops goals for lasting prosperity across the north.

The Ministers are aiming to diversify and strengthen the north's economy by increasing the participation of First Nations, meeting workforce needs, promoting the liveability of working, living and investing in the north and developing natural and economic assets.

Minister King said agriculture in northern Australia contributes significantly to Australia's economy and the Albanese Government is committed to supporting farmers and producers in the north.

"I am excited about this opportunity to re-inject urgency into our agenda for sustainable economic development," she said.

"I am focused on the critical importance of social infrastructure and community-led development, while supporting industry to expand and create sustainable regional jobs."

Federal Agriculture, Fisheries and Forestry Minister Murray Watt took part in discus-

sions on the importance of the north to the Albanese Government's approach to managing emerging biosecurity risks.

Queensland Regional Development, Manufacturing and Water Minister Glenn Butcher said the State is already delivering jobs through its Queensland energy and jobs plan.

"The Queensland government is already delivering innovation and good, stable jobs for northern Australia through the Queensland energy and jobs plan," he said.

"The work we conduct through these forums directly impact the liveability of communities and attract young people to regional and remote Australia."

Through a further \$4b investment, Queensland is aiming to be using 70% renewable energy by 2032 and 80% by 2035.

Further, the Queensland Government will create two new regional transmission and training hubs as well as a new energy industry council and a Queensland renewable energy jobs advocate.

Work will reduce emissions in remote and First Nations communities with a \$10m Queensland microgrid pilot fund to improve network resilience.

The Queensland Government will also co-design a clean energy strategy with First Nations communities to achieve net zero electricity emissions in communities supported by Energy Queensland power stations. **AMR**



(Image source: Madeleine King) Federal Resources Minister Madeleine King with representatives from around the country for the northern Australia ministerial forum.

GEMCO RAIL CHOSEN BY RIO TINTO TO ESTABLISH FIRST- EVER RAIL ORE CAR MANUFACTURING FACILITY IN THE PILBARA

WA-based Gemco Rail has been chosen by Rio Tinto (ASX:RIO) to establish the first-ever rail ore car manufacturing and maintenance facility in the Pilbara.

Gemco Rail will deliver 100 wagons — 40 initially and another 10 per year over the next six years — plus repairing and refurbishing components.

Over the six years, Rio expects to invest around \$150m to purchase the rail cars and bearing refurbishment to support Gemco Rail's Pilbara operations.

The initial 40 cars will be built at Gemco's existing facility in Forrestfield while a further facility is established in Karratha.

Once the new facility is up and running, Gemco is expected to build an average

of 10 ore cars per year, replacing the old ones as they are retired.

Further, the new Karratha facility will support the supply of new and reconditioned ore car bearings from the Pilbara and reduce the need to transport iron ore cars and bearings between Perth and the Pilbara, removing an estimated 150 truck journeys and 300t of CO2 emissions every year.

Rio Tinto chief executive Simon Trott said the company is proud to be bringing a new industry to the Pilbara.

"We aim to create enduring partnerships that generate positive impacts in the regions where we operate and are proud to be leading the way in bringing iron ore car manufacturing and maintenance to the Pilbara," he said.

"We've taken our original scope to build iron ore cars in Western Australia and enhanced it to see the construction of ore cars in the same region as our operations.

"This will bring a new industry to the Pilbara, creating jobs and providing more opportunities for local and Indigenous businesses."

This partnership enables Gemco Rail to expand its existing operations, create new jobs, support local economic growth and increase spend with local and Indigenous businesses.

The first WA-built rail car is expected to be delivered in 2024 and subject to the availability of a suitable property, the Karratha facility is expected to be established by the end of next year.

Engenco, the parent company of Gemco Rail, chief executive Dean Draper said the partnership reflects the company's commitment to WA customers and communities.

"In securing this opportunity with Rio Tinto, Gemco is proud to utilise its experience and capabilities to re-establish the manufacture of iron ore rail cars in Western Australia," he said.

"Gemco Rail's investment in the Pilbara reflects our long-term commitment to customers and communities in Western Australia.

The partnership was developed by Rio Tinto and Gemco Rail with support from Qihang Railway Rolling Stock and the WA State Government.

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(Image source: Gemco Rail) Two of Gemco Rail's locomotives.

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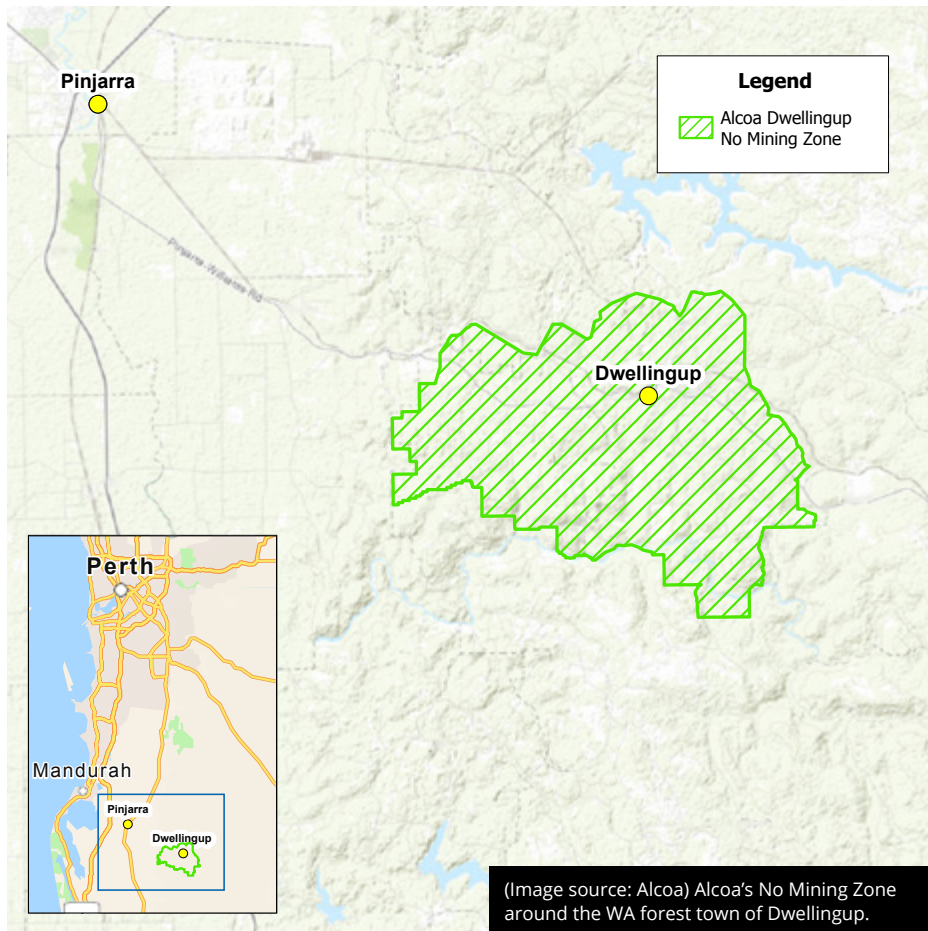


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(Image source: Alcoa) Alcoa's No Mining Zone around the WA forest town of Dwellingup.

Alcoa has committed to not mine within 3km, and in some instances more than 6km, of the Dwellingup town centre in WA's southwest to protect the local environment, lifestyle, ecotourism and recreation.

This is an area more than four times the size of Rottnest Island, with Alcoa's commitment not to mine in the area helping to protect 5,000ha of forest and a combined 31km of the Bibbulmun walking track and Munda Biddi cycle trail near Dwellingup.

Alcoa Australia president Matt Reed said the company's decision to establish the Dwellingup no mining zone followed extensive studies and consultation and respected feedback about the area's growing importance to not only the local community but the broader state and nation.

"We hope this decision provides greater certainty about our intentions in a prospective mineral area and demonstrates our willingness to protect important environmental and social values," he said.

ALCOA COMMITS TO 'NO MINING ZONE' AROUND DWELLINGUP

"We respect the Dwellingup area has immense lifestyle, ecotourism and forest recreational values that people want to continue to enjoy now and into the future.

"We have worked closely with the Shire of Murray and other stakeholders in reaching this decision, and we believe this commitment will provide certainty to the community for the future."

The WA Government has welcomed Alcoa's announcement that it will establish an 8,344ha mining avoidance area around Dwellingup and says it will work with Alcoa to ensure the appropriate restrictions are put in place to prevent mining by the company or a third party.

WA Premier Roger Cook says "the announcement reflects the value of Dwellingup's incredible landscapes, including the magnificent jarrah and marri forest, to the local community, its expanding ecotourism industry and the State."

Through the *Alcoa Refinery Agreement Act 1961*, a State Agreement with the WA Government, Alcoa holds a bauxite min-

ing lease (ML1SA) up until 2045, which includes land around Dwellingup.

The 8,344ha no mining zone across Alcoa's bauxite lease will connect with areas where future mining has already been ruled out by the company.

Any potential future mining will predominantly be to the east and be subject to environmental review and approval.

Alcoa recently committed to not mine within 5km of Jarrahdale, another WA forest town about 60km north of Dwellingup.

It has also withdrawn plans to export bauxite reaffirming its commitment to process all the ore it mines in WA at its three local alumina refineries.

In addition, Alcoa has a long running commitment to not mine old growth forest, national parks, and areas of high conservation value.

Private property is excluded from Alcoa's mining operations. **AMR**

FORTESCUE METALS SIGNS \$18M AGREEMENT WITH NYAMAL FOR IRON BRIDGE PROJECT

Fortescue Metals Group (ASX:FMG) has signed an \$18 million agreement with the Nyamal traditional custodians to provide mining equipment for FMG's Iron Bridge magnetite project in WA.

The agreement will see Nyamal Holdings initially provide five contour drill rigs, two platform rigs and one stemming loader.

Over the next two years, six additional platform rigs will be provided to meet the Iron Bridge mine plan.

Nyamal Aboriginal Corporation chair Gavin Mitchell said this agreement provided ample opportunities for the community.

"Nyamal Holdings are excited to secure this significant contract for the Nyamal people enabling us to own the fleet which will provide ongoing training and employment opportunities for Nyamal members," he said.

Since 2019, \$331m worth of contracts have been awarded to Nyamal businesses, and through Fortescue's billion opportunities program, more than \$4.5b in contracts have been awarded to over 140 Indigenous Australian businesses since 2011.

Fortescue chief executive Fiona Hick said this contract will help Indigenous businesses grow.

"From the outset, Fortescue has been focused on practical initiatives that drive economic and employment opportunities for Indigenous Australians," she said.

"Contracts like this support the growth of Indigenous businesses, enabling them to build capacity which in turn provides ongoing economic benefits to communities."

FMG has sourced \$3.6b worth of goods and services from WA businesses for Iron Bridge and its operations.

The Iron Bridge magnetite project is a joint venture held between FMG Magnetite (69%) and Formosa Steel IB (31%).

Magnetite production began in early May with a first run grade of more than 68% iron achieved and FMG will continue to ramp up to 22mtpa of high-grade magnetite concentrate.

This production signified FMG's entry into the highest-grade segment of the iron ore market and provides an enhanced product range and an increase to annual production and shipping capacity. **AMR**



(Image source: Fortescue Metals) Travis McPhee, Graham Howard, Martin Drage, Danny Brown, Fiona Hick and Gavin Mitchell at the signing of the significant agreement.



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BHP NAMES THREE RECIPIENTS OF GRANTS PROGRAM



(Image source: BHP) Scuba diver restoring seagrass in the Wet Tropics region of the Great Barrier Reef.

Three organisations have been named as recipients of BHP's grant program aimed at driving the development of Australia's blue carbon market.

Launched in June 2022, BHP's grant program aims to provide funding and support to emerging blue carbon projects with the distribution of over \$5m across three years.

Blue carbon refers to carbon captured by oceans and coastal ecosystems. Projects to conserve and restore these ecosystems are being recognised for the role they play in mitigating climate change.

BHP's blue carbon breakthrough grant program supports shovel-ready projects ready for execution in FY24 while its blue carbon enabler program supports earlier stage projects where outcomes are expected to be realised over a longer time period.

BHP climate and sustainability officer Fio-

na Wild said the company is excited to support the blue carbon market.

"We are excited to support the development of the emerging blue carbon market in a way that delivers climate, nature and community benefits," she said.

"The large number of applicants for our program makes it clear that there is significant interest in taking action for our environment and for our communities, and BHP is very pleased to be working with the successful recipients."

The program was developed with support from leading climate change investment and advisory firm, Pollination.

Pollination chief executive Martijn Wilder said the company was pleased to work with BHP on the grant program.

"There is enormous potential for blue carbon projects to help support Australia's net zero and nature positive transition,

and we are pleased to have worked with BHP as it supports the development of the blue carbon market in Australia," he said.

"With these grants from BHP, these projects will be able to demonstrate how blue carbon activities can be deployed on the ground, with the potential to be replicated and scaled across the country in future."

Deakin University Blue Carbon Lab, Tidal Moon and James Cook University are the recipients of the grant.

Deakin University Blue Carbon Lab: Restoring Coastal Wetlands Through Low-Cost Strategies — a Demonstration of Exclusion Fencing

Led by Deakin University's Blue Carbon Lab in partnership with Greening Australia, the project will demonstrate the potential of fencing as a scalable, replicable and low-cost strategy to restore blue carbon ecosystems.

It aims to restore over 200ha of marginal farmland as tidal marsh and supratidal swap forest in south-eastern Australia.

This will generate new knowledge to help operationalise marketable blue carbon projects in Australia that are beneficial to the natural environment and society.

Deakin University Blue Carbon Lab: Enabling Blue Carbon Restoration at Scale

Previous work developed by Deakin University identified major gaps on the location of tidal barriers along the coastline.

Deakin's second project aims to support the uptake of blue carbon restoration projects through tidal reinstatement along Victoria's coastline.

This will be done by developing a portfolio of potential sites for restoration projects.

Assessment of potential sites will drive an understanding of the possibility of blue carbon restoration in Victoria and support the development of a functioning blue carbon market.

Tidal Moon

Indigenous owned and led marine service business Tidal Moon aims to restore 100,00ha of damaged sea grass meadows within Shark Bay, WA.

Work will be delivered using the Indigenous skills, knowledge and diving operations of Tidal Moon in association with technical expert teams specialising in the restoration of Shark Bay seagrass and the evaluation of blue carbon segregation.

James Cook University

As the first meadow scale seagrass restoration in tropical Australia, James Cook University will restore two key seagrass areas in the Wet Tropics region of the Great Barrier Reef that were lost as a result of La Nina in 2011.

This will establish a range of regionally appropriate seagrass restoration techniques as well as assess the impacts to seagrass blue carbon and the return of fisheries functions in the restored seagrass. **AMR**

ECOGRAF SIGNS COOPERATION AGREEMENT WITH POSCO INTERNATIONAL TO SUPPLY BATTERY ANODE MATERIAL



(Image source: EcoGraf) Snapshot of operations underway at EcoGraf's operation.

JULY 2023 **AMR**

Diversified battery anode materials company EcoGraf (ASX:EGR) has signed a non-binding cooperation agreement with POSCO International to sell its battery anode material for an initial 10 years.

The first year of the agreement will see EcoGraf supply 7500–12,500t of battery anode material and years two to five will see 12,500–20,000t of battery anode material supplied per year.

Years six to 10 will see production ramp up to 20,000–40,000t of battery anode material per year.

The agreement follows a successful technical program between the companies undertaken to assess EcoGraf's graphite product performance.

A subsidiary of POSCO Holdings, POSCO International aims to become a reliable and eco-friendly battery anode material

supplier for its end-consumer, POSCO FUTURE M — a globally leading manufacturer of natural graphite anodes for lithium-ion batteries in electric vehicles.

EcoGraf and POSCO have also agreed to establish a global battery anode materials supply chain hub in Tanzania.

The partnership will see the development and expansion of the Epanko graphite mine and the development of the Merelani-Arusha graphite project.

Further, battery anode material micro-nising and spheronising facilities and by-product fines will be developed.

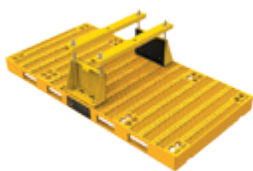
POSCO will also leverage EcoGraf's proprietary graphite purification technology to ensure logistical and operational efficiencies and de-risk the short-term supply chain risk in South Korea, North America and Europe. **AMR**



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FUELFIX. TWO PATHWAYS, ONE GOAL.

As the world starts to transition towards a low emissions future, the demand to combine traditional fuels with renewable and next-generation alternatives continues to gain pace.

Fuelfix & Tanks2Go (Fuelfix) is committed to helping its customers in their journey to a clean energy future through innovative energy management and storage solutions. Leveraging extensive hydrocarbons expertise, Fuelfix is well placed to provide best-in-class solutions to customers in the form of the right sized fuel infrastructure in the right location that optimises fuel usage when it comes to cost, maintenance, and emissions.

Deliberately energy agnostic, the company's specialist technicians assist customers in identifying the ideal fit-for-purpose solution whilst maintaining operational performance. Through their comprehensive range of fuel, hybrid, battery-driven equipment, and national branch network, Fuelfix delivers a suite of integrated services to improve operational energy efficiency and emissions without impacting reliability.

Building on its expertise

Since 2006, Fuelfix has delivered innovative and cost-effective fuel management solutions across its core business activities of equipment hire, equipment sales, repairs, maintenance, engineered solutions, and facility management. As alternative energy storage options have become available, Fuelfix has continued to build on its knowledge and capability, integrating data analytics and insights to best meet customer needs.

Fuelfix's overarching strategy of Two Pathways, One Goal not only gives its customers the power to maximise the efficiency of their hydrocarbons infrastructure, but provides alternative energy solutions where it is practical to displace diesel.

According to Fuelfix Chief Executive Officer Patricia Welsh, a rich history of innovation in hydrocarbons management has strategically positioned the company to advise customers on how to mitigate, eliminate,

and offset their carbon emissions and reduce their energy costs.

"Helping our customers understand where, and how they use fuel, allows our specialist technicians to design solutions to reduce the cost of production, maintenance, and NGER compliance," Ms Welsh said.

"Industry is looking for tangible strategies to reduce their scope 1 and scope 2 emissions now, whilst maintaining energy reliability and cost efficiency. This is where we can help."

Launching its Go-Greener brand, including its low and zero emissions product range, Fuelfix are providing sustainable solutions to help customers make greener choices. At the core of this strategy is effective monitoring and data modelling, with a tested methodology that provides a clear supported pathway to maximising fuel efficiency and mitigating scope 1 and 2 emissions.

Data modelling and review process

Fuelfix aspires to set their partners up for success. This begins with the supply of the right measuring tools, followed by an audit of existing infrastructure and operational processes.

This process helps customers establish

correct data capture and management policies, which provide the platform for emissions efficiency and reduction analysis.

Effective data management enables customers to correctly capture tangible data. This data can then be used to understand fuel usage trends, fuel infrastructure requirements, plant health, and fleet utilisation.

Fuelfix' technicians, engineers, and analysts help customers interpret the information captured by fuel management systems, and using live monitoring data sets, recommend industry tested solutions to reduce or mitigate fuel costs wherever possible.

By exploring low investment and easy-to-implement solutions, their customers are finding multiple opportunities to create efficiencies in their operations. These micro-efficiencies compound to significantly improve equipment and infrastructure utilisation.

Although investing in large-scale emergent projects in the carbon reduction space can offer practical options for the future, mining companies find it challenging to produce medium to short-term results.

By focusing on low-hanging opportunities,

Fuelfix' customers can secure measurable and immediate benefits. These include lower scope 1 and 2 emissions, reduced fuel consumption, extended plant life, and optimised fuel delivery infrastructure, to name a few.

Australian miners are also looking for easy wins due to increasing fuel and compliance costs. Fuelfix is proving that with good data collection and an ongoing review of operational systems, the mining industry can move closer to their cost savings and emissions reduction targets.

A trusted partner

By upgrading fuel infrastructure, switching fuel usage, or changing the way fuel equipment is controlled and operated, Fuelfix can recommend and provide impactful solutions to meet current demands, accurately measure fuel usage, and make improvements that reduce or displace diesel.

This work is already achieving tangible results with Sojitz Blue, who are partnering with Fuelfix to analyse data models, which proactively reduces emissions and reduces operational costs.

Ann Houston, Head of Environment, Social and Governance says Sojitz Blue is committed to reducing their carbon emissions in accordance with Sojitz Group Policy.

"Diesel reduction is an important part of this, and we are partnering with Fuelfix to actively reduce diesel use and movements, through comprehensive monitoring," Ms Houston said.

"This huge data set is providing insights into the optimal placement of fuel tanks, the best fuel truck volumes and movements, as well as identifying any losses. We are putting this data into action to immediately reduce our fuel usage with demonstrated cost savings."

For more information, visit
www.fuelfix.com.au/

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GLOBAL GREEN STEELMAKING OPPORTUNITY MAPPED FOR WA

Western Australia accounts for 38% of the world's iron ore supply, producing 934mt in 2022, with major competitor Brazil accounting for just under half of this at 17% of global supply.

A new report released by the WA Government has mapped the pathways for the State to join the global green steelmaking value chain.

Led by the Minerals Research Institute of Western Australia (MRIWA), WA's green steel opportunity report maps five ways WA iron ore can be used to reduce emissions from steelmaking.

The report considers the size and scale of the capital requirements and infrastructure needed for these pathways.

Pathways include green iron ore mining, green pellets, hot briquetted iron (HBI) from green pellets using fossil fuels, iron making — HBI from green pellets using renewable hydrogen and producing green steel in WA.

WA Premier Roger Cook said the green steel chain will expand the state's economy.

"Our state's abundant renewable energy resources alongside our world-leading iron ore industry puts WA front and centre in the global push towards green steel," he said.

"Moving up the steel value chain will diversify our economy and create more local jobs right across the state.

"This report delivers on an important election commitment and will help position WA as an investment destination for low-emissions steel opportunities."

WA Mines and Petroleum Minister Bill Johnston outlines further benefits.

"A small scale 4.8mtpa vertically integrated magnetite HBI plant in the Pilbara generates taxation benefits in the order of \$31.7b to Australians during construction and operations through to 2050," he said.

"It is estimated that the 4.8mtpa plant would increase employment in the WA iron ore sector by 1,700 full-time employees.

Minister Johnston says there are opportunities for future value adding of iron ore in WA.

"The transition option of using natural gas has the potential to reduce emissions from iron making by 65% and is technically feasible today," he said.

"This information can be used to support investment attraction into WA."

As green hydrogen technology continues to emerge and more renewable energy infrastructure is established, the report highlights the state's access to natural gas and renewable energy resources is a key factor to supporting emissions reductions in steelmaking.

Green Iron Ore Mining

Traditional iron ore mining uses diesel and burner fuel for excavating, hauling, shipping and land transportation and gas-fired power for crushing, screening and beneficiation.

WA's iron ore sector can remove the use of fossil fuels in iron ore mining by using alternative fuels.

This can remove scope three emissions

for steelmakers and reduce WA's overall emissions.

Green hydrogen is used to excavate and haul the material and transport it to port, solar and wind power is used to crush and screen the material and the beneficiation process while green ammonia is used to ship overseas.

Green Pellets

Current iron and steelmaking technologies rely on being fed with iron ore feedstock.

Lump hematite is the only ore of sufficient quality and diameter that can be fed directly to further processing stages while all other ore must first be assorted before use.

Through the process of pelletisation, this process can be decarbonised. Pelletisation uses a hydrogen indium furnace to help form the pellets.

To have fully green steel, green pellets are necessary, however, hydrogen costs are too expensive at this point to produce them competitively.

Magnetite concentrates are more economic as they do not require as much heat to form the pellets as hematite.

HBI From Green Pellets Using Fossil Fuels

Predominantly, turning iron ore into iron is done by putting iron ore agglomerate through a blast furnace which uses gas-fired power and coal.

A greener way is to create green pellets and convert them to HBI using natural gas shaft furnaces. With the cheaper cost of natural gas, HBI can be produced for around \$200/t cheaper than the traditional coal-fired route.

Currently, every tonne of iron produces 1.7tCO₂/t but can be reduced to 0.5tCO₂/t iron if the shaft furnace is brought on-shore. If lower gangue WA ores are used, this could reduce emissions at a rate of around 0.01tCO₂/t.

Iron Making — HBI From Green Pellets Using Renewable Hydrogen

Iron making via the traditional blast furnace route is heavily carbon-intensive and to make truly green iron the carbon use in blast furnacing needs to be fully replaced.

The most promising way to do this is to use shaft furnaces that use green hydrogen as a reductant and heating agent in the conversion of iron ore to iron.

To go to a fully green iron value chain, power facilities will be to be substantially scaled-up. Most of the power required is for hydrogen production with a cost of around \$780m per million tonnes of HBI.

Producing Green Steel in Western Australia

To move to a fully green steel solution, shaft furnaces with a hydrogen heating and reducing agent are necessary.

Further, fossil fuels used in powering operations and providing electrical power are substituted with renewable alternatives — replacing the traditional blast furnace steelmaking route.

This is considered the most feasible way as it does not rely on carbon capture and the only alternative is iron reduction which uses biofuels.

A fully green steel solution would produce almost no emissions along the value chain.

AMR

(Image source: BHP) Iron ore getting poured to produce steel.

(Image source: BHP) Train transporting materials at the Jimblebar iron ore mine in WA.

(Image source: BHP) Reclaimer picking up the ore from the stockpiles ready to convey to the train.



BRAVUS MINING TOASTS TOWNSVILLE AND ITS FUTURE AS ENERGY HUB

BRAVUS Mining and Resources chief operating officer Mick Crowe has made a toast to the regional Queensland city of Townsville amongst a slew of some of the country's most important mining companies at the 2023 mining and resources forum in Townsville in early June.

Townsville Enterprise presented its 2023 Mining and Resources Forum on June 6, bringing together speakers from across the mining industry to discuss and celebrate the state's unofficial northern capital and its contribution to mining and renewables.

The event, which was sponsored by local news outlet The Townsville Bulletin alongside The Ville Resort-Casino, Bravus Mining and Resources, Glencore, Goldtower, Helix Legal, MMG, Orica, The Port of Townsville,

PowerLink and Wulguru Technical Services, spruiked the benefits the city provides to the resources sector and outlined its future as a renewable resources hub.

Townsville Enterprise chief executive Claudia Brumme-Smith led the charge by stating the future of mining has never been brighter following the QLD state government's recent announcement of CopperString 2032.

"All eyes are on Townsville in North Queensland thanks to CopperString 2032," she said.

"This enabling transmission line will unlock \$740b of untapped known minerals and unleash 33GW of renewable energy along the northwest corridor.

"Townsville...will be the only city in the

world home to the first green zinc refinery and the global processing hub of all green battery materials the world desperately wants – zinc, copper, Queensland Pacific Metal's nickel and cobalt, vanadium and lithium. The only city in the world."

Townsville-headquartered Bravus Mining and Resources – one of a number of sponsors of the forum – outlined its first year of operations at its renowned Carmichael mine.

Mr Crowe said there were generational work and business opportunities in mining for north and central Queenslanders as people in nations like India, Vietnam, and the Philippines sought a comfortable, modern, lifestyle with fridges, consumer goods and televisions.

"It's a reality that global energy demand

is increasing, not decreasing, as nations in Asia lift their people out of poverty by providing affordable, reliable energy to partner with renewables," he said.

"India, for example, has more people than Europe, America and Oceania put together – all up around a sixth of the world's population – and they all want the same standard of living we enjoy in Australia.

"What that means is our export coal sector will be a vital part of the global energy mix for decades to come, and for the people of Townsville, that means a secure job for you, for your kids and your grandkids as an operator or a tradie or a chef or any of the dozens of roles you find on a mine site." **AMR**



WA Mining Conference and Exhibition is the destination for thought-provoking content and technical and digital solutions transforming the mining industry. The high-calibre conference will explore the mining sector's evolution through technological and sustainable improvements across the entire mining value chain. Alongside the conference will be an expanded exhibition featuring over 120 leading suppliers where you can see first-hand the latest equipment and digital innovation shaping the sector. New at WA Mining this year is the **Decarbonisation Zone**.

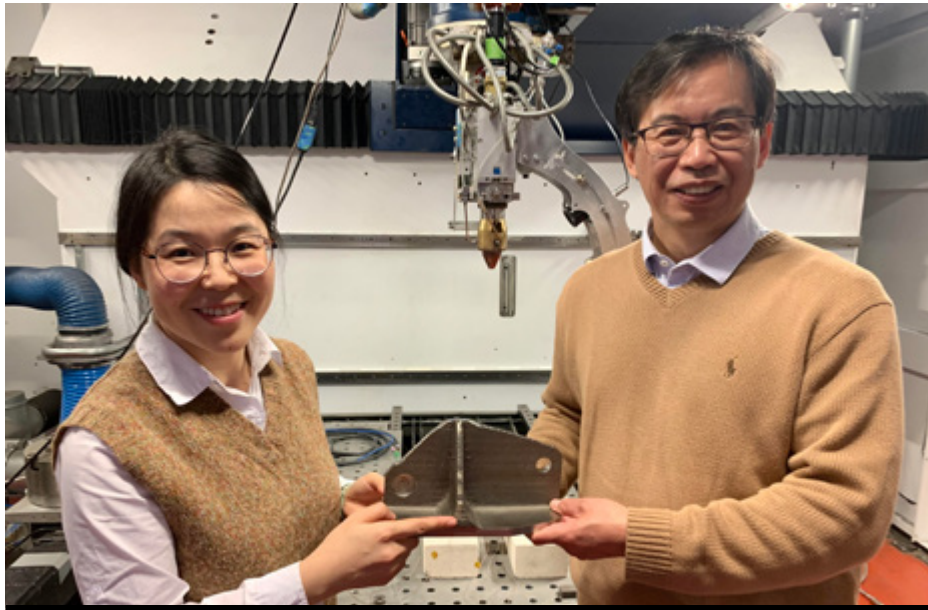
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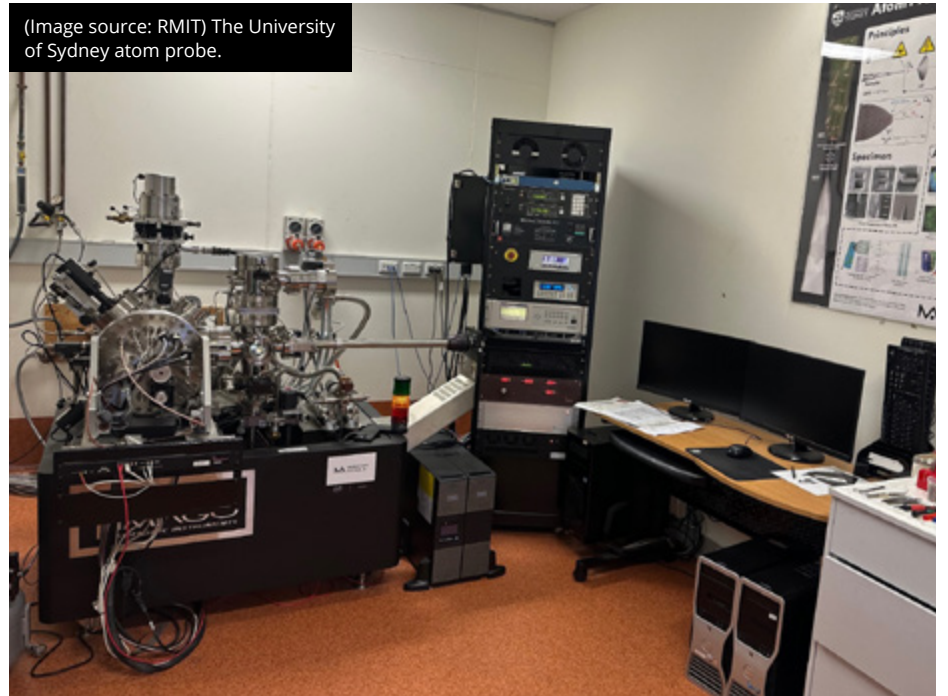
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(Image source: RMIT) (L-R) Lead author and RMIT Vice-Chancellor's Research Fellow Dr Tingting Song and RMIT Lead researcher Distinguished Professor Ma Qian Ma Qian with a titanium alloy part created with the laser 3D printer that the team used at RMIT University.



(Image source: RMIT) The University of Sydney atom probe.

NEW 'DESIGNER' TITANIUM ALLOYS MADE USING 3D PRINTING

A team of researchers has created a new class of titanium alloys that are strong and not brittle under tension, by integrating alloy and 3D-printing process designs.

The breakthrough, published in the top journal *Nature*, could help extend the applications of titanium alloys, improve sustainability and drive innovative alloy design.

Their discovery holds promise for a new class of more sustainable high-performance titanium alloys for applications in aerospace, biomedical, chemical engineering, space and energy technologies.

RMIT University and the University of Sydney led the innovation, in collaboration with Hong Kong Polytechnic University and the company Hexagon Manufacturing Intelligence in Melbourne.



University of Sydney Pro-Vice-Chancellor Professor Simon Ringer.

Lead researcher Distinguished Professor Ma Qian from RMIT said the team embedded circular economy thinking in their design, creating great promise for producing their new titanium alloys from industrial waste and low-grade materials.

"Reusing waste and low-quality materials has the potential to add economic value and reduce the high carbon footprint of the titanium industry," said Professor Qian from RMIT's Centre for Additive Manufacturing in the School of Engineering.

The team's titanium alloys consist of a mixture of two forms of titanium crystals, called alpha-titanium phase and beta-titanium phase, each corresponding to a specific arrangement of atoms.

This class of alloys has been the backbone of the titanium industry.

Since 1954, these alloys have been produced primarily by adding aluminium and vanadium to titanium.

The research team investigated the use of oxygen and iron – two of the most powerful stabilisers and strengtheners of alpha- and beta-titanium phases – which are abundant and inexpensive.

Professor Qian says two challenges have hindered the development of strong and ductile alpha-beta titanium-oxygen-iron alloys through the conventional manufacturing processes.

"One challenge is that oxygen – described colloquially as 'the kryptonite to titanium' – can make titanium brittle, and the other is that adding iron could lead to serious defects in the form of large patches of beta-titanium," he said.

The team used Laser Directed Energy Deposition (L-DED), a 3D printing process suitable for making large, complex parts, to print their alloys from metal powder.

"A key enabler for us was the combination of our alloy design concepts with 3D-print-

ing process design, which has identified a range of alloys that are strong, ductile and easy to print," Professor Qian said.

The research team says attractive properties of these new alloys that can rival those of commercial alloys are attributed to their microstructure.

"This research delivers a new titanium alloy system capable of a wide and tunable range of mechanical properties, high manufacturability, enormous potential for emissions reduction and insights for materials design in kindred systems," said co-lead researcher and University of Sydney Pro-Vice-Chancellor Professor Simon Ringer.

"The critical enabler is the unique distribution of oxygen and iron atoms within and between the alpha-titanium and beta-titanium phases.

"We've engineered a nanoscale gradient of oxygen in the alpha-titanium phase, featuring high-oxygen segments that are strong, and low-oxygen segments that are ductile allowing us to exert control over the local atomic bonding and so mitigate the potential for embrittlement."

Lead author Dr Tingting Song, RMIT Vice-Chancellor's Research Fellow, says the team is "at the start of a major journey, from the proof of our new concepts here, towards industrial applications".

"There are grounds to be excited – 3D printing offers a fundamentally different way of making novel alloys and has distinct advantages over traditional approaches," she said.

"There's a potential opportunity for industry to reuse waste sponge titanium-oxygen-iron alloy, 'out-of-spec' recycled high-oxygen titanium powders or titanium powders made from high-oxygen scrap titanium using our approach."

Co-lead author Dr Zibin Chen, who joined Hong Kong Polytechnic University from the University of Sydney in the later stages

of the collaboration, says the research had broader implications.

"Oxygen embrittlement is a major metallurgical challenge not only for titanium, but also for other important metals such as zirconium, niobium and molybdenum and their alloys," he said.

"Our work may provide a template to mitigate these oxygen embrittlement issues through 3D printing and microstructure design."

Professor Ringer says the team's work benefited from sustained, targeted investment in research infrastructure from national and state governments and from universities.

"In many ways, this work showcases the power of Australia's national collaborative research infrastructure strategy and sets the scene for extending this strategy into the realm of advanced manufacturing," he said.

The Australia Research Council (ARC) through the Discovery Program and the Training Centre in Surface Engineering for Advanced Materials (SEAM) funded and supported this research.

The team acknowledges support from the Australia-US Multidisciplinary University Research Initiative program supported by the Australian Government; The Hong Kong Polytechnic University; the State Key Laboratories in Hong Kong from the Innovation and Technology Commission of the Government; and Hexagon Manufacturing Intelligence for its Simufact DED solution used in the L-DED process design.

The team's research paper, 'Strong and ductile titanium-oxygen-iron alloys by additive manufacturing', is published in *Nature* (DOI: 10.1038/s41586-023-05952-6), also available here: <https://www.nature.com/articles/s41586-023-05952-6>. **AMR**



MORE INTEGRATION. LESS HEADACHES. THAT'S IMPACT!

The use of drones and advanced surveying technology, 3D modeling and blast simulations, and GPS guided drill rigs, are rapidly changing the way companies approach their critical onsite drill and blast activities. Companies are starting to see the massive upside from embracing these types of new technology in an effort to boost productivity and efficiencies in their operations.

In order to achieve a successful blast program, it's critical to identify key geological structures present in the rock mass where blasting will be conducted. This forms an integral part of blast pattern planning and design process from both a safety and efficiency perspective.

There is also the need to minimise any environmental impact on surrounding infrastructure, sensitive landmarks, and local communities. By undertaking detailed surveying, site personnel can optimise blast design parameters based on rock types and their properties, determine the most appropriate drill and blast techniques, identify the initiation sequences to best time a blast, and of course, minimise risk through the implementation of protective safety measures.

For over 30 years, Australia's only fully integrated drilling and blasting company, Impact Drill & Blast (Impact) has been the trusted partner in the mining, quarrying and construction space, helping compa-

nies across Australia successfully complete their drilling and blasting projects.

As an early adopter of technology, it offers a one-stop-shop for rock-on-ground services with an emphasis on using technology to benefit their customers. From surveying, blast design and mark out, to drilling, loading and shotfiring, every step can be followed on Impact's exclusive customer interface platform 'We Manage'.

According to Impact Managing Director, Rui Chen, the company works closely with customers to understand their geology, challenges and desired outcomes, and leverages technology to survey, design, and time the shot to provide the customer with the best blast outcome possible.

"We embrace the latest drone technology to create a detailed 3D map of a mining area, which means the shotfirer can turn the design around more quickly, allowing the drilling and blasting process to progress faster and improve mining cycle times," said Mr Chen.

"Drones are also providing other valuable information for our customers. One Central Queensland operation in particular receives a 3D model of its current pit, benches, broken rock stocks, and processed stockpiles. The volume measurement of the broken rock stock and detail of the mining area gives the customer the opportunity to better plan and improve site efficiency."

Impact's use of technology extends into the design and timing of a blast. The innovative design software 'O-Pitblast' includes 3D-modeling and blast simulation, which enables their design to be analysed and the timing tested, before it is sent to their GPS guided drills. The design software fea-

tures an android application for real-time monitoring by either technical support or the shotfirer. If conditions on the bench have changed, the blast pattern can be modified, and a blast simulation run, prior to implementing changes.

A bore tracking tool is also used as part of the final quality control process before loading, to ensure what has been drilled matches the plan.

The bore tracker provides an accurate image of actual versus design allowing bore-hole deviation information to be loaded into the design software to identify critical burdens in the bench and face holes to improve safety.

Mr Chen highlighted that a strategically designed and executed drill and blast plan, coupled with careful quality control, plays an influential role in solving downstream issues such as dig rates in the pit, wear and tear in the crushing process, and productivity through the plant.

"Impact's use of electronic detonators to control the blast with greater accuracy, has contributed to better fragmentation and blast outcomes for our customers, and has also helped them save time and money.

"By reducing the size of fragmented rock through optimised blasting, asset owners can benefit from increased production throughput, lower maintenance and labour costs, and a significant reduction in wear and tear of their crusher."

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Potential First Fully Integrated Lithium Chemicals Producer in North America



Sayona Mining's North American Lithium (NAL) operation.

A new study on lithium carbonate production at Sayona Mining's (ASX:SYA) North American Lithium (NAL) operation in Quebec, Canada, has confirmed the benefits of moving into downstream processing, showing it would increase the operation's net present value (NPV) to A\$5.4b, on the back of a recent NAL DFS.

Study highlights included an estimated, pre-tax NPV (8% discount) for the stand-alone carbonate plant of A\$3.2b, with a pre-tax IRR of 60%.

Total earnings before interest, tax, depreciation, and amortisation (EBITDA) over the 16-year project life of the carbonate plant amount to A\$7.5b (exchange rate C\$1 = A\$1.10, as at 20 June 2023).

Sayona now plans to advance a definitive study, targeting lithium carbonate production as early as 2026 and making it the only such North American integrated producer.

Production of spodumene concentrate at NAL commenced in March, with the first shipment due in July.

Sayona managing director Brett Lynch said this study shows the outstanding value the company has generated from its

strategy of acquiring a brownfields plant with existing assets.

"With an accelerated pathway to lithium carbonate production, we are rapidly advancing our goal of becoming a fully integrated producer of lithium chemicals," he said.

"Significantly, NAL is set to become the only lithium operation with a concentrator and carbonate plant all on the same site in North America.

"Lithium demand continues to increase and the Canadian and US governments have clearly shown their intentions to develop a North American supply chain, from mining to processing and manufacturing.

"Québec has shown a clear vision of becoming a leader in this new industry, maximising the benefits of its sustainable hydropower, world-class infrastructure and proximity to key battery markets."

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True North Copper Encounters Visible Copper Sulphide Zones At Cloncurry

Recently listed True North Copper (ASX: TNC) has encountered large zones of visible copper sulphide mineralisation near its great Australia resource on its Cloncurry project in Queensland.

An initial two-hole drilling program (totalling 820m) targeted extensions to the existing great Australia resource and potential continuity to the greater Australian target.

Drilling of the two holes identified large zones of visible copper sulphide mineralisation.

Hole GAD014 detected about 180 metres of consistent mineralisation and multiple zones of chalcopyrite mineralisation while hole GAD015 encountered multiple zones of chalcopyrite mineralisation.

True North Copper managing director Marty Costello said drilling was undertaken

to gain a better understanding of the greater Australian target.

"Our recent great Australia resource drilling program was undertaken to help us understand how we would undertake potential extension of the great Australia resource towards the greater Australian target," he said.

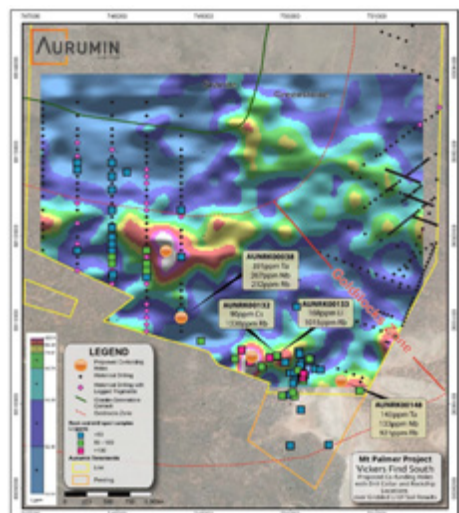
"We have recently completed an induced polarisation (IP) survey of the greater Australian target area. We believe IP is an effective tool for targeting potential copper mineralisation.

"We remain excited about the exploration potential at the great Australia resource especially considering that historical drilling has been limited and shallow."

Samples have been sent to ALS Global Laboratory for analysis and results are pending. **AMR**



(Image source: True North Copper) Snapshot of two True North workers.



(Image source: Aurumin Limited). Proposed lithium targeting drillhole collar locations. Ultrafine soil sample lithium results and other samples.

JULY 2023 AMR

AURUMIN TARGETS LITHIUM-BEARING PEGMATITES WITH DRILLING START AT MT PALMER LITHIUM PROJECT

Aurumin Limited (ASX: AUN) will begin drilling at its 100%-owned Mt Palmer project, 40km southeast of Southern Cross, WA, targeting lithium-bearing pegmatites from the week beginning July 3.

Drilling is targeting geology analogous to the Mt Holland lithium deposit about 65km to the south, with four diamond core drill holes to be drilled vertically, to a nominal depth of 250m each, to test for interpreted broad flat lying pegmatites.

The planned drilling covers targets identified from geochemical multielement

soil anomalism with lithium results up to 146ppm and resampled (historical) drill spoils returning tantalum results up to 391ppm.

Aurumin managing director Brad Valiukas says Mt Palmer is prospective for lithium mineralisation.

"[It] shows great potential, remaining unfished business for the company since we announced results from orientation drilling in June last year," he said.

"We are excited to be drilling these holes and look forward to the results.

"We will complete this drilling before the team moves to Sandstone.

"The EIS funding is a competitive process and excellent recognition of the lithium potential at Mt Palmer and the work completed to date."

Aurumin can claim up to 50% of direct drilling and mobilisation costs up to \$150,000 through the Exploration Incentive Scheme (EIS) funding agreement, a WA Department of Mines, Industry Regulation and Safety (WA DMIRS) initiative to encourage exploration in the State. **AMR**

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FEDERAL GOVERNMENT ESTABLISHES THREE NEW JOBS AND SKILLS COUNCILS

The Federal Government has established three new Jobs and Skills Councils (JSC) to help address skill shortages and broader workforce challenges.

Industry-owned and led, JSCs are being established to provide industries with a firmer and more strategic voice in ensuring Australia's VET sector delivers stronger outcomes for learners and employers.

The JSCs will identify skills and workforce needs for the sector, map career pathways, develop contemporary VET training products and support the collaboration between industry and training providers to improve training and assessment.

JSCs have a strong connection with Jobs and Skills Australia (JSA) to align workforce planning for their sectors.

The new JSCs cover the transport and logistics, manufacturing and mining and automotive sectors.

The Manufacturing Industry Skills Alliance will work to enable modern manufacturing and associated industries get the right workers with the right skills to ensure Australia's manufacturing sector continues to grow through advanced manufacturing and innovation.

Under the Transport and Logistics JSC, Industry Skills Australia will bring employer

and union leaders from the transport and logistics industries to support workforce planning and skills needs for Australia's supply chain sectors.

The Mining and Automotive Skills Alliance will work with employers and unions to address workforce challenges and skill gaps in industries critical to the country's economic and environmental future.

Federal Skills and Training Minister Brendan O'Connor says JSCs, like Manufacturing Industry Skills Alliance, will help inform and advise both tertiary sectors about the existing and emerging skills needs of our economy.

(Image source: Minister O'Connor's office) Federal Skills and Training Minister Brendan O'Connor (centre) with students in FMG's Vocational Training and Employment Centre program.

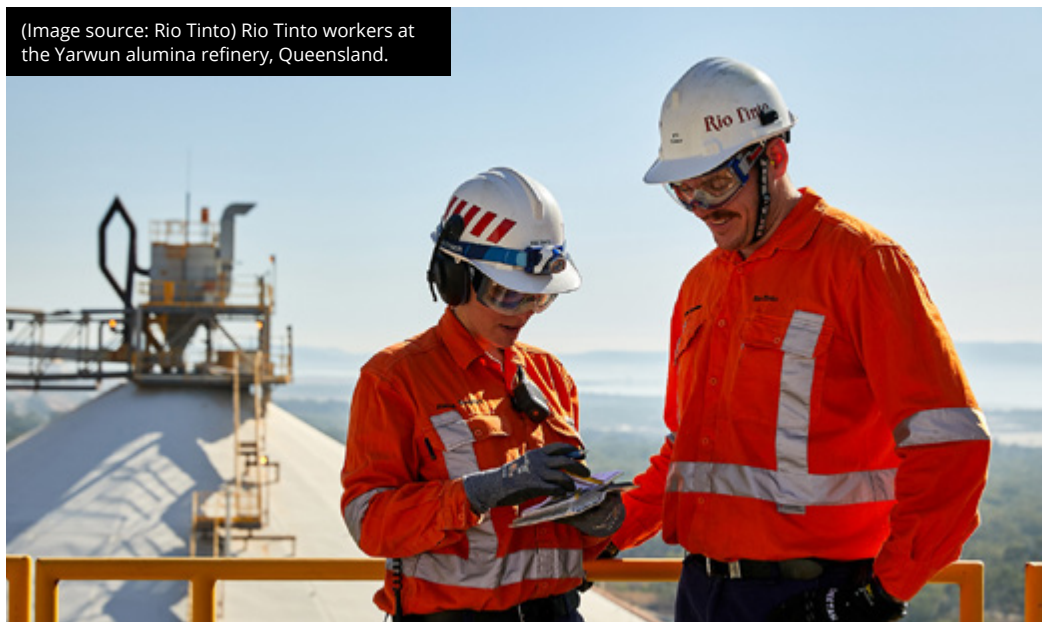


"These new JSCs will act as a source of intelligence on issues affecting their industries and provide valuable leadership and advice in addressing skills and workforce challenges," he said.

"JSCs are crucial in making sure industry has the right workers and students are getting opportunities to get a decent, secure job and have a fulfilling life."

Further JSCs are in the process of being established with \$442m set to be invested over the next four years to establish 10 Jobs and Skills Councils. **AMR**

(Image source: Rio Tinto) Rio Tinto workers at the Yarwun alumina refinery, Queensland.



EXPRESSIONS OF INTEREST

ARE OPEN FOR RIO TINTO'S 2024 GRADUATE AND 2023 VACATION PROGRAMS

If you want to drive change from the inside out, expressions of interest are open for Rio Tinto's (ASX:RIO) 2024 graduate program and the 2023 vacation program.

The mining giant is looking for graduates and students from a range of degrees including engineering, geo and environmental science, business, humanities, data science, robotics, computing and software.

To be eligible for the 2024 graduate program, candidates must be in their final year of study or must have recently graduated with a relevant university degree and have less than two years of appropriate work experience.

The vacation program is open to students in their second, third or penultimate year of study and those enrolled in a related university program. Further, they must be returning to university after the program has ended.

Registrations for both programs close in three months on August 31, 2023.

Program overview

Year one of the program will see graduates focus on the strategy, behaviour and value of Rio Tinto and build relationships and network with teammates, technical experts and leaders.

Graduates will receive one-on-one coaching and work with an experienced external coach and receive practical support and tools to achieve personal and career goals.

Through grad talks, hear first-hand from leaders about their own experiences at Rio Tinto and see strategy, values and projects in action.

Game-based learning allows graduates to practice the skills leaders use everyday and as part of a simulation, lead a virtual team, set objectives and provide feedback.

Hear from subject matter experts across the company as they deliver key disciplines including automation, orebody knowledge, tailings, processing and water.

In year two, graduates will focus on collaborating with others, innovating, sharing with others and developing new ways of working.

They will create solutions to real-life challenges based on the United Nations' 17 sustainable development goals and develop creative problem-solving skills.

Future skills masterclasses allow the graduates to work with external experts and learn new tools, strategies and methodologies and then put these skills into action as part of the innovation project.

Work in a team to propose solutions to change the way work is undertaken — both now and in the future — then pitch

the final innovation project to a panel of internal senior leaders and experts.

Some ideas could even be adopted by the business.

Application process

When applying, applicants will be asked to complete a few questions before submitting their application and undergo assessments that are designed to help the company work out who is right for the role.

Following this, an interview will take place where candidates will get to tell the recruitment team a bit about themselves, talk about the role and ask any questions they may have about the company.

Successful applicants will need to complete a few checks including a background and security check, and once all have been completed, will be able to start working.

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The Komatsu Training Academy building in Perth, WA.

STATE-OF-THE-ART TRAINING ACADEMY FOR KOMATSU

Future tradies can develop their skills at Komatsu's new \$6m state-of-the-art training academy in Welshpool, WA, after the company doubled its annual investment in training to \$12m

Construction of the recently completed Perth training academy includes advanced workshop training rooms, a 30t crane heavy lifting bay and labs dedicated to hydraulics and electronics.

Komatsu regional general manager Glenn Swift says the purpose-built facility is Komatsu's response to a critical skills shortage, particularly in WA's resource sector.

"Skills and labour shortages are a significant challenge for the resource sector," he said.

"We need to invest in training and upskilling programs to ensure that our workforce is equipped with the necessary skills to meet the demand for these industries".

Komatsu's training centre offers both apprentice and post-trade technical training in mining and construction industry jobs with a focus on diesel mechanics, auto electricians and fabricators.

Company research shows upon completion of Komatsu's award-winning apprenticeship program, Komatsu's customer facing people will be approximately one year ahead of an equivalent conventionally trained apprentice who has completed an apprenticeship outside of this system.

This is due to Komatsu's futuristic and innovative training methods incorporating VR/AR and its team of highly proficient educators.

Komatsu also recognises the importance of equipping apprentices with important life skills, such as mental health aware-



A Komatsu Training Academy trainer with a couple of apprentices.

ness, public speaking, road safety and fatigue management, drug and alcohol awareness and a variety of business skill-sets.

In addition, Komatsu maintains an 84% retention rate, far exceeding industry standards by up to 30 percent.

Komatsu general manager training and capability Janine Gurney says apprentices gain experience in next-generation technology including telemetry and driverless trucks as well as learning essential life skills.

"It's about fitting into the broader company culture where we focus on safety, community, career progression and access to the latest technology," she said.

"Our aim is that the apprenticeship is the first step in a lifelong career with."

Komatsu 2024 Apprentice Intake Opens in July This Year

Ms Gurney says the company aims to train 600 apprentices by 2025.

Women filled nearly half of the 2023 intake of 75 places. The 2024 intake will open in July.

Ms Gurney says Komatsu is a pioneer of



Komatsu and Toyota Motor Corporation have announced a partnership to develop an autonomous light vehicle to run on Komatsu's autonomous haulage system (AHS).

autonomous haulage systems, and a leader in Smart Construction via integrated technology as it builds a workforce of the future.

"We want to help ordinary operators become fantastic operators so that when they are cutting or digging trenches for example, their precision is to the exact millimetre and a lot of our current technology does this for them," she said.

Komatsu-Toyota Partnership on Autonomous Light Vehicle for Mine Sites

Komatsu and Toyota Motor Corporation announced a partnership in mid-May 2023 to develop an autonomous light vehicle to run on Komatsu's autonomous haulage system (AHS) for enhanced safety and productivity improvements in mines.

Haulage trucks using an AHS are already in use in mine sites but the equipment may decrease their speed or stop when passing manual light vehicles to avoid potential collision caused by human error.

This impacts overall productivity in mines, leading to Komatsu and Toyota addressing this challenge in a joint project.

Under the agreement, Komatsu will develop a new management program for

autonomous light vehicles (ALVs) on its autonomous haulage supervisory system (AHS) and Toyota will develop ALVs running automatically under AHS control.

Both companies are currently testing a concept autonomous light vehicle at their proving grounds and plan to have a proof-of-concept at a customer site by January 2024.

Komatsu Australia executive general manager mining Leo Kaloglou says since the launch of the world's first commercial application of an autonomous haulage system in Australia in 2008, Komatsu has been known for pioneering autonomous trucks, with a focus on safety and productivity.

"Since 2008, we've have rolled out 650 driverless trucks at 22 mine sites around the world," he said.

"Our AHS has a proven track record in delivering enhanced productivity and lower operating costs, with safety as the highest priority."

Komatsu Australia managing director Sean Taylor says Komatsu and Toyota have a long, strategic, global relationship and this project is another example of this collaboration delivering value to joint customers.

"Komatsu and Toyota are also collaborating on hydrogen fuel cell technologies to be featured on medium sized hydraulic excavators, which will support our journey towards a 50% reduction in CO₂ emissions by 2030 and net zero by 2050," he said.

"Komatsu's vision is to empower a sustainable future where people, businesses and planet thrive together and we are accelerating our efforts to realise smart and clean future mine sites, leading to higher safety and productivity for our customer and partners." **AMR**



MFB'S S280 RANGE BUILT TO LAST

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The S280 split rack in the image is a fully welded enclosure allowing users to separate key pieces of equipment and in doing so allows freedom to separate potentially hazardous batteries and electrical components. This application was specifically built for mining. It included such features as a stainless steel weather hood to protect from fallen debris and allow runoff for any liquid. Percussion vents were also built into the racks design to assist in compensating for mining conditions. Other features include a fire extinguisher, galvanized plinth, shock mounts and lifting eyes.

The S280 (19") Data Enclosures are built around the IEC 60297 19" racking format for data and electrical equipment. MFB's range of standard S280 outdoor enclosures offer a variety of heights measured in rack units (RU) Widths typically 600mm wide or 800mm wide and a variety of depths.

Fully welded enclosures provide greater IP (Ingress Protection) attributes. MFB'S S280 range conforms to AS 60529:2004 Degrees of Protection provided by an enclosure. As a minimum they meet IP54, where 5 = dust protected, limited ingress; and 4 = protected against water splashed from all directions, limited ingress.

MFB S280 enclosures can also meet IP66 if needed, where 6 = dust tight, 6 = water from heavy seas or water projected shall not enter the enclosure. Contact our experienced sales members to work out what IP rating you need and any further questions you have about the S280 range.

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WOMEN IN MINING AND RESOURCES SUMMIT 2023

Back for its fifth consecutive year on July 25th and 26th at The Westin Perth, the Minerals Council of Australia (MCA) has partnered with the Women in Mining and Resources Summit for the annual event.

Driven by industry leaders, the summit aims to create a future in mining that attracts and retains diversity, allowing leaders to thrive and prioritise their psychological health.

The theme this year is Step Up & Speak Out and the focus on psychological health is broadened in response to the 'Enough is Enough' parliamentary report on sexual harassment, acknowledging that the current approach is at an unacceptable standard.

With this year's partner being Full Stop Australia, 10% of event proceeds will be donated to the organisation which aims to put a stop to sexual, domestic and family

violence through support, advocacy and education.

Events

A series of sessions have been curated to both celebrate the effort and achievement of individuals and organisations whilst simultaneously addressing challenges within the industry.

WA Finance, Commerce and Women's Interests Minister Sue Ellery and WA Mines, Petroleum, Energy, Hydrogen Industry and Industrial Relations Minister Bill Johnston will address industry progress to the 'Enough is Enough' report, workplace culture and sector diversity, health and safety.

Mineral Resources, OZ Minerals and MATES in Mining will share why psycho-

logical safety must be prioritised across all levels of the organisation.

Chief executives from industry heavy weights including Thiess, Roy Hill and Peak Minerals will share latest initiatives and what more can be done to best use the leadership of women to advance industry change.

New for 2023, scenario-based roundtables have been introduced where common scenarios are presented and solutions are brainstormed.

Not just for women, bring along a male or non-binary ally to the 'improving workplace culture through open discussions' block of sessions. **AMR**

Mining employees the forgotten workforce in suicide research

Mining workers are often overlooked in Australian suicide research, according to the report *Suicide in the Australian Mining Industry: A National Study* by the University of Melbourne's School of Population and Global Health.

The paper, commissioned by suicide prevention body MATES in Construction, Mining and Energy, is the first to look into rates of suicide within the mining sector and was launched in early June by Federal Member for Hunter Dan Repacholi, on behalf of Federal Resources Minister Madeleine King at Glencore's Ravensworth operation in the Hunter Valley, NSW.

Study author Associate Professor Tania King says the report estimates that suicide rates among mining workers is between 11 and 25 per 100,000 – and probably closer to 25 per 100,000 – with the report also suggesting rates of suicide among male mining workers may be increasing, while suicide rates for males across most other workplaces categories show some decline.

Federal Resources Minister Madeleine

King says mining workers are "very often the forgotten people in Australian suicide research".

"Coming from WA, I know many mining workers," Minister King said.

"I've heard these stories first hand – the isolation of being at camp and away from family, shift work meaning you miss important family events and public holidays.

"Of course this would impact your mental health.

"We need more research to better identify suicide trends and possible causes.

"The more data we can gather, the more we can determine the types of support that might be needed for this workforce."

MATES national chief executive Chris Lockwood recognises the increased risk of suicide for those working in mining and has put a call out to the broader mining industry to tackle this problem collaboratively.

"We understand that suicide is a problem that is impacting too heavily on those

working in the mining industry, their families and regional communities," he said.

"This report confirms the vital importance of all of us working together as an industry to step forward and look after all of our MATES working in mining.

"One of the problems highlighted by this research was the classification of workplace by the coronial system, with mining, as one of Australia's most important industries, lacking access to the full detail regarding the impact on the well-being of its workers.

Mr Lockwood calls for detailed information on specific industries to be routinely collected in coronial data to "enable the rigorous assessment of industry as well as occupational patterning of suicide."

To address these concerns MATES in Mining, with the support of leading mining companies such as Glencore, have implemented their workplace-based peer support and training programs recognised as world's best practice by the World Health Organisation.

Glencore Coal director of health, safety and training Kylie Ah Wong says partnerships such as this foster a supportive culture, raising awareness and encouraging open conversations about suicide and mental health within the mining industry.

"When someone is struggling with their mental health it can be challenging to seek help," she said.

"This partnership is about training our workforce to identify behavioural changes in their mates so we can offer support when it's needed most.

"Our employees look out for one another's safety every shift, and that sense of camaraderie is deeply embedded in the mining industry.

"It makes sense to use that same approach when it comes to looking out for the mental health and wellbeing of our workmates."

For help, contact MATES 24/7 help line on 1300 642 111 or mates.org.au.

AMR

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26th WORLD MINING CONGRESS

To Be Held in Brisbane in
First Ever Australian Event

26 - 29 JUNE 2023

For the first time in over sixty years one of the world's most prestigious international mining events will be held in Australia for the first time and will feature a host of international representatives from some of the world's leading resource economies who will meet to discuss the very latest research, technologies, challenges and innovations in the resources sector.

The 26th World Mining Congress (WMC) will be held in Brisbane at the City's Convention and Exhibition Centre from Monday 26 - 29 June 2023 and is being presented by Australia's national science agency, the

CSIRO, and supported by government, industry, and academia.

Inaugurated and first held in Poland in 1958, the congress has set the scene for international agreements and high-level discussions that have influenced mining practices and the resource industry globally for decades.

The normally triennial event, which has been held in a slew of eastern European capitals since its inception, alongside countries such as the UK, US, Mexico, India, Peru, Sweden, Canada, Brazil and China, was last held in Kazakhstan in 2018 and is returning this year after a COVID-19 induced delay.

The program includes 15 plenary speakers and over 300 technical discussions segmented through 13 core streams and three symposiums.

A total of 15,000m² of exhibition space will welcome a wide range of national and international exhibitors and the event will attract around 3000 delegates from almost seventy countries worldwide.

The overarching theme of this year's first ever Australian congress is *Resourcing Tomorrow: Creating Value for Society* and will examine the world's future economic and social dependence on resources and consider issues like environmental sustainability, climate change, digital transformation, disruptive technologies, and future workforces.

Event organisers say that themes will be addressed in plenary and concurrent ses-

sions, special interest group meetings, workshops and discussion panels.

The focus is on active participation, giving attendees opportunities to present and participate in important discussions on the major current and future issues and challenges facing mining and resources across the globe.

This structure will allow delegates to take 'deep dives' into the latest developments and new research in these specific areas. These parallel streams will be interspersed with joint-stream and plenary sessions where delegates come together to explore nexus issues.

The Congress will explain and explore how technology is transforming the sustainable production of minerals and fuels creating value that continues to lift significant segments of the world's population out of poverty and contributes in an essential manner to an improved way of life.

Discussion streams being presented at the Congress include:

- Artificial Intelligence
- Critical Minerals
- Environmental Sustainability
- Geosciences and Discovery
- Mining, Science and Engineering
- Processing and Refining
- Technology and Operations
- Autonomous Systems
- Decarbonisation
- Future Workforce and Education
- Health, Safety and Wellbeing
- New Mining Frontiers
- Social Performance and Governance.

Three pre-congress symposiums will commence on Monday and include a wide range of discussions with thought leaders

on Mine Closure and Post Mining Transitions, Sustainable Construction Materials and Minerals Policy and Governance for the New Economy.

The Sustainable Constructions symposia will continue on the Tuesday and Wednesday and the Minerals Policy and Governance for the New Economy symposia concluding on the Tuesday.

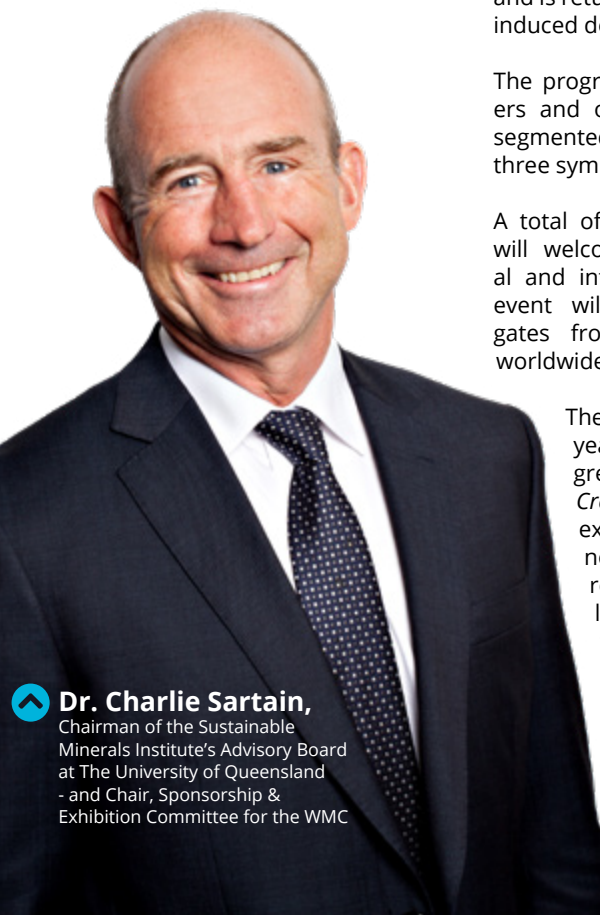
Event organisers say that day registration, rather than booking for the full three-day program may now be possible and that attendees from across the globe who are unable to make the event can register for virtual attendance where videos of each session will be posted and made available online for up to six months post the congress.

Attendees at the event will also be able to access the online video sessions so that presentations missed on any given day can be viewed at a later time.

For more information, to view the full congress program and to register as an attendee or virtual attendee go to: wmc2023.org

Exclusive Interview with Dr. Charlie Sartain and Emeritus Professor Mike Hood from the WMC 2023 Australian National Organising Committee.

In what has been a two-year labour of love for the WMC 2023 board and certainly for Dr Charlie Sartain - Chairman of the Sustainable Minerals Institute's Advisory Board at The University of Queensland - and Chair, Sponsorship & Exhibition Committee for the WMC, bringing the event to Australia with all its complexity for the first time has been both an enormous task yet one that brings with it considerable satisfaction.



Dr. Charlie Sartain,
Chairman of the Sustainable Minerals Institute's Advisory Board at The University of Queensland - and Chair, Sponsorship & Exhibition Committee for the WMC



Despite Australia's significant mining sector and the fact that some of the world's biggest mining companies are headquartered here, it may come as a surprise to some that this is the first time the WMC has been held in the country.

And to some extent it remains an enigma.

"It is one of the really remarkable things that when I was invited to join the committee a couple of years ago it was unbelievable that it had never been held in Australia, given Australia's role and profile in the mining industry," Dr. Sartain acknowledged.

"So, Dr. Hua Guo, the congress chair and research director for sustainable mining technologies at the CSIRO was personally instrumental in the decision to host the event in Australia alongside the CSIRO which has also been very helpful."

Professor Mike Hood, a former tenured academic at UC, Berkeley and Emeritus Professor at the University of Queensland's School of Mechanical and Mining Engineering and Chair of the program committee for the WMC agrees.

"It is amazing actually that the congress has been running since the 1950's and this is the first time it has been held in Australia," he said.

"Dr. Hua Guo has been going to these congress meetings for the last ten or so years and he lobbied on behalf of the CSIRO for it to come to Australia with the CSIRO as the host, and was (fortunately) successful."

And what shape will the event take for its first time in Australia?

"This year's program is quite complex because we have got plenaries on each day from a range of speakers and thirteen different streams or topic areas so I set up a committee for each of those streams," Professor Hood added.

"In addition, we have three symposiums running on the day before the congress starts that allow us to delve into more detail that we can in a conference."

According to Dr. Sartain, because it is the first time the congress has come to Australia it has given the organising committee

the opportunity to broaden the scope of the congress and to gain some traction in terms of interest amongst the major mining and mining services companies, not just in Australia but at the global level.

"Close to seventy different countries will be represented at the event and around 3000 delegates", he said.

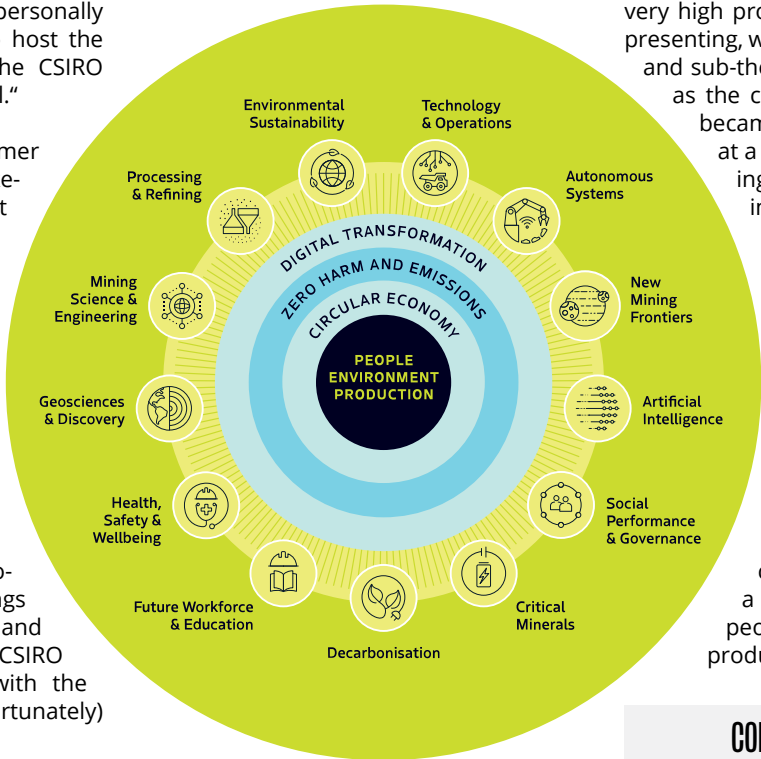
"It is such a broad cross section of global representation and the other feature of it is the range of sponsors attracted to the event which is indicative of the level of interest and the role they want to play at the congress.

"One of the things we were looking to do with the plenary speeches, where we have very high profile and high impact people presenting, was to deliberately set themes and sub-themes for each given day and as the congress planning evolved, it became evident that it is occurring at a time of a rapidly decarbonising world and it is about creating value for society and delivering against sustainability goals.

"A congress like this can talk about these issues from a global perspective."

Congress Themes

With the astonishing breadth and scope of topics being discussed at the congress, it is the theme of a circular economy that puts people, the environment and production at its centre, while



CONTINUED ON PAGE 26



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incorporating zero harm and emissions, including harnessing the power of digital transformation, that lies at the heart of all the varying streams of discussion.

Decarbonisation of not just the mining sector, but also society more broadly will feature and the role that mining can play will be analysed.

"The world is at a transition point as companies commit to net zero targets and the world is going to change in a big way in terms of energy production so we have a speaker from the international energy agency for example who will talk about the vast increases in metal and minerals

needed to build the wind turbines and solar plants etc," Professor Hood said.

"Questions we are going to ask include: where is this stuff going to come from and what does it mean to build sustainable mines that benefit society as a whole and not just mining communities?"

Symposiums

A range of symposia are being held commencing from Monday which will provide a range of fascinating deep-dive discussions.

The Minerals Policy and Governance for the New Economy symposium will look at the relationship between government and industry and seek to make it a closer one in order to improve access to critical minerals.

According to Professor Hood, the International Energy Agency has made the point that the world needs five times more copper than is presently being produced and new deposits are yet to be found.

"It generally takes between five to ten years to locate a deposit, another five years or so to get from permit to production and by this time it could be mid-century if the traditional (exploration and governance) path is followed," he said.

"So there needs to be a much tighter relationship between government and industry to

be able to accelerate that permit process, which also incorporates the discovery process via new technology, but done in a sustainable way."

Another symposium, titled Sustainable Construction Materials will look at sustainable construction commodities with a focus on producing the sand and gravel needed for cement construction.

Because the deposits for both sand and gravel are depleted, and the demand for cement particularly in developing countries continues to rise, the need for how production can meet these needs will be explored.

According to Dr. Sartain, this intersects with economic opportunity and sustainability aims.

"This is where we can see the influence of sustainable development goals coming in and, in order to do that in developing countries, there is a huge potential for small to medium sized enterprises to bring themselves and their communities out of poverty and be part of the economy delivering sustainable construction," he said.

A third symposium, titled Mine Closure and Post Mining Transitions, will look at rehabilitation from an indigenous perspective, how to absorb mine site closures into the idea of the circular economy and the regulatory policies which might enable it.

"It heavily engages with indigenous communities but also looks at areas like the Bowen Basin and the Hunter Valley and as we transition away from coal and eventually gas, these mining areas are going to

close and what are we going to do with them?" Professor Hood said.

"We don't want to see the similar examples that we saw in the UK, where I come from, where they (government and industry) just closed the coal mines down and forgot about them which resulted in severe social destruction for decades after the Thatcher area.

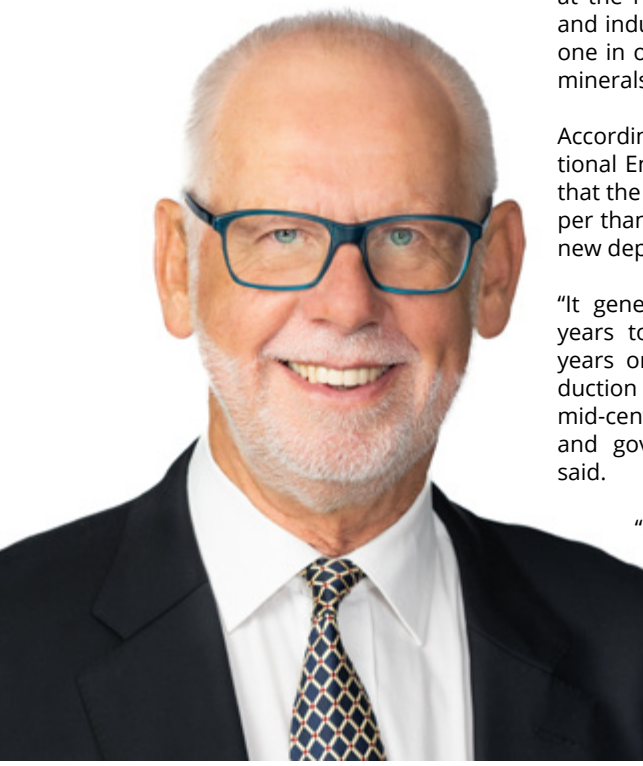
"You can do it much better when you plan ahead for closure and incorporate questions such as: what are we going to do with the workforce? what new industries can we produce in those areas, etc?"

"There are possibilities to open up discussions with authorities and regulators on the potential further uses of the land post-closure, so that it is not necessarily closing and shutting the gate and locking it away, but looking at ways to integrate activities within the circular economy", Dr Sartain added.

"For example, there is potential for the waste products from mine sites to be either used for alternative construction materials in building or construction or to further utilise the materials via new technologies to extract minerals, including critical minerals to further into the renewable economy.

"These are the sorts of concepts being discussed in various countries around the world and this is the type of congress and symposium where you can talk openly about that.

"When you have government representatives from around the world attending a symposium such as this it may result in changes to policy as well." **AMR**



◀ **Professor Mike Hood,**
University of Queensland's
School of Mechanical and Mining
Engineering and Chair of the
program committee for the WMC



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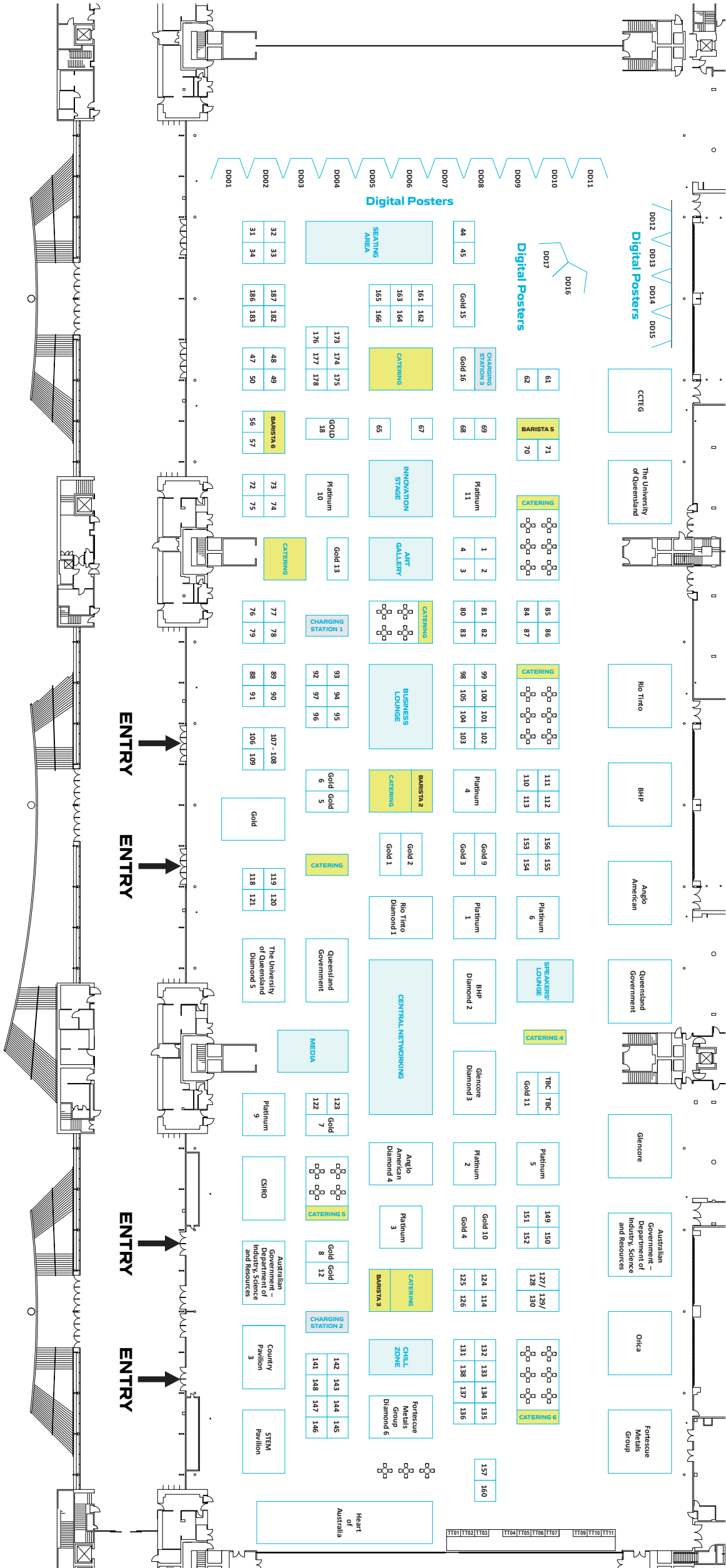
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Delta Electronics unveils a complete eco-system for sustainable mining



DAVID LEAL

DELTA ELECTRONICS AUSTRALIA COUNTRY MANAGER

For the first time in its history, the 26th World Mining Congress is coming to Australia, and with it, the chance for the industry to come together, share ideas and support increased innovation.

At this year's global event in Brisbane, now more than ever in the Congress's 60-year history, the focus is firmly on the future of the planet, and mining's role in sustainability.

Like all industrial sectors, mining has a responsibility to reduce the world's carbon footprint; however, uniquely, it is also responsible for providing much of the raw materials needed to manufacture next-generation clean tech.

While the output of mining is critical, so too is a mine site's throughput; that is, its ability to harness the power of renewable energy to reduce its environmental impact during normal operations.

As a global technology leader, Delta Electronics Australia will be showcasing its ground-breaking 'Pit-to-Port' holistic telecommunications, energy management,

distribution and charging ecosystem: one of the first of its kind, and in keeping with the company's brand promise of doing things "Smarter. Greener. Together."

The ecosystem plots a course for a more sustainable mine site: one that reduces its carbon footprint while at the same time prioritising people, production and processes.

Delta's ecosystem addresses the community aspects of the mine site by providing the technology to power and manage staff electro-mobility, offices, workstations and accommodation, the optimisation of the mine's operation by supporting automated electric vehicles and the transportation and shipping of mined materials.

To maximise operations, mine sites need to communicate, process, store and manage increasingly large amounts of data, much of it on-site.

Miners that are able to rapidly deploy agile and flexible modular data centre technologies will gain performance benefits in speed, reliability and security throughout their operations.

With over 150MW deployed in Australia, Delta combines the right technology, experience, knowledge and supply chain expertise to support miners in managing their data centre needs.

Delta Electronics Australia Country Manager, Mr David Leal, was proud to be showcasing the future of mining technology for the first time in his own backyard.

"I'm delighted that Delta is part of the World Mining Congress, here at home for the first time ever, and that we get the chance to share with the industry a future-proof solution for sustainable mining," Mr. Leal said.

"Mining is an undeniable part of modern Australia. Whether it's through the supply of core materials used in modern technology, creating Australian jobs or supporting the global economy, Australia has the opportunity to lead the way in mining optimisation and innovation," he continued.

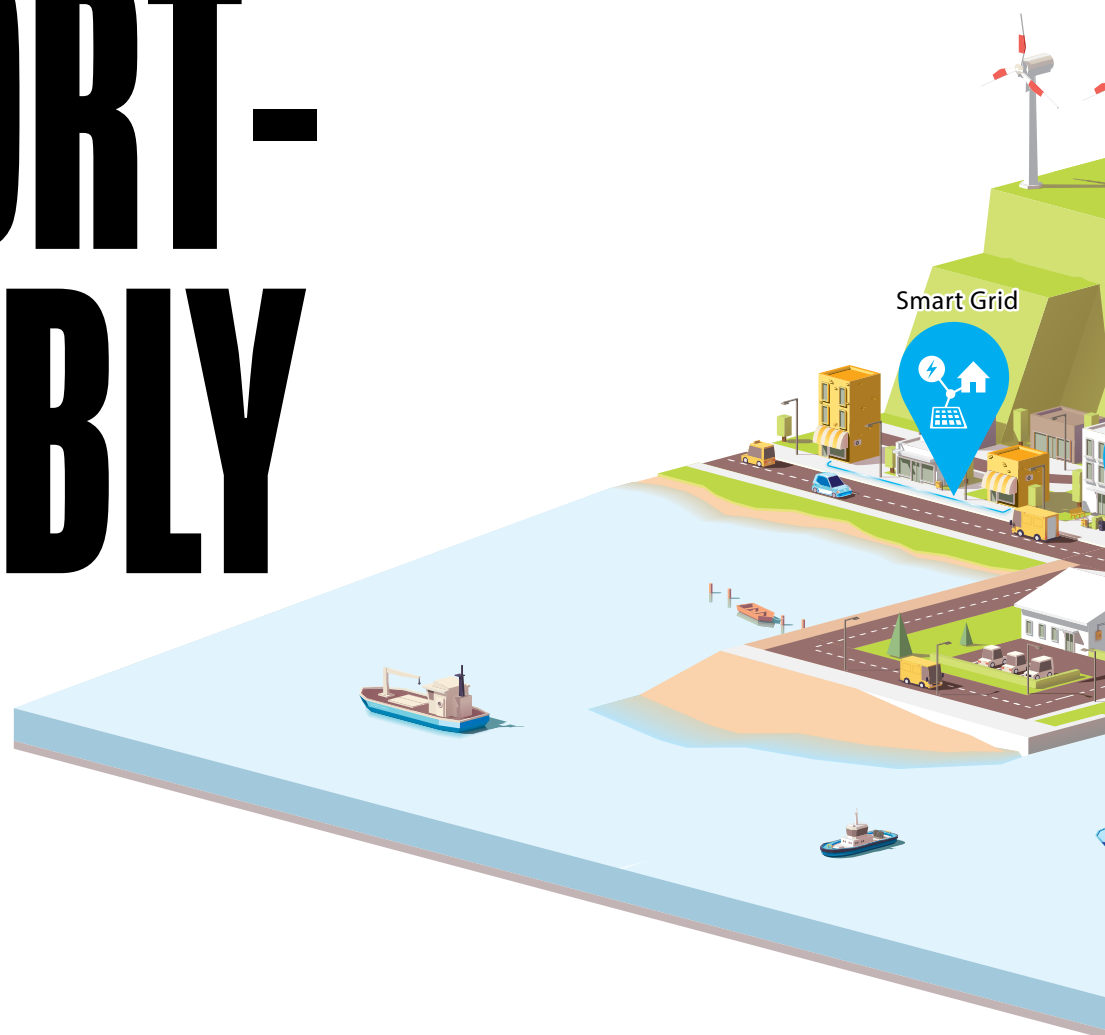
Delta's presence at the World Mining Congress will demonstrate the Pit-to-Port ecosystem to attendees, who can also learn more about Delta's complete range of energy storage, management, charging, telecommunications and data centre technologies.

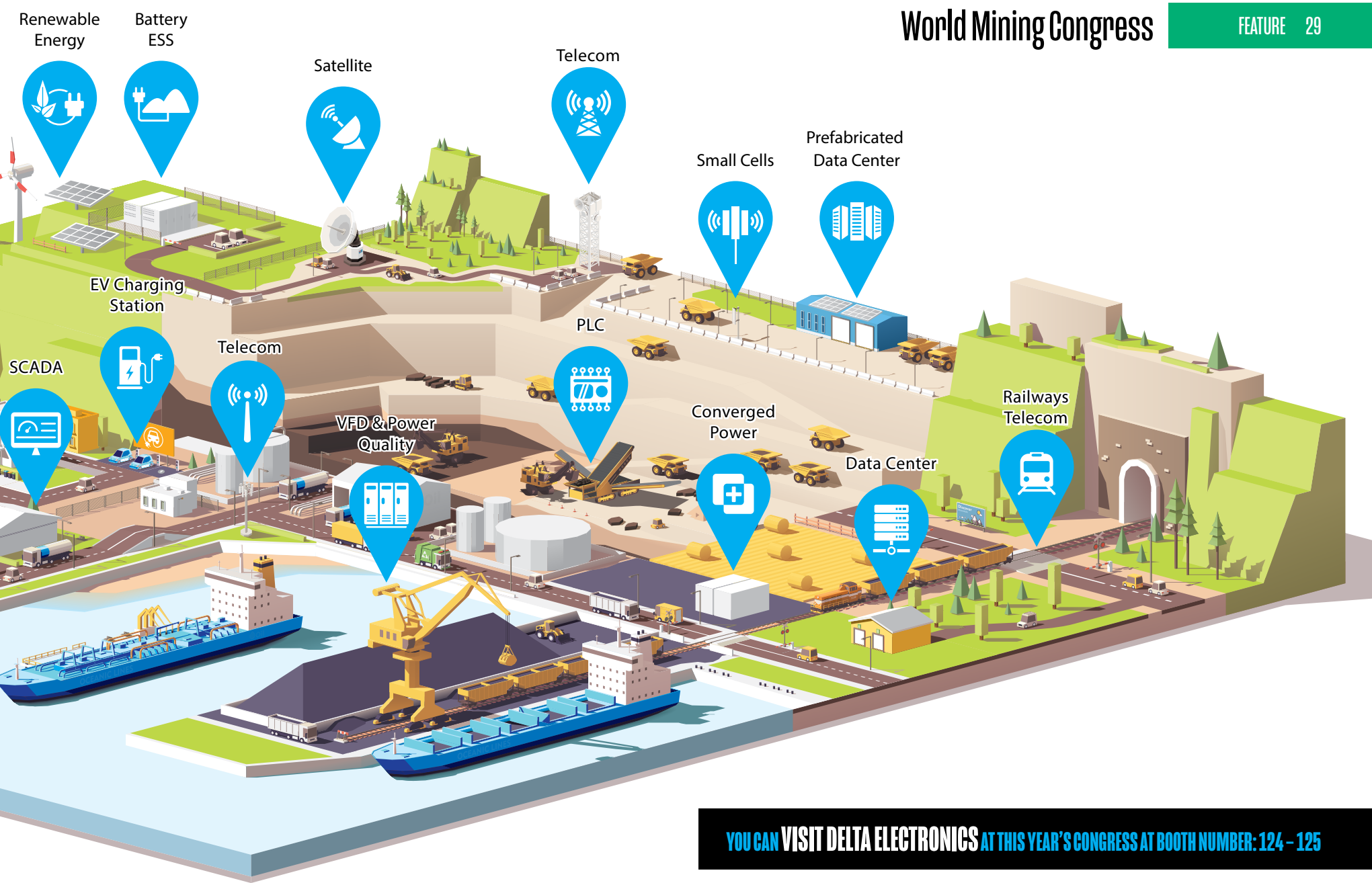
As a Delta Group company, Delta Aus-

tralia is committed to its mission statement "To provide innovative, clean and energy-efficient solutions for a better tomorrow".

Delta's business categories include Power Electronics, Automation and Infrastructure and is rapidly growing into solutions for Renewable Energy, Industrial Automation, Power Quality, Display and Control Room, Mission Critical Infrastructure, Electric Vehicle Charging and Energy Storage.

Delta Australia is committed to providing smarter products with high efficiency, helping to create a greener, more environment-friendly way of life.





YOU CAN VISIT DELTA ELECTRONICS AT THIS YEAR'S CONGRESS AT BOOTH NUMBER: 124 - 125

IN DETAIL: PIT-TO-PORT ECOSYSTEM EXPLAINED

Delta's vision for the future of mining is no-better illustrated than in its Pit-to-Port concept; an end-to-end ecosystem that provides mine operators with the energy to keep the site running: storing and managing the energy it collects from the environment, charging electric vehicles, storing data and information, and managing site telecommunications, all in one.

ENERGY COLLECTION, MANAGEMENT & DISTRIBUTION

Delta's ecosystem gives mine sites the ability to produce energy through solar and wind turbines, store it safely and manage it through its Power Conditioning

Systems (PCS). Delta was one of the first companies in the world to certify its PCS range to Australian standards.

Electric vehicles (EV) are fast becoming a vital tool on mine sites. Delta's range of electric vehicle chargers encompasses the full gamut of AC and DC charging solutions that can be deployed for various EV charging applications on-site.

Delta's EV charging management system, DeltaGrid, provides a cloud-based platform for EV charging stations, and features smart energy management functions to manage the available energy from the grid and integrating with energy storage and solar energy systems for power regulation.

Delta remains a preferred provider for many private, corporate and industrial customers, having already supplied more than 2,000,000 chargers globally.

TELECOMMUNICATIONS & DATA CENTRE SOLUTIONS

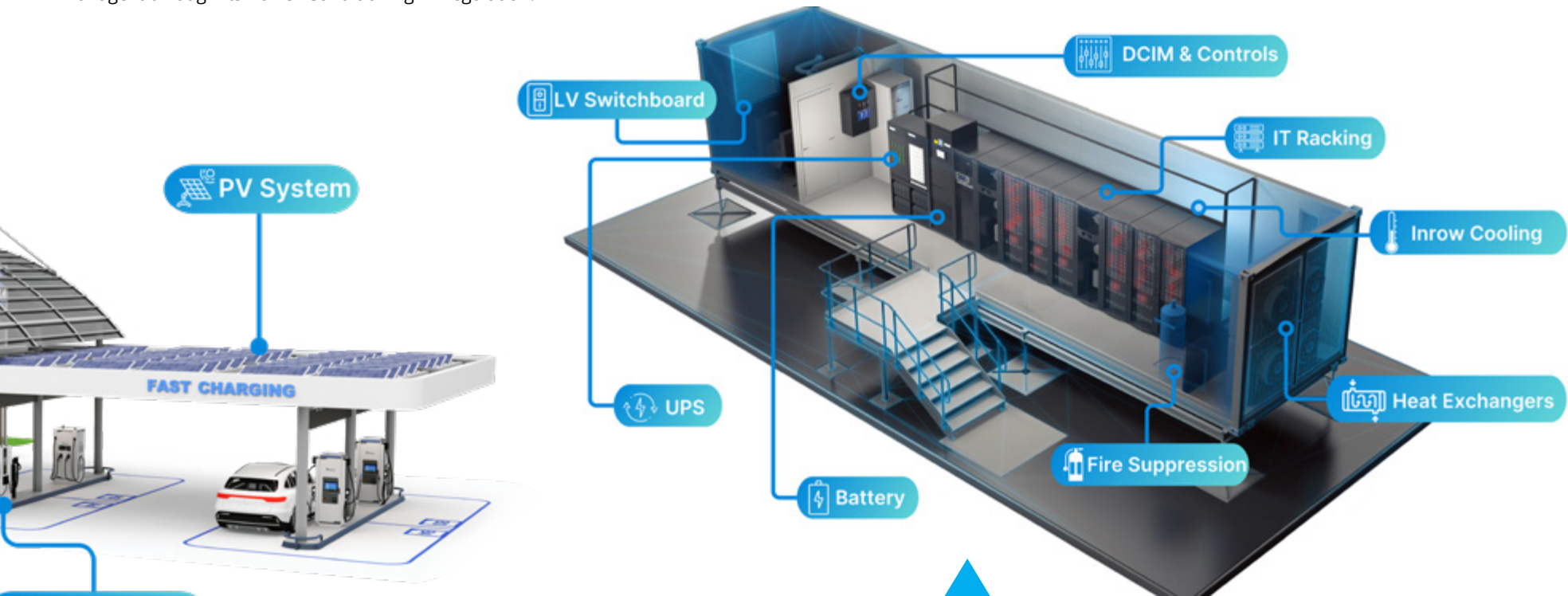
As one of the leading providers of telecommunications and data centre technology, Delta Electronic's ecosystem also benefits from class-leading, rapidly deployable data centre solutions able to power the most sophisticated and remote mine sites.

From small scale to hyper scale; Delta offers customised data centre solutions for every mine site's needs.

Delta is also a Telecom Power Solutions provider for many of the world's major operators and has dominated the Australian landscape for twenty years under the Eltek brand.

Its power management solutions incorporate the control, management and cooling systems to facilitate energy savings for Base Transceiver Stations (BTS).

Where power is unreliable or unavailable, as is the case with many mine sites, Delta's hybrid energy power solutions ensure maintained telecom services by combining solar & wind power, diesel generators and fuel cells. **AMR**



DELTA



ELTEK
A brand of Delta

JULY 2023 AMR

PMeye

a new Commercial Lidar Scanner for PM Pollution Monitoring In Industrial and Urban Environments

The adverse effects of Particulate Matter (PM) pollution on human health and the economy are well known. Accurate mapping is therefore essential in effectively monitoring and enforcing air quality regulations and mitigation measures, as well as minimising exposure to such pollutants.

Mining and quarrying applications produce PM emissions due to the different processes mainly used to extract the ore and associated overburden, including drilling and blasting, loading, and unloading, and overburden replacement. Fugitive PM emitted from these operations is the sum of emissions from the mining of metallic and nonmetallic ores and coal.

Although low-cost sensor technologies can provide real-time PM measurements, they also have several weaknesses such as frequent maintenance and field calibration that can be challenging and costly. Remote sensing PM from space also has several limitations, with spatial resolution typically in the range of several kilometers, infrequent coverage for short-term pollution events, or diurnal variations monitoring and limited usefulness for monitoring aerosols close to the ground.

Remote sensing of PM absolute concentrations at the horizontal plane addresses the need of continuous wide area monitoring directly above urban and industrial sites, with high accuracy, spatial and temporal resolution.

Raymetrics PMeye lidar is a new, state-of-the-art commercial scanning lidar system that successfully solves this challenge.

Designed around polarization scanning UV lidar, PMeye utilises an innovative inversion scheme for transforming raw signals to PM concentrations, offering large area PM concentrations monitoring and high spatial resolution (minimum radial 3.75m and azimuth 0.1°) sources localisation. The system is designed for 24/7 unattended operation and its quality is assured using the EARLINET/ACTRIS Quality Assurance procedures.

Following data acquisition, PMeye runs automatic data processing, using a chain of processors to retrieve higher-level products from the raw lidar signals. All data is available in NetCDF4 format, and their internal structure follows the Climate and Forecast (CF) metadata conventions.

PMeye provides a user-friendly operation interface, resulting in visualization, archive, and easy-to-create videos of acquired monitoring records. Virtual alert areas can be easily setup so the user (and any connected SCADA system through the application's API) is instantly notified when PM concentrations exceed certain limits (fully user customized). Additionally, up-to-date (and last three-days) results can be viewed via a custom designed webpage, where the user can also view and download PM concentration timeline figures for any location with a simple click.

Raymetrics also offers high weather and pollution dispersion forecasting solutions with or without the use of PMeye. The added value of PMeye is the ability to repeatedly detect, quantify and update emission sources inventory of the monitored area, which feed the forecasting system. In doing so, realistic near future air quality predictions support an advanced warning system, and users can proactively identify actions that could reduce emitted PM pollution.

PMeye application therefore helps ensure a company can follow its corporate sustainability program towards reducing its environmental and climate impact, and take the necessary actions to:

- Strengthen the environmental management of each facility;
- Adjust facility operations (e.g. plan and apply mitigation strategies, adapt scheduling of plant activities) to reduce emissions that impact the environment and surrounding areas
- Plan and implement risk responses relative to violations against federal environmental agencies for noncompliance with regulated emission thresholds.

Today, environmental quality standards and implied pollutants emission control are becoming more and more critical, both from an industrial plant operation and community perspective, but also in relation to compliance and the need to meet strict industry standards and regulations.

When it comes to heavy industrial and urban environments, Raymetrics technology aims to address three major and frequently encountered challenges, including:

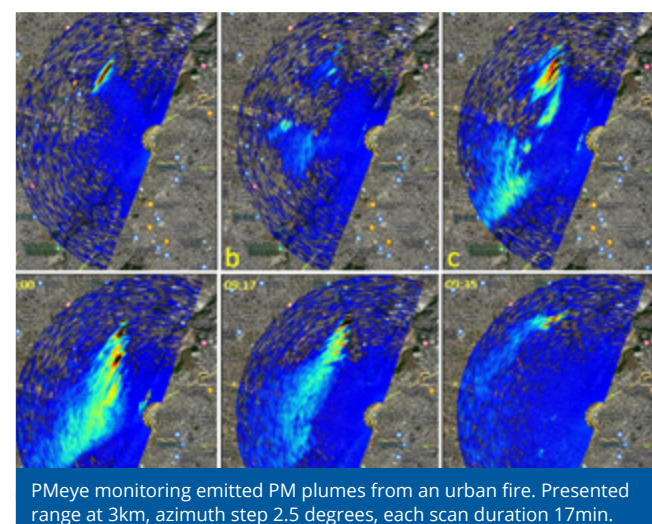
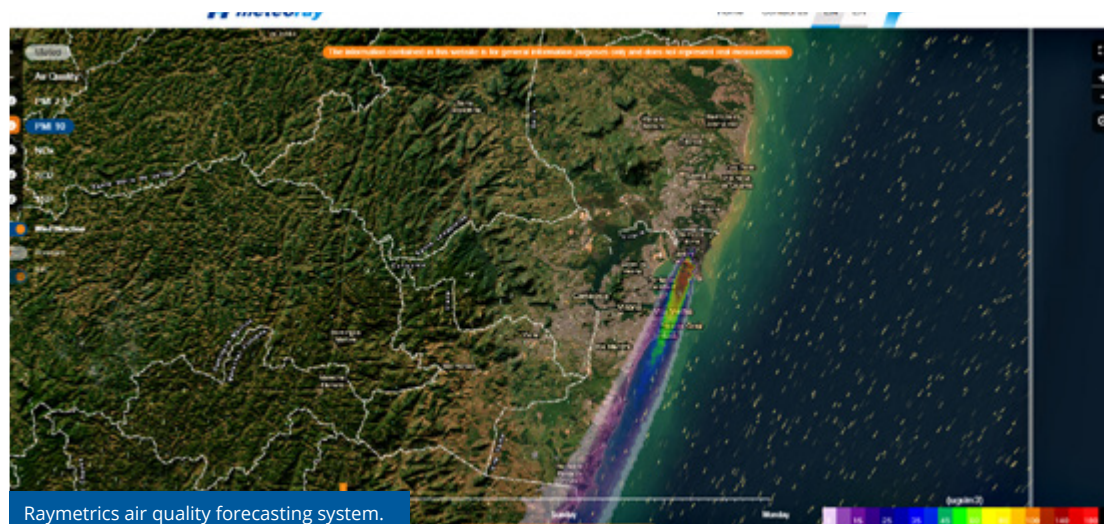
- Identify, quantify and monitor all PM pollution emission sources;
- Provide dispersion models that simulate the monitored emissions and PM dispersion in the area, enabling forecasting capabilities;
- Enable control of the effectiveness of any mitigation actions through constant wide area monitoring and forecasting.

PMeye is an innovative lidar technology already adopted by heavy industries and agencies in Latin America and Southeast Asia. For heavy mining and metal processing companies, this sensing technology is a new era in remote PM monitoring that will change the way they detect and monitor aerosols at longer distances, while subsequently minimising their environmental footprint.

Raymetrics will be exhibiting at the 26th World Mining Congress in Brisbane, Australia on 26-29 June 2023. Don't miss the opportunity to visit the team at Stand 126 to learn more about their PMeye technology and how it can benefit your industrial operations.

For more information, visit <https://raymetrics.com/>

AMR



PMeye monitoring emitted PM plumes from an urban fire. Presented range at 3km, azimuth step 2.5 degrees, each scan duration 17min.

PMeye

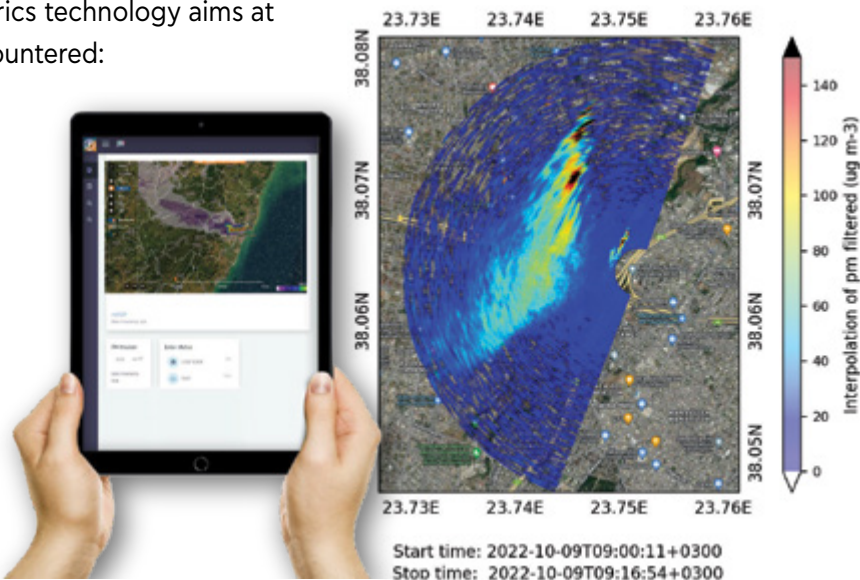


Environmental quality standards and implied pollutants emission control are becoming more and more crucial, for the environmental and community friendly operation of cities and industrial plants nowadays, and compliance to the continuously stricter standards is essential.

When it comes to the heavy industry and urban environments, Raymetrics technology aims at successfully addressing the three major problems most frequently encountered:

- identify, quantity and monitor all PM pollution emission sources.
- Provide dispersion models that simulate the monitored emissions, and dispersion in the area, enabling forecasting capabilities.
- Enable control of the effectiveness of any mitigation actions through constant wide area monitoring and forecasting

PMeye is a novel and state-of -the-art technology an innovative tool already adapted by heavy industries in Latin America like TERNIUM steel in Argentina and Brazil, VALE in Brazil, and has been widely used in the past in open mining sites in Chile (CODELCO-ANTOFAGASTA).



Raymetrics PMeye sensor offers:



Wide coverage:

A single Lidar can cover 50Km² area and identify all PM sources.

3D monitoring:

Lidar is the only technology that can monitor horizontal and vertical PM dispersion.

High sensitivity:

Lidar detects PM concentrations down to 10µgr/m³, day and night, levels which are otherwise not detectable by the human eye or EO & IR cameras.

Real-time information:

All data are provided in real-time, giving a good understanding of the temporal behavior of the PM productions.



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UNSW School of Minerals and Energy Resources Engineering:

Leading the Way in Education and Innovation



Advanced Visualisation Lab at UNSW.

The UNSW School of Minerals and Energy Resources Engineering (MERE) is a leading provider of innovative world class engineering education and research, and a proud sponsor of the 2023 Oral Presentation Prize at this Year's World Mining Congress in Brisbane.

Operating for over seventy years, the School continues to thrive with highly sought-after undergraduate and post-graduate programs, alongside an increase to its internationally acclaimed research output.

In the latest global rankings, MERE was ranked both 4th in the world (QS World University Rankings, 2023), and 10th in the world (Academic Ranking of World Universities, 2022).

The School prides itself on creating and nurturing industry change makers and immersing them in a world that few people get to experience.

Whether it's finding the lithium that powers electric cars; spearheading the sustainable exploration and development of subsurface energy resources, investigating ways to decarbonise industry, or developing the technology to extract water and minerals from the Moon and Mars, MERE is at the forefront of both learning and thinking.

Where others might see a limited resource, MERE expands the imagination of its students to see further and bring new life to those essential things that cannot be grown. It generates ideas and technologies that completely inform how society uses and thinks of energy, minerals, and resources into the future.

The UNSW School of Minerals and Energy Resources Engineering is committed to:

Technology Development & Integration
Advance the uptake of state-of-the-art technologies for minerals and energy resources industry to achieve sustainable technology-integrated operations.

Advance the knowledge of extractive industries
Develop novel mining systems and sustainable practices for waste disposal, mine tailings, ground and surface water interactions, and in situ mining approaches.

Reduce the energy footprint of extractive industries

Deploy hybrid renewable energy technologies by co-developing and designing effective solutions for energy transition including deep subsurface storage of CO₂.

Development of energy storage solutions

Expand the effective recovery of essential minerals for the onset of renewable technologies and storage of heat and pressure in underground reservoirs.

Research Strengths

Geoenergy

Geoenergy focuses on fundamental and applied research related to minerals, energy extraction and storage.

Of particular importance are technologies that improve recovery and provide new insights into the production of transition fuels and critical minerals.

Traditional knowledge and expertise in petroleum and mining engineering will drive new technologies related to the geological storage of CO₂ and hydrogen, recovery of critical minerals, production of transition fuels, and extraction of geothermal energy.

Geomechanics

Geomechanics focuses on fundamental and applied geomechanics related to the mining industry.

Interests and learning are oriented towards improving safety performance related to current and emerging technologies.

MERE closely collaborates with industry partners to find innovative ways to ensure environmentally safe and sustainable practices are incorporated in all aspects of design and operation.

With future energy technologies new practices and approaches are ever evolving that require geomechanical expertise.

Transformative Technologies

Transformative technology relates to providing innovating new technologies for operational excellence to accelerate the transformation of the minerals and energy resources sectors.

Of particular interest is the adoption of scientific knowledge and emerging technologies from other disciplines tailored for the minerals and energy resources sectors.

This includes monitoring and communication technologies to improve operational safety, evaluate environmental impact and expand efficiencies, and artificial intelligence for automation and data analytics.

Postgraduate programs

Mining Engineering

- Master of Mining Engineering
- Graduate Diploma of Mining Engineering
- Graduate Certificate in Mining Engineering
- Master of Engineering (Mining Engineering)

Mine Geotechnical Engineering

- Graduate Diploma of Mine Geotechnical Engineering
- Master in Mine Geotechnical Engineering

Mine Ventilation

- Statutory Coal Mine Ventilation Officers (Non-Award) Course
- Graduate Diploma in Mine Ventilation

Petroleum Engineering

- Master of Engineering Science (Petroleum Engineering)
- Master of Engineering (Petroleum Engineering)
- Graduate Diploma of Engineering Science
- Graduate Certificate in Petroleum Engineering

UNSW MERE's role in Future Energy

MERE's excellent renewable energy, mining and subsurface engineering research capabilities give it a natural advantage but also the potential to conduct research involving the deployment of future technologies into the energy and resources sector.

The conflict between global energy demand and the conservation of natural resources supplies a unique opportunity for novel engineering solutions.

MERE's experience with extraction technologies; geomechanics, flow and transport processes and industry engagement

provide a prime platform to address the challenge of future energy.

The School's research efforts focus on new extraction technologies for the resources sector – particularly in relation to alternative energy sources – and on investigating approaches to reduce the environmental impact associated with the extraction of raw materials.

As energy demand is ever growing, a diverse collection of technologies will be required to address the need since the utility of each technology is not equivalent.

The School therefore focuses on natural gas as a transition fuel, geological storage of CO₂ to mitigate current technologies and geothermal energy as an alternative energy source.

What we do today in our discipline will change, however, the conflict between energy and the environment will remain a pressing question needing new insights, novel research, and technological innovations all of which are driven by UNSW MERE.

It is the School's aim to be at the forefront of the energy transition with novel technological innovations. **AMR**

Touch base with UNSW School of Minerals and Energy Resources Engineering via:

LinkedIn: <https://www.linkedin.com/school/unsw-mere/>

Website: <https://www.unsw.edu.au/engineering/our-schools/minerals-and-energy-resources-engineering>

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UNSW Minerals and Energy Resources Engineering

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UNSW Engineering

School of Minerals and Energy Resources Engineering

Spearheading the sustainable
exploration and development
of minerals and resources
for future generations

**UNSW is the proud sponsor of the
Oral Presentation Prize at this
Year's World Mining Congress.**





SciAps LANDS DOWN UNDER

SciAps Boston-based instrumentation company recently opened a location in Australia.

The company specialises in handheld portable analytical instruments that measure any mineral, any element, in any place on the planet. It's industry-leading X-ray fluorescence (XRF) and laser-based (LIBS) analysers are hard at work across every major industry, including the new specialty field of geochemistry.

As the only handheld instrumentation company to offer both XRF and LIBS for the geochemistry and mining industry, SciAps gives asset owners complete visibility when it comes to research, exploration, grade control, block modeling, process optimisation, and much more, all via a handheld device.

SciAps has 35 years of combined experience with elemental handheld technology across the United States and Australia. This is backed by a knowledgeable team of regional geoscientists and market-specific support staff, that understand and provide tailored solutions to Australian clients.

According to SciAps CEO, Don Sackett, LIBS and XRF analysers are what the company does best.

"Our LIBS analyser technology enables in-field analysis of lithium, beryllium, boron, carbon, sodium, and fluorine," said Mr Sackett.

"We can analyze lithium in hard rocks, ores, powders, and brines (Z-903 only). This LIBS analyser also has high sensitivity to other major elements including Magnesium, Silicon, Aluminum, Calcium, and Potassium. The analyser can also map elemental distribution using the GeoChem Pro application.

"The Z-903 analyser is our flagship product for geochemistry, particularly clients that require full elemental coverage from

Hydrogen to Uranium. The spectrometer spans 190-950 nm to measure low atomic number elements that the XRF can't, including beryllium, boron, carbon, fluorine and sodium, plus the many transition and heavy metals that XRF can measure."

SciAps' Z-901 lithium analyser is the world's only handheld analyser capable of measuring lithium in rocks, ores, and powders, and offers in-field analysis at a value price point.

The SciAps XRF range are the smallest, fastest, most precise handheld analysers available on the market, with the most powerful X-ray tube – ideal for gold pathfinders, transition, and heavy metals – optimised for rare earth elements. The XRF thrives in rugged conditions and produces results in under five seconds.

"Our X-555 analyser, which is the most advanced X-ray tube technology available, led by a 55 kV X-ray tube – the world's only handheld XRF with this capability," said Mr Sackett.

"The 55 kV operation, rather than the com-

mon industry 50 kV, delivers higher performance for critical 'light' and some 'heavy' rare earth elements (REEs), making it a superior option for REE analysis.

"The X-505 is the best-in-class light element performance for ultra-low detection limits of elements like silicon, phosphorus, sulfur, magnesium, and aluminum. With the optional 50 kV mining calibration, it gets even better LODs on heavier REEs or gold pathfinders like Silver or Antimony. A 5.5W X-ray tube combined with the latest large area silicon drift detector technology and super tight X-ray geometry yields fast, precise results even on the hardest elements to measure with handheld XRF"

It's important to note that the SciAps LIBS analyser does not require licensing in most Australian states.

Trusted Analysis and Delivery with SciAps

SciAps is capable of supplying analysers within a few weeks post-order. Not only does the company deliver with such speed, but their high level of support and quick delivery continued during COVID-19

when other brands were challenged by supply chain issues, unable to meet client demands and taking a better part of a year to fulfill orders. With SciAps, clients receive innovative designs and updated software, backed by an ability to manufacture products and ship them quickly and reliably to our clients, no matter where in the world they are located.

SciAps has been designing, selling, and servicing field-worthy handheld elemental analysers globally for over 20 years.

Mr Sackett says that the company is well aware of the stats, the actual costs, and the value of customer loyalty.

"We've simplified the RMA process with repair and return prioritisation at no additional cost, added multi-point inspections, software and firmware updates – even updates that require a full re-calibration.

"With a dedicated support line, you never have to think about running an update and higher frequency status updates. Our sales and service teams are responsive, knowledgeable, and empathetic to clients' needs. You will speak directly to a team member in Australia, who will help you when you need it. Our service team will quickly and cost-effectively diagnose, repair and return your instrument much faster than anywhere else."

SciAps is excited to be exhibiting at exhibiting at the World Mining Congress in Brisbane, Australia on 26-29 June 2023. Don't miss the unique opportunity to meet the team at Booth 175 and check out a live demo of their leading XRF and LIBS analysers in action.

If you're ready to purchase, contact SciAps today on +61 8 6185 1613, email sales@sciaps.com.au, or visit www.sciaps.com/ for more information on our range of portable analytical instruments.

AMR



See What Others Can't

Analyse any mineral, any element, any place on the planet.



XRF

Smallest, fastest, most precise handheld available, with the most powerful X-ray tube. Perfect for gold pathfinders and transition and heavy metals. World's only pXRF optimized for rare earth elements.

X-505: Best-in-class light element performance for ultra low detection limits of elements like Si, P, S, Mg, and Al.

X-555: The most advanced X-ray tube technology available, led by a 55 kV X-ray tube delivering higher performance for critical "light" and "heavy" REEs.

LIBS

In-field analysis of Li, Be, B, C, Na, and F. Lithium in hard rocks and brines. High sensitivity to other major elements Mg, Si, Al, Ca, and K.

Z-901 Li: The world's only handheld analyser capable of measuring lithium in rocks, ores, and powders for instant, in-field analysis.

Z-903: An extended spectrometer range spanning 190 – 950 nm, allows measurement of low atomic number, including Be, B, C, F, and Na, plus many transition and heavy metals.



SciAps



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VISIT UQ AT THIS YEAR'S WORLD MINING CONGRESS



As one of the world's top 50 universities, The University of Queensland is proud to be a diamond sponsor of the World Mining Congress being held in Brisbane this month.

For more than a century, UQ has educated and worked with outstanding people to deliver knowledge leadership.

The prestigious university is committed to developing solutions to the world's greatest challenges through the delivery of world-class teaching and research.

It has won more national teaching awards than any other Australian university and is committed to training and upskilling the workforce of the future.

As society wrestles with the effects of climate change and the transition to a low

carbon future UQ brings a multidisciplinary approach to support the mining sector to reduce its footprint while working to meet the increased demand for minerals.

UQ researchers are developing new and sustainable mining and processing approaches; exploring alternate supply sources of critical minerals; and addressing the consequences of ageing and new mining operations.

Its technologies and innovations reduce the economic, environmental and social impacts of mining.

UQ works collaboratively with industry, governments, business and the broader community to translate research into impact through commercialisation, contract research and consulting.

The University delivers professional development, higher degrees by research and formal teaching programs to train the next generation of industry and community leaders.

At the World Mining Congress, UQ researchers are presenting across a range of streams, including autonomous systems, health, safety and wellbeing, geoscience and discovery, social performance and governance, new mining frontiers, mine science and engineering, future workforce and education, processing and refining and environmental sustainability.

UQ Vice-Chancellor Professor Deborah Terry will deliver a plenary address on "The role of universities in mining's global future".

Keynote presentations will include Pro-

fessor Jolanda Jetten (School of Psychology) on "Leadership for Highly Reliable Organisations", and Professor Robin Burgess-Limerick (SMI Minerals Industry Safety and Health Centre) speaking on "Participatory Ergonomics in Action".

Professor Stephen Wilson will deliver a keynote address titled "Serious about Decarbonisation? Be up-to-date with Nuclear Energy".

In addition to the comprehensive line-up of presentations, attendees can speak directly with researchers about a range of topics – from mining technology and mineral processing to decarbonisation and social responsibility - at the UQ Booth (Diamond booth 5). **AMR**

Let's create change together

At UQ, our partners range from startups to small businesses and governments to global companies.

Together, we are delivering creative, value-focused solutions to accelerate the transition to a decarbonised economy.

We have some of the world's leading experts and infrastructure in:

- Automation
- Development minerals
- Discovery and exploration
- Environment and water
- Health, safety and risk
- Leadership and governance
- Mine waste transformation
- Mining and mineral processing
- Social responsibility
- Transition and closure

uq.edu.au/minerals-resources

 **THE UNIVERSITY OF QUEENSLAND**
AUSTRALIA
CREATE CHANGE



MEET CRITICAL MINERALS GROUP AT THE 2023 WORLD MINING CONGRESS



Outcrop of the Linfield Project.

Battery metals company Critical Minerals Group (CMG) is proud to be exhibiting at this year's World Mining Congress in Brisbane and is gearing up to showcase how it is meeting the growing demand for critical minerals that are key to ensuring a carbon neutral future.

The company, which was listed on the ASX late last year, was founded upon the global shift towards decarbonisation and electrification, and primarily focuses on the essential new minerals needed for energy storage, electric vehicles and renewable energy.

To this end, CMG is focusing on critical mineral deposits that will help bring about a renewable and sustainable future, with its primary focus being on vanadium.

Mining and Energy company Idemitsu is a strategic investor in the newly formed company and its investment in CMG stems

from its appetite to diversify from its traditional mining focus into renewables.

CMG's flagship project is its Lindfield Vanadium Project, which has an inferred JORC mineral resource of 363Mt @ 0.43% V2O5 and covers an astonishing 295km² in the Julia Creek area of northwest Queensland.

This makes it one of the largest vanadium deposits in the world and the company is currently progressing its scoping study and metallurgical test work after successfully completing its maiden drilling campaign at the end of 2022.

In addition to the Lindfield Project, CMG also owns the Figtree Creek and Lorena Surrounds copper and gold projects, the Whinmoor Project, Lara Downs Project Application and the Lindfield North Project Application under subsidiaries Vantec Minerals, CMG 1 and CMG 3.

Critical minerals are vital for the economic well-being of the world's major and emerging economies, and examples of such metals include vanadium and copper.

They can be deployed in a wide range of high-tech applications in a range of sectors including battery storage, electric vehicles, renewable energy, aerospace, defence technologies, telecommunications and agri-tech.

Vanadium batteries are poised to play a globally significant role in energy transition and grid firming and as we head to a more sustainable future it is widely considered that vanadium is a superior metal, when compared to lithium for example, because the power output in a battery containing vanadium is decoupled from capacity.

In order to increase power capacity in a Vanadium Flow battery, the size of the

tank is simply enlarged, which creates a low-cost way of increasing the duration the battery can discharge at full power. This can be compared to lithium batteries that have a limited capacity, including an average lifespan of only 7-10 years.

With vanadium ranked as one of the most critical minerals by the US, Japan, Korea and the European Union (including the UK), CMG is well placed to take advantage of the growing demand and to leverage a range of Queensland State Government initiatives that will significantly reduce costs and improve the economic viability of its projects.

The company looks forward to meeting with investors and delegates at the WMC and becoming recognised as a significant battery minerals development company. You can meet with the CMG team at booth 92.

AMR

Charging Ahead with Australia's Newest Battery Minerals Developer

Critical Minerals Group Limited is a battery minerals development company with the principle focus of developing critical minerals projects to assist in the global shift to decarbonisation and electrification and to support a renewable and sustainable future.

CMG was formed to identify, secure, acquire and develop critical mineral resource tenements in proven regions in Australia and is the owner of the Lindfield Vanadium Project, Figtree, Lorena Surrounds Project, Whinmoor Project, Lara Downs Project Application and the Lindfield North Project Application.



CRITICAL MINERALS GROUP

Visit CMG at Booth 92 at this year's World Mining Congress in Brisbane

CONTACT US:

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- info@criticalmineralsgroup.com.au
- criticalmineralsgroup.com.au
- @criticalmin_ltd
- Critical Minerals Group Ltd: Overview | LinkedIn

MEET ALS AT THIS YEAR'S WORLD MINING CONGRESS

A proud platinum sponsor of this year's World Mining Expo in Brisbane, ALS is a leading international company that specialises in laboratory testing, inspection, certification and verification solutions.

Founded and headquartered in Brisbane over forty years ago, the company provides a wide range of testing services, including services for the global mineral exploration, mining and mineral processing industries.

Solving complex challenges with data-driven insights from scientific analysis is core to the vision, mission and purpose of the company and it has a passion for science that helps create a healthier and safer world.

With a global presence in over 65 countries via 350 laboratories and offices, the quality and breadth of the company's geochemistry, mineralogy and metallurgy testing solutions is second to none.

This, coupled with the company's industry-leading environmental services make partnering with ALS a logical choice to create value for mineral resources project owners and society.

Congress delegates can find ALS at Platinum booth 3 where the company will have representatives from its geochemistry,

mineralogy, metallurgy and environmental businesses ready to discuss any and all aspects of its expertise.

It will also be hosting a lunchtime symposium titled *'Measurements you can manage: how partnering with ALS can support resource projects through their entire life cycle.'*

Featuring speakers from three of the company's divisions – Mark Pirlo from ALS Geochemistry, Hamid Sheriff from ALS Metallurgy and Phillip Kennedy from ALS Environmental, topics discussed will include:

- Geochemistry and Mineralogy – learn how ALS develop and implement fit-for-purpose technologies to cover the full range of commercial geochemical analysis options to support the global exploration and mining industry;
- Metallurgy – understand why ALS are technical leaders in the field of minerals processing for critical and battery metals;
- Environmental – discover how ALS use digital data delivery platforms to alert clients at key decision points associated with environmental testing and monitoring.

ALS looks forward to meeting attendees at the event and discussing the critical role it plays in the resources sector worldwide.

AMR

GLOBAL LEADER IN LABORATORY AND TESTING SERVICES



right solutions.
right partner.

An integrated service offering across the entire resource lifecycle



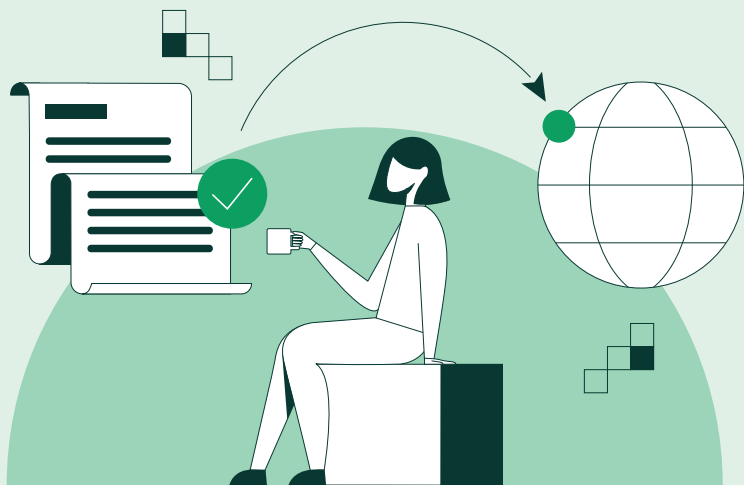
ASX 100 company
employing 3,000+ Australians

- | | |
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| ▶ Geochemistry/Exploration | ▶ Coal |
| ▶ Inspection and Superintending | ▶ Mine Site and Assay services |
| ▶ Metallurgy | ▶ Hydrographics |
| ▶ Environmental | ▶ Occupational Hygiene |
| ▶ Oil and Fuel Analysis | ▶ Acid Mine Drainage |

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Visit Pagero at the World Mining Congress!

You'll find out how e-invoicing ensures global compliance, optimises your financial operations and is particularly important for multinationals and those operating in the LATAM region.



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PAGERO DEBUTS AT BOOTH 91 AT THE WORLD MINING CONGRESS 2023

Pagero is excited to be exhibiting at this year's World Mining Congress in Brisbane.

There is an impressive lineup and some interesting topics being discussed including the future of mining, current industry trends, digital transformation and automation.

Pagero is no stranger to automation – the company helps organisations digitalise and automate their financial processes.

Electronic invoicing (or e-invoicing) is taking the world by storm and is rapidly becoming the preferred method for sending and receiving invoices.

Many countries have mandated e-invoicing or are planning to mandate it, so if you are an organisation based in Australia but also operate internationally then you will need to stay on top of these regulatory changes and ensure compliance.

Latin America is an especially complex re-

gion to operate in as the regulations are constantly changing and often with short notice, and organisations in Australia can find this difficult to navigate.

Pagero has expertise in global e-invoicing regulations, and is an expert at helping companies stay on top of these changes and remain compliant.

Even if you do not operate internationally, there are many benefits to e-invoicing including increased efficiency, reduced cost, increased accuracy of data and faster invoice turnaround time.

Many organisations in Australia and globally such as Shawcor and Sandvik are utilising e-invoicing to optimise their accounts payable and accounts receivable operations.

If you would like to learn more about e-invoicing, please come and chat with Emma and Ray at the Pagero booth located near the entrance to the Congress. The company looks forward to meeting you! **AMR**

The Sound of Thunder Heralds the Zircon Storm

By Kate Dzienis

The Broome Port facility where Thunderbird product will be loaded onto vessels bound for overseas markets.

Bruce Griffin 
Sheffield Resources Executive Chair



The Thunderbird Mineral Sands Project in the Kimberley region of northern Western Australia is the first significant heavy mineral sand deposit to have been discovered in the Canning Basin, and is one of the largest and highest-grade mineral sands deposits globally.

Consisting of a large-scale zircon and ilmenite open cut mine and mineral concentration and separation plant, the project is located on the Dampier Peninsula and is a joint venture between Sheffield Resources Limited (SFX) and Yansteel, who together formed the Kimberley Mineral Sands (KMS) joint venture in March 2021.

From humble beginnings as an exploration project to now an incredibly substantial development project, it was announced in mid-June 2023 that Thunderbird construction was approaching 90% complete – well on track to see projected first deliveries in 2024, with expected cost outcomes within the original planned \$484m budget.

Today, Sheffield executive chair Bruce Griffin explains that proceeds totalling \$130 million from joint venture partner Yansteel were applied towards completion of the mine access road, accommodation village, borefield, process plant site preparation and civil foundations.

"This work occurred primarily during the Kimberley dry seasons of 2021 and 2022," he says.

"At the time of a final investment decision (FID) in October 2022, the project had advanced to 45% complete and erection of the Thunderbird process plant commenced, following execution of the main EPC contract with GR Engineering Services Limited at that time.

"From October 2022 to April 2023, the tailings storage facility and storm surge pond were built in parallel with the installation of structural steel within the process plant, followed by main equipment assembly and installation of the process plant structure, with the project 85% at the end of April 2023."

Mr Griffin also says that between May 2023 and the forecast commencement

of operations in Q4 this year, the process plant will be completed with final equipment installation, terminating cables and connecting pipework followed by cold and hot commissioning.

"The non-process infrastructure will be completed including sealing the access road and completing the turn off from the mine access road on to the national highway, along with completion of the tailings storage facility, storm surge pond and installation of the gas engines in the power station," he says.

"Final preparation for operations including recruitment of the full operations team, initial waste mining, installation of the dry mining unit in the mining area and ore mining will commence."

Project capital expenditure is forecast to be \$335m with another \$70m of operating expenditure incurred before production commences. On top of this \$405m there is another \$69m of other costs including working capital and capitalised finance costs consistent with the \$484m of funding available to the KMS joint venture.

Mr Griffin says the initial throughput expected from the Thunderbird Mineral Sands project will see around 11 million tonnes of ore mined and 1 million tonnes of saleable concentrates produced every year.

"We see production increasing in stages over the life of the project. Whilst Stage 1 is expected to produce 1 million tonnes of saleable product, further capital investment and potential doubling of mine capacity and an increase in processing capacity could see Stage 2 produce a further 800,000 tonnes of saleable product per year, expected toward the end of this decade," he explains.

These are exciting times for Thunderbird, with KMS expecting to be progressively commissioning the plant from Q3 2023, starting up the power station and then introducing ore into the plant in Q4 2023.

First products should be produced from the mine and transferred to port for loading by the end of the year and the first

shipments to customers continue to be expected in Q1 2024.

ZIRCON & ILMENITE The majority of the zircon at Thunderbird (about 120,000 tonnes per annum) is contained in the zircon concentrate and 75% of this has been sold for the initial 5 years of production to three offtake processors in China.

Mr Griffin says the processors recover zircon, rutile/HiTi and monazite from the concentrate and KMS receives the market price for the concentrate based upon the recoverable minerals.

"It should be noted that the zircon concentrate represents approximately 65% of the total revenue stream from Thunderbird," he reveals.

"Our other product, and the largest by volume not value, is magnetic concentrate which contains high quality ilmenite. This is being sold to our joint venture partner Yansteel under a Life of Mine offtake agreement with the price fixed for the first 5 years of that contract.

"Yansteel will recover the ilmenite and use it to make slag and ultimately titanium dioxide pigment. The magnetic (ilmenite) concentrate represents approximately 30% of the total revenue stream from Thunderbird.

"There is a lower quality zircon contained within our final product which we class as a 'paramagnetic' concentrate. This product also contains some ilmenite/HiTi and monazite and is priced in a similar way to the zircon concentrate, and represents approximately 5% of total revenue over the life of mine."

THE CUT & DRY OF IT

So how will it be done? Thunderbird waste will be stripped using an excavator and haul trucks, and the ore will be ripped and pushed using D11 dozers into a dry mining unit in the pit. The dry mining unit removes oversize and pumps ore in a slurry to the Thunderbird process plant.

Explained by Mr Griffin himself, tailings will initially be deposited in a tailings storage

facility and once sufficient room is created in the pit, in around year 3 of mining, tailings will then be deposited in the mined out areas of the pit.

"The mine will be rehabilitated throughout its life and at the end of mining the mined area will be fully rehabilitated with no 'hole' left," he says.

"The concentrate products will be loaded into rotainers and trucked in quad road trains to a location near the Broome port where they will be stacked prior to ship loading. When a ship is loading product, the rotainers will be shuttled using doubles to the Broome port facility where the crane will lift the rotainers into the bulk carriers hold and tip product into the ship accordingly."

FUTURE LOOKS BRIGHT

The Thunderbird Mineral Sands Project will undeniably deliver positive change to the region and its surrounds, with it being a prime example of the industry continuing to support jobs in regional areas by contributing significantly to the economy. Mr Griffin is looking forward to seeing all the growth that Thunderbird will present to the wider community.

"It's very exciting. The Thunderbird Project will deliver significant benefits to the Kimberley region of Western Australia and to the people and businesses operating in that region," he says.

"We are committed to seeing our workforce reside in the Kimberley and be a part of that community, using family friendly rosters.

"We are close to completing the on-time and budget build and starting up the mineral sands mine. This has been the culmination of a lot of work by Sheffield, Yansteel, the KMS team and our contractors over a decade or more.

"Thunderbird will be a key source of global zircon supply for the next three or four decades, a product that is forecast to be in short supply for years to come." **AMR**

DRILLING INT



◀ **Peter Hall,**
ADIA Chief Executive Officer

Australia continues to experience increasing global demand for its resources in response to the transition toward renewable energy sources and a desire for companies to achieve their ambitious sustainability targets.

Lithium, cobalt and nickel, are just some of the critical minerals in the spotlight, which are used to manufacture everything from battery technology for electric vehicles, smartphones and computers, to solar panels and wind turbines.

It is therefore no surprise that Australia's drilling industry is playing a pivotal role in the race to help miners locate and extract these minerals and other rare earths, further strengthening Australia's position as a major player on the world stage.

The *Australian Mining Review* sat down with Australian Drilling Industry Association (ADIA) chief executive Peter Hall to gain insight into the drilling industry and its future outlook.

AMR: Can you tell us about the current state of play within the Australian drilling industry?

PH: Over the past five or so years, there has been a very strong period of growth, one that has been consistent around the country. Exploration has seen the largest increase and, in 2021 and 2022, we were looking at a rig utilisation rate of 85%. It

doesn't get much better than this, as there are always some rigs being refurbished or on standby waiting to go to a job.

2023 hasn't started as well as expected with several of our association members indicating there is currently a slowdown in demand. However, at this stage, it is more at the junior exploration level, so we will have to wait and see how things play out as the year progresses. Exploration slow-downs are generally caused by global issues, which means there is little we can do about it at a local level.

AMR: With continued technological advancements including smart drilling, 3D modelling, digital automation and data capabilities, what do you see as the future trends in drilling within the mining industry?

PH: Technology advancements don't happen quickly in the drilling industry as there is normally high risk involved with the investment and transition into new equipment. A cautious approach needs to be taken in response switching gear, which must be well-engineered based on the

conditions and environments where exploration drilling equipment operates.

The last decade has seen more electronics integrated into drilling equipment, as this is the optimum way of adding automation and more safety features onto the rigs. This requires another skillset, and further reliance on equipment manufacturers to provide support.

Automated drilling is already available on drill and blast rigs, so the technology for incorporating it into exploration rigs is very close. This does however create a number of additional challenges as these rigs do not operate in the same shallow holes, or part of a repetitive process. There will need to be a balance between the benefits of removing the knowledge and hands-on ability of drill crews from the site and a remote operator in a control-room kilometres from site that relies solely on system readouts and programming to progress the drilling.

Exploration drilling often presents deviations from how the hole is expected to progress, and an experienced driller can usually anticipate things before they actually happen.

The MinEx CRC, the world's largest mineral exploration collaboration, has an interesting project in development with its coil-tube drill rig, which has adopted some of the methodology from oil and gas rigs.



A DIAMOND CORE RIG OPERATED BY BOART LONGYEAR IN THE PILBARA, WA

OUT THE FUTURE



RANGER DRILLING OPERATING A REVERSE CIRCULATION RIG IN THE PILBARA, WA.

The coiled tubing replaces the drill rods, which in a traditional exploration operation, have to be run in six-metre lengths. The coil-tube method allows continuous drilling without the need to stop and add another rod. It is also utilising a down-the-hole motor to do the drilling with the sample being returned to the surface mixed in with the drilling fluid.

The project has been going for quite a few years now and it is yet to be seen whether the concept will be taken up by the industry. It does however have runs on the board when following in-field testing, which could accelerate the exploration process in some applications.

AMR: What are the current challenges facing the Australian drilling industry, and how will it close the gap between the ‘now’ and the ‘future’?

PH: Exploration drilling is very cyclical in the sense that when demand is on, there is always a shortage of people. In the current cycle, this demand has existed since mid-2017. Current international border controls make it very difficult to fill the experience gap with overseas drillers, so the demand must be met by training new entrants and promoting from within.

During this cycle there hasn't been the consumables and equipment shortages that were seen between 2004 to 2012, however costs have risen dramatically

over the last couple of years. Steel prices, fuel and shipping costs are driving up drilling costs considerably, and often this is not reflected in the drilling contract rates.

The manufacture of drilling rigs domestically is also weaker than it used to be, largely due to the effects of globalisation over the last decade or so. This could hurt Australia moving forward as there will be an over-reliance on imported rigs that generally require modifications to suit local requirements.

This will result in longer lead times and higher costs. Economies of scale is the root cause of this, combined with contractors wanting modifications to standard products to meet their own requirements.

AMR: Training is obviously a fundamental part of the drilling industry. How is it keeping up with innovation and evolving industry regulations?

PH: I would say it is keeping up reasonably well. There are some very good RTO's out there that specialise in driller training and deliver it to a high standard. Federal Government support is also available, as well as drilling industry involvement through ADIA to ensure the RII resources and infrastructure industry training package, which contains the drilling certification qualifications, is kept up-to-date.

An example of this is the recent addition of



A REVERSE CIRCULATION RIG BEING OPERATED BY MINING DRILLER FORACO. A REMOTE OPERATOR CONTROL PANEL IMPROVES SAFETY BY POSITIONING THE DRILLER FURTHER AWAY FROM RIG.



A REVERSE CIRCULATION RIG OPERATED BY EAGLE DRILLING IN NORTH QUEENSLAND.

a competency unit in the area of automated cyber chair drilling operations.

AMR: Are there any active campaigns which are supporting ADIA in servicing the industry and drilling contractors nationally?

PH: As the skills shortage has had such a detrimental impact on the drilling industry, much of our recent advocacy has focused on addressing this issue.

There's no denying this has been a real battle with slow progress as a result, some of which is due to the classification level of drillers on the Federal qualifications framework, so it is difficult to make any large-scale change to this.

Drilling contractors were mostly able to continue working during the COVID-19 pandemic as mining and exploration were seen as a vital part of keeping revenues and royalties flowing, therefore, there has been less issues for the industry to complain about.

AMR: How is sustainability and the

transition to renewables influencing mining projects across Australia, and what is the impact for drilling operators?

PH: The demand for lithium was one of the things that really kick-started the drilling industry back in 2017, and we have seen further demand for similar renewable-related minerals since then.

Gold still represents about half of the drilling that occurs in Australia, but the advancement of the critical minerals sector will directly benefit drilling contractors through additional diversification.

If the current slowdown continues to worsen and lead to an industry downturn, having this underlying demand for a wide range of minerals will hopefully mean that it won't last too long.

Drillers who have been around for a number of years have generally experienced a few downturns and understand that things never continue on a steady upwards trajectory and speed humps are only natural. **AMR**



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Edge Underground crews have tested the AdaptX Mini during the development process (L-R: Adrian Sneddon, Darrin Breeden, Tiernan O'Rourke, Stuart Harrison)



Stuart Harrison, OptionX Group CEO, launches the AdaptX Mini

OptionX Group, a prominent player in the drilling, tunnelling and boring sector, has unveiled the groundbreaking AdaptX Mini modular drilling system at an event held in Bourne-drill's Archerfield workshop.

This cutting-edge system is set to redefine industry standards, revolutionising drilling, tunnelling, and boring operations.

The AdaptX Mini will initially be used by Edge Underground, and has already impressed with its unmatched performance and adaptability.

Whether it's vacuum and slurry drilling, bed boring, auger boring, or pipe jacking, this innovative system effortlessly adapts to a wide range of drilling techniques, eliminating the need for multiple equipment configurations.

Stuart Harrison, OptionX Group CEO and

the visionary inventor behind the AdaptX Mini, highlighted its significance for the industry.

"The AdaptX's modular drilling platform allows contractors to utilise a single machine for various drilling techniques, providing unparalleled versatility and efficiency," he said.

Harrison is renowned as a pioneer in the industry, having also invented the groundbreaking Vermeer AXIS laser-guided boring system. One of the AdaptX Mini's key advantages is its ability to adapt to unexpected ground conditions, minimising project delays and cost overruns.

It offers additional functionalities such as pressure air vacuum, horizontal directional drilling, displacement pilot, canopy tunnel drilling, pipe assist, and pipe bursting. With adjustable torque and speed, contractors can easily tailor its performance

to meet specific project requirements, making it an indispensable asset for any mining drilling or tunnelling endeavour.

Featuring a torque range of 10,000 to 80,000 ft lbs and a maximum thrust of 40 tonnes, the AdaptX Mini delivers a compact yet powerful solution for drilling projects of varying scales.

OptionX Group is also releasing the AdaptX Maxi, designed for larger-scale projects, with a torque range of 17,500 to 180,000 ft lbs and a maximum thrust of 125 tonnes.

"The AdaptX Mini is the product of collaboration among experts, including Edge Underground, Bourne-drill, and other industry stakeholders," Mr Harrison said.

"It has also undergone rigorous testing to demonstrate its resilience in different worksite environments."

OptionX Group's commitment to driving industry advancements is further exemplified by its proactive approach in securing patent protection for the AdaptX's multiple innovative features.

This versatile drilling system showcases the power of collaboration and innovation in pushing boundaries, which is why it has captured the attention of mining professionals around the country. While currently available exclusively to the OptionX Group business, Edge Underground, wider availability is expected in the near future.

To learn more about the AdaptX modular drilling system and witness its transformative capabilities first-hand, visit adaptx.com.au or contact Stuart Harrison at stuart@optionxgroup.com.au.

Stay tuned for further updates as OptionX Group continues to shape the future of drilling, tunnelling and boring. **AMR**

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OptionX Group is an integrated group of companies focused on providing comprehensive services for the drilling, tunnelling and boring industry.



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WA Water Bores is Western Australia's newest specialist in water well drilling based out of Geraldton, servicing the resources sector across the state and offering the very best in project management.

Utilising modern equipment and technology, WA Water Bores provides a quality assured process to deliver end-to-end solutions and all the reliability you would come to expect from a professional business.

With more than 15 years' experience in the industry and an intimate knowledge of various drilling applications, WA Water Bores founder James Harrington and his team of specialists have the expertise and knowledge to offer cutting edge drilling innovation to clients not only in WA but across the whole of Australia.

A TEAM OF EXPERTS

With WA Water Bores' commitment to undertaking significant drilling projects and providing a detailed consultation process prior to work commencing, James has put together the most experienced and skilled

team who are all fully dedicated to implementing the highest standard of performance.

The combination of full industry experience and a complete range of deep well drilling equipment means the team at WA Water Bores has a track record of being one of the best in the business. Each team member is skilled in water well drilling with quality workmanship practices, an accurate knowledge of geology and ground water development, and each is dependable and reliable in providing positive results every time, on time.

Completing a large number of projects across WA since its inception in July 2022, you will not find a better partner for your project – because no matter the size, scale or complexity of the job, the team at WA Water Bores will finish on time and within your set budget – with no compromise to quality of work.

SERVICES

Delivering unparalleled quality and service, WA Water Bores specialises in all aspects of water well drilling, including but

not limited to: Mud Rotary and Rotary Air Hammer Drilling, Complete Bore Field Installations, Water Exploration Drilling, Mine Site Water Supply and Dewatering, TSF Recovery Bores, Water Monitoring Bores, Piezo Installations, Breakthrough Holes for Underground Dewatering, TSF Geotechnical Holes and Water Injection Bores, plus so much more.

WA Water Bores are also experts in Angled Paste Holes, achievable with James' years of experience in producing outstanding results and taking the guesswork out of a challenging operation or project.

With all these services on offer, WA Water Bores' equipment is maintained to the highest standard. The company's fleet consists of 4 drill rigs and a large range of ancillary equipment to back up its operations.

There is also a custom built Air-Core system specifically designed for the exploration of Palaeochannel sands.

AN EFFICIENT SYSTEM

Thanks to WA Water Bores setting itself

up with a fully automated IMS system, the team can concentrate on getting your water well drilling project finished efficiently rather than having to focus on managing paperwork to get all drilling and reporting processes complete.

All safety and training systems are set up in a cloud-based software system with input data uploaded via smartphones or tablet devices, whilst documents, policies, management plans, procedures, reports and registers are held and integrated into the software system.

EXCELLENCE IN DELIVERY

WA Water Bores has developed its business to provide first class drilling solutions with a pursuit for excellence in its delivery.

Offering exceptional value in the water well drilling industry, James and his experienced field crew at WA Water Bores works with you and your requirements for purpose built drilling to ensure the completion of projects on time and on budget.

**For more information call
James Harrington on 0429 695 538**



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If you're searching for reliable, cost-effective used drilling equipment, then look no further than Equipment Hub. With an extensive inventory and unparalleled expertise, the Brisbane based broker is a genuine one-stop solution for all your drilling equipment needs.

As a leading player in the drilling industry, Equipment Hub specialises in the sales and brokerage of used equipment in Australia and overseas. With a strong market presence, it offers a comprehensive range of quality drilling equipment for the diverse needs of the industry.

Whether it's exploration, mining, construction or geotechnical projects, Equipment Hub provides cost-effective solutions to meet the demands of its clients.

The company leverages both an extensive network and expertise in the field, allowing it to source and deliver a wide

range of drilling equipment, including rigs, drill pipes, bits, pumps, and much more. This is backed by a customer-centric approach, whereby the company strives to build strong, long-term relationships with clients by providing personalised service, competitive pricing, and timely support.

"Whether you're looking to buy or sell used drilling equipment, we are your trusted industry partner and aim to deliver a seamless experience and maximise the value of your investments," said Terry Horsburgh, Managing Director of Equipment Hub.

"Our product range is specifically designed for applications within the mining, construction, manufacturing and agriculture industries. We stock everything from heavy machinery and industrial equipment, to specialised tools and everything in between. This includes a full inventory of excavators, forklifts, loaders, generators, compressors, and much more, sourced from global manufacturers known for their reliability and durability."

Equipment Hub is renowned for its ability to offer tailored solutions that meet specific site requirements and industrial applications. It recognises that every business has unique requirements when it comes to equipment. Therefore, it goes above

and beyond by deliver solutions aligned to their clients' needs.

Mr Horsburgh said Equipment Hub's team of product and technical experts take the time to understand a client's operation and recommend the most suitable equipment options.

"From small businesses to large enterprises, we provide a range of support services from equipment selection through to financing and maintenance, helping clients at every stage of the process.

"Customer satisfaction is at the heart of everything we do. Our dedicated team is committed to providing the best service possible from the moment they make an inquiry all the way to post-purchase. We guide our clients step-by-step, address their concerns and offer expert advice where required."

Investing in new equipment can be a significant financial commitment for any business. Equipment Hub understands this, and has built a service offering around this procurement challenge.

The company offers flexible financing options to accommodate various budgets and business models.

"Whether you prefer to purchase outright, opt for leasing, or explore rent-to-own arrangements, we work closely with you to find a financing solution that best suits your needs," said Mr Horsburgh.

"Our transparent and flexible approach sets us apart in the market and has made us the ideal partner for businesses of all sizes.

"We draw upon years of heavy industry experience, where we have developed deep-rooted expertise and a thorough knowledge of the unique equipment requirements in different sectors.

From equipment functionality, performance, and applications, to industry insights, we support our clients in making informed decisions aligned to their business goals, to drive operational efficiencies and maximise productivity." **AMR**

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In underground drilling, the exploration and extraction of mineral resources is a highly technical process. It requires an elite team with the right skillset, technology, and experience, particularly when drilling in multiple directions at greater depths.

There's also the company owner mentality, to drive productivity and profitability, which in-turn places added pressure on drilling crews to hit their targets with speed and accuracy.

A successful drilling campaign and grade control program requires a strategic mindset and results-driven approach in combination with tools and techniques that meet the complex challenges faced in an underground environment. The last thing you need is to run the risk of sub-standard drilling services or expensive hidden unforeseen costs.

Founded in 2014, Lansdale based diamond drilling specialist Webdrill is one company that goes above and beyond, drilling with a rig capability to complete technical drilling at vertical depths of 1,500 metres dependent on core size.

Webdrill is more than just an exploration company. They're experts in their field. As an underground drilling contractor with an elite reputation, Webdrill have you covered. Whether it's drilling safely and efficiently to meet targets on-time and on-budget, or locating and defining resources quickly so you can make faster ASX announcements.

According to Webdrill Chief Executive Officer Jared Webb, the team provides a suite of professional, outcome-focused drilling solutions that drive its clients' mining projects forward in various formations and ground conditions.

"We use the most advanced drilling equipment the industry has to offer to improve performance and get faster results," Mr Webb said.

"By combining both quality equipment and highly experienced crews, we're well positioned to provide our clients with safe, reliable and productive drills, no matter the project."

Webdrill understands that every project is different and works with each client to select the right rig for their specific needs. Whatever rig is chosen, Webdrill has the capability to drill from all angles safely and productively, whilst drilling in the most economical way possible to minimise the cost per metre.

The company has an ambitious goal of having 30 drill rigs in the fleet by 2029. All existing Diamec Smart 6 MCR and Smart 6M machines feature universal controls which provides uniformity when it comes to safety performance as no additional operator training is required across different rigs.

Specialists in everything drilling

From dewatering to drilling and everything in between, Webdrill offers an extensive range of drilling services designed to suit different mines.

The company has a wealth of experience

in the area of high-risk dewatering and gas drilling programs where clients need to effectively utilise their water for underground services from stemmed, stand-piped, and tapped holes in high pressure aquifers. The team is experienced with all types of hazardous gasses commonly found in hard rock mining such as CH₄.

By dewatering or venting areas previously off limits due to the risks and hazards associated with gas and water ingress, Webdrill has enabled our clients to mine into new areas, helping build ore reserves and increase mine life.

"We continue to refine our expertise no matter the difficulty, which has allowed many of our clients to uncover massive ore bodies that were previously not possible. We combine various time management techniques with our arsenal of drilling methods to confidently maintain hole completion, all with minimal downtime and reduced overall cost per metre."

"This extends to challenges like Banded Iron Formations and ultramafic formations, which demand customised drilling styles and execution. It comes to appropriate bit selection and altered drilling meth-

ods to ensure hole completion is achieved with minimal consumable costs and optimised productivity and sample results."

The Webdrill team also have expertise in the installation of underground cave tracker systems and seismic instrumentation in block cave mines. This includes installing standard breakthrough holes and oversized back reaming service holes, drain holes between levels, and HV cable holes through to designing all service hole requirements.

For exploration and grade control programs, the company's fleet of smart rigs allows them to dig deep exploration holes down to 1,000 metres, giving their clients the flexibility to immediately switch between long exploration and grade control programs. This mitigates lengthy delays or rig changeouts to accommodate any changes to their drilling scope, delivering fast, efficient results.

Directional drilling is one stand-out area for Webdrill whereby it can service all areas including any deep directional work using the NX Navi tool or wedging and drilling off in daughter holes. This continues to prove highly valuable for clients that need to hit all targets with accuracy at depth.

"It's not just first-class performance that makes us the first choice for our clients' drilling needs, but our values that set us apart from the competition," Mr Webb said.

"Drilling's in our blood. Everyone involved with Webdrill loves what they do. Whether you're clients, partners, or suppliers, we're all working together to achieve great things and make a positive difference on the world. We go beyond results to ensure the physical and mental wellbeing of every single person we work with on our journey." **AMR**

For more information, visit
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Webdrill is the professional, reputable underground diamond drilling contractor you can rely on. With years of expertise, fully utilised crews and a universal fleet, our goal is to deliver fast, accurate results that help you make quicker ASX announcements.

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DDH1 DRILLING

SETTING THE STANDARD IN DEEP HOLE MULTIPLE INTERSECTION DIRECTIONAL DRILLING

DDH1 Drilling is a renowned provider of comprehensive core drilling services, with a distinct specialisation in deep hole multiple intersection directional drilling. With offices in Perth and Brisbane and premises in Kalgoorlie and Mt Isa, the company operates throughout Australia, delivering exceptional results in the mining industry.

The company's expertise in directional core drilling is particularly notable, as it allows for the design and execution of complex multiple intersection holes with remarkable spatial accuracy. DDH1 Drilling has successfully completed projects involving over 35 intersections drilled from a single parent hole. This advanced drilling technique provides a solid foundation for mine engineering drilling, where direction-

al drilling skills are utilised to accurately break into mine workings at significant depths.

One of DDH1 Drilling's notable achievements is the drilling of inclined H-size cored electrical drop holes at the Sons of Gwalia Mine. These holes broke through at impressive depths of 1,338m and 1,450m, and were subsequently enlarged and cased to accommodate various operations such as paste backfill, electrical cable installation, and water pumping directly to the surface.

In another project, the company successfully drilled two inclined water bores to intersect old shafts beneath Kalgoorlie's Super Pit. The holes were meticulously designed to avoid historic workings, and ad-

vanced drilling techniques were employed to achieve accurate intersections with the targets.

DDH1 Drilling utilises their larger rigs, equipped with hands-free rod and casing handlers, to complete the hole opening and casing work for such demanding projects. Their mine engineering fleet includes the 180,000lb WEI 75S rig, which excels at shallow angle holes and is fitted with a 1000rpm core drilling rotation head. They also employ the 130,000lb Foremost Explorer and the highly regarded 100,000lb UDR5000, both of which contribute to their success in executing complex drilling projects.

One of the key factors contributing to DDH1's growth is their active participation

in early-stage exploration. The company is committed to supporting exploration activities and has been instrumental in drilling discovery holes that have led to multi-rig programs, mine development, and extensive resource drilling campaigns. Their dedication to exploration has earned them contract opportunities spanning several years, allowing them to provide a complete range of drilling services.

DDH1 Drilling's expertise in deep hole multiple intersection directional drilling, combined with their commitment to exploration and industry recognition, solidify their position as a leader in the mining drilling sector. With a track record of delivering exceptional results, the company continues to shape the future of mining exploration and resource drilling. **AMR**



From first pass exploration to resource drillouts and deep hole directional drilling, no one delivers results like DDH1.

To find out more call
(08) 9435 1700 or visit
www.ddh1.com.au



BLUE SPEC

DRILLING PTY LTD



Blue Spec Drilling Pty Ltd provides a variety of drilling services including:

- ✓ Reverse circulation
- ✓ Surface diamond drilling
- ✓ Directional drilling
- ✓ Water bores
- ✓ Remote area exploration and camps

Blue Spec Drilling employs highly skilled and experienced operators and has a fleet of 20 modern multi-purpose drill rigs, which incorporate the latest safety and drilling techniques.



**BLUE SPEC DRILLING IS BASED IN KALGOORLIE, WA
AND ALSO HAS OPERATIONS IN SOUTH AMERICA.**

CONTACT MURRAY BLACK

M. 0417 973 394 P. 08 9021 3033

E. murray@bluespec.net.au W. www.bluespec.net.au

THE STARK DIFFERENCE

From the moment a drill rig first arrives on any site, expectations are high. A highly experienced team, combined with the latest fleet of rigs, form an integral part of a successful drilling program. Whether you're drilling for gold, zinc, nickel, lead, rare earths, copper, or lithium, you need an experienced team you can count on.

Western Australian-owned company Stark Drilling has over 30 years of RC drilling experience. The company understands the challenges that lie beneath the surface and how to overcome problems on the fly.

Drilling veteran, and Stark Drilling managing director, Courtney Henness, knows what it takes to consistently deliver results safely, cost-effectively, and to the highest quality, regardless of project size, location or requirements.

"At Stark Drilling, we run a well-maintained fleet of operator-friendly, late model equipment, designed by drillers for drillers, with a strong focus on safety design and innovation."

"We've seen a lot of positive changes in the drilling industry over the past three decades. Quickly adapting to these changes has helped us evolve into a big name within the industry, and has seen clients depend on us to deliver safely and economically, while ensuring our activities have minimal impact on the fragile environments that we operate in.

"We don't just stop at mineral exploration and conquering the most challenging ground conditions either. We have built a reputation of faultless hole navigation time and time again. This is coupled with our custom sampling equipment, where

we're leading the way in resource definition, grade control, and water exploration. No job is too big or too small."

The company's expertise lies in remote and difficult drilling conditions such as paleo or deep iron/clay channels. For remote activities, Stark employs complete, compact camps, mounted on 40-foot trailers, which means setup and breakdown time is kept to a minimum, with more focus on the drilling program at hand.

Stark Drilling has also introduced a newly designed Cyclone/Splitter arrangement across its fleet, which has led to a significant improvement in sample quality and maintenance downtime across all drilling conditions.

"We strive to make an impact from the

moment we hit the ground onsite, utilising a vigilant, results-oriented team, and top tier services that help us to extract quality samples, we work together with our clients to hit the required targets at every depth.

"We have also taken things to the next level by establishing our own dedicated supply chain and logistics support service.

This makes mobilisation easy, and enables us to get supplies to and from remote areas for our clients and teams in the field. We understand that remote operations can be a tough game so the support and back-up must be there when and where it's needed."

For more information, visit
<https://www.starkdrilling.com.au/>
 AMR

S T A R K
DRILLING

**Discover the
 Stark Difference
 in Drilling Services**

Welcome To Stark Drilling

At Stark Drilling, we don't just work for our clients, we collaborate with them to ensure the success of their projects. With over 30 years' experience covering everything from resource development, grade control and deep RC, through to remote and Greenfields projects, we have the knowledge, the back-up and the right equipment to deliver outstanding results.

Contact us:

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**Johnson
Screens**

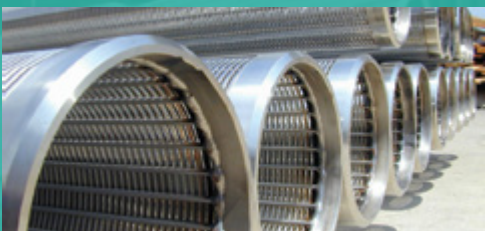
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Resilient as the Aussie Spirit

Complete Screening Solutions for the Australian Mining Industry

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The Johnson Screens' well screens, casing, pump column and chemicals were developed by our experts based on our knowledge in the water well industry and have been the heart of the well for nearly 120 years.

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mining solutions, click or
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QUALITY DRILLING AND SAMPLE RECOVERY

Raglan Drilling has the capacity and capability to work around Australia with 18 rigs specialising in RAB, Air Core, Reverse Circulation, Diamond, Auger and Lake Drilling.

The company has come a long way since 2006, when brothers Hugo and Gus Lacey started out with a one air-core rig in Kalgoorlie, WA.

Fifteen years later, Raglan Drilling has become well-known for delivering high-quality sample recovery and safe exploration drilling services.

Raglan Drilling director Gus Lacey started out in the mining industry as a geologist and has experience running resource definition programmes, grade control drilling, grade control modelling and ore extraction.

"With drilling experience from both sides of the industry, Raglan Drilling understands issues relating to poor sample recovery, hole deviation and the effects on resource estimation, head grade, block model calculations and dilution," he said.

His brother Hugo started as a driller's off-sider for McKay drilling and worked his way through to a driller in record time.

Hugo is also a competent RC & AC driller who provides a wealth of knowledge in all aspects of air drilling.

"Our long-term clients include AngloGold Ashanti, Apollo Consolidated, Breaker Resources, Horizon Minerals, Lefroy Explora-

tion, Nexus Minerals and St Barbara," said Gus.

"We strive for effective and clear communication to ensure the best outcome for every drill program."

With dedication and a 'can do' attitude, Raglan has gained a reputation for strong client relationship and satisfaction amongst a crew of 80 people.

Raglan Drilling's commitment to the health and safety of its employees and the protection of the environment is demonstrated by four-plus years of ISO accredited systems.

The list of equipment that Raglan Drilling provides includes a fleet of modern Deep Hole RC rigs, Deep Hole Diamond and fully mobile small foot-print Air Core rigs.

With 10 years of Salt Lake Drilling, Raglan offers a full suite of drilling disciplines and specialty skills for those "hard to reach" exploration targets.

Raglan Drilling also supplies complete remote camp setups with either Explorex-type caravans or transportable buildings.

Every three months, Raglan Drilling holds geology lectures with the Goldfields geoscientific community in Kalgoorlie, WA.

Drop Raglan Drilling a line now on **08 9021 3833** or email **admin@raglandrilling.com.au** to find out more. **AMR**



RAGLAN
DRILLING

Dig Deep & Deliver

www.raglandrilling.com.au





DRILLING SOLUTIONS OF SEISMIC PROPORTIONS

When you're drilling mineral deposits in harsh mine environments, you can generally expect challenging terrain and difficult to access areas. Solving complex problems on the go essentially comes down to experience and technical know-how, no matter what is encountered above or below ground.

Australia's first Aboriginal owned and operated drilling contractor, Seismic Drilling Australia (SDA), is renowned for achieving drill targets from unconventional access points, safely and accurately. Their reputation as the best value 'difficult access specialist' stems from the company's capability of consistently completing shallow angles, from -20 to -90 degrees.

SDA understands the Australian landscape and the challenges associated with different mining environments.

It has been a part it for decades and has a management team with more than 150 years of combined experience in all major drilling techniques.

Backed by a team of accredited drillers, the company utilises a modern fleet of compact, versatile rigs that allow it to reach unique drill targets, whilst providing clients with a flexible, cost-effective drilling program.

"We customise our approach to meet our clients' individual project requirements,"

said SDA Managing Director, Dwayne Reynolds.

"What's important for us is safely and efficiently delivering our services with minimal environmental impact, an approach that aims to support and strengthen community and culture. We take pride in what we do, and our people are a reflection of that.

"As local leaders in drilling, we constantly strive to improve and innovate, from staff upskilling to keeping up-to-date with the latest drilling equipment and techniques. Every drill rig we operate not only meets or exceeds Australian safety standards, but is selected based on its proven adaptability and operating efficiency."

SDA offers a range of specialist drilling services to suit all types of exploration and drilling programs.

For mining and exploration projects, the company's drilling expertise is second to none. It can safely and accurately capture data in solid core samples through advanced techniques. These include diamond coring, directional drilling, and Air-core drilling.

Mr Reynolds says shallow angle drilling is where the company has really differentiated itself as a specialist driller.

"We know our way around shallow angles with proven expertise in flattened angles as low as -12 degrees by the end of hole. This unique ability enables us to complete drill programs in areas subject to extremely tight access, which saves costly redesign or site works.

"Additionally, when environmental or heri-

tage restrictions are in place, our capability can be the difference between the project's drill viability entirely.

"We regularly combine shallow angle techniques with directional hole control to hit targets that other contractors can't, including drilling alongside and underneath open-cut pits, and hitting targets previously deemed unachievable.

"This is complemented by our fleet of compact, fit-for-purpose Aircore drill rigs, which offer a low impact footprint deigned for tight access in even the remotest areas. This helps us strengthen the services we can offer clients, from greenfield exploration to mine production, they can be confident we have the skills and equipment to respond to any project."

Geotechnical drilling and land based site investigation is another area where SDA excels. When it comes to accurate design of earthworks and foundations, or the repair of existing structures, the company is a trusted professional with experience in obtaining accurate sub-surface soil and rock data.

"Whether it's testing and monitoring equipment installations, SPT and packer testing, piezometer, inclinometer or extensometer installation, we've got you covered," said Mr Reynolds. **AMR**



For more information, visit <https://seismicdrilling.com.au/>



Tailored drilling solutions to complex problems.

Australia's very first Aboriginal-owned drilling contractor with the unique ability to achieve drill targets from unconventional access points and shallow angles from -20 to -90 degrees.

We understand this country.

Is your contractor challenged by shallow angles and unconventional access points? SDA consistently achieve our drill targets by combining the industry's most compact, versatile rigs with talented, highly experienced crew.

- Nationally Accredited with decades of experience
- Innovative team player: we listen to clients
- Safe and accurate: SDA is highly cost effective



Contact:
T +61 8 9302 6777 | E dm@seismicdrilling.com.au
or visit seismicdrilling.com.au



➤ **Mayor Gregory Campbell,**
Cloncurry Shire Council

Located in North-West Queensland, the town of Cloncurry boasts a rich history that dates back over 150 years.

It is nestled on the banks of the Cloncurry River, a catchment area that stretches all the way from the Selwyn Range through the Flinders River and into the Gulf of Carpentaria.

Since its founding in 1867 by Ernest Henry, the rural town and surrounding regions have become a prosperous epicentre off the back of mining and agriculture.

In its early beginnings, Cloncurry was the home of Qantas, with the original Qantas hangar still in use at the airport, and where 'Queensland and Northern Territory Aerial Services' remains proudly displayed above the hangar door. The town also served as a major USA air base during World War II.

With vast copper reserves and other valuable critical minerals such as gold, silver, lead and zinc, Cloncurry has become a focal point for mining companies as they invest in major projects and innovation, fuelling industry growth and boosting the local economy.

This is rapidly transforming the region and surrounding communities, creating job opportunities and an environment for people to live and thrive well into the future.

The past and present

The *Australian Mining Review* recently interviewed Cloncurry Shire Council mayor Greg Campbell, in which the Mayor highlighted the significant contribution that mining has had on both Cloncurry itself and its neighbouring regions.

"The continued strength of the mining industry over the past decades has benefited North-West Cloncurry on a number of levels," he said.

"Mining has essentially created thousands of jobs where the majority of them were previously based in areas like Cairns, Townsville and Brisbane.

"We've seen mining companies attract talent from outside the region, which has generated local employment opportunities.

"This is a win-win for both the community and businesses involved, particularly

as mining staff live locally and help make Cloncurry a sustainable place to live and work.

"Mines such as Dugald River, Cannington, and Ernest Henry, have been in operation for over 25 years and generated hundreds of millions in royalties for Queensland.

"We're really proud that our area has played a key role in producing so much wealth for the State.

"The opportunity to have a well-paid and worthwhile career in mining is well and truly here in Cloncurry Shire."

Mayor Campbell acknowledges the continued contribution of mines in the local community, particularly the rates they pay, which lifts the level of service the council offers.

"Upgrades to parks, amenities, and critical infrastructure, as well as events and communities groups we support, wouldn't happen without the rates the mining companies pay," he said.

"Another key benefit is the strategic partnership between the mines and transport operators, which have worked together to build roads and railways that connect communities."

A growing demand for minerals

The increasing global demand for Queensland's critical minerals means that regional towns like Cloncurry and Mt Isa need to establish strategic priorities to ensure healthy economic development over the long-term.

"It's worth noting, we have an abundance of minerals here in Cloncurry and its surrounds, from copper, gold, silver, lead and zinc, to vanadium, cobalt, phosphate and graphite, among other rare earths," Mayor Campbell said.

"The strength of the original mines in the region such as Eloise Copper Mine, Dugald River, Cannington and Ernest Henry, and the fact it takes a significant amount of time to get a greenfield project off the ground and into full operation, Cloncurry is a reflection of what's possible.

"If you have a desire to produce a particular metal, Cloncurry is the place to come.

"Mining is obviously the predominant pri-

ority we're lobbying for, specifically upgrading roads to and from the ports.

"Without mining, this simply won't happen. The Flinders, Landsborough, and Barkly highways are in need of an upgrade, as well as the Cloncurry-Dajarra Road.

"We've been working with the Department of Transport and Main Roads to get these roads appropriately sealed for all weather conditions from Phosphate Hill to the Port of Townsville."

Mayor Campbell added it's all about making the logistics chain as efficient as possible and the only way to achieve this is by having quality roads.

"Whether agricultural products or metals, both industries are competing on global markets, which need to streamline the transportation of their materials from site to port," he said.

"We are also lobbying for access to water from the Julius Dam, an asset that is currently underutilised and will enable industry growth.

"As the CopperString project highlighted huge potential in South Cloncurry, Council has its own projects involving water storage, which serve as an important step in removing unnecessary roadblocks to water accessibility."

CopperString 2.0

CopperString 2.0 is a 1,000km high-voltage network line will connect businesses and communities across Mount Isa, Cloncurry and the North-West Minerals Province, to the National Electricity Grid.

Not only will the project boost the national income by \$45 billion, it will provide reliable and competitively priced electricity to the North-West Queensland regions, delivering new opportunities for the mining, industrial, and manufacturing industries, as well as support renewable energy projects.

Mayor Campbell says CopperString is another example of a major project that will generate significant economic returns through job creation and increased revenues for Queensland, particularly Cloncurry and surrounding communities.

"Cloncurry will be a key hub during the construction phase of the CopperString 2.0 project," he said.

CLONCURRY MAKES ITS MARK



The Ernest Henry mine is located at Cloncurry.



The Cloncurry township.



The Mine Cart Rally is a favourite event at the annual Cloncurry Beat the Heat Festival.

"In the short-term, it will deliver a massive boost to our community in terms of the workforce and economic benefits, while helping get the new mining and renewable energy projects off the ground.

"As a resource rich region, we have considerable critical mineral reserves, estimated to be around \$740b.

"Unearthing these minerals obviously requires exploration, meaning more jobs and opportunities for local businesses to get involved."

A focus on community partnerships

Cloncurry Council continues to actively engage with the community and mining companies to build stronger relationships and identify opportunities for local businesses within the mining industry.

"We've been a mining and agricultural area for over 150 years now, with both industries working in relative harmony," Mayor Campbell said.

"We have seen really strong growth in the transport sector and it's clear that this is providing valuable support for mining operations in the region.

"In 2022, we hosted the Road and Rail Forum, which was an opportunity for industry leaders to discuss road and rail infrastructure solutions for North-West Queensland.

The industry players involved shared insights that have given a voice for future lobbying.

"In September 2023, we will also be hosting our first mining conference.

"A lot of Queensland miners in the region previously had to travel to other States to talk about their projects, however this time they can do it right here in Cloncurry where the actual project is happening.

"Tours of local mines sites will be in the schedule, giving stakeholders unique insight into what the community is like, and the positive impact these mines are having in the region.

"Cloncurry has been named the friendliest town in Queensland on two occasions.

"This reinforces why it's truly an ideal place to do business, raise a family, and build a solid career." **AMR**

THINK CONCRETE WITH BELL RURAL CONTRACTING

Wherever you look in an industrial operation or mine site, there's bound to be a plant facility or other type of infrastructure that's been carefully crafted of concrete.

Based in Cloncurry and Richmond, Bell Rural Contracting (BRC) services all areas of rural North West Queensland wherever concrete pumping and mobile batching are required. For fourteen years, the family owned and operated business has supplied concrete to domestic, industrial, mining and government projects of all sizes.

From in-ground pools and concrete slabs to major mining infrastructure and main road culverts, BRC has the capability to tackle projects of any scope.

BRC is the only concrete supplier in North

West Queensland that offers mobile batching plants. In 2007, the business started its first concrete batching plant in Cloncurry to supplement its day-to-day services and deliver concrete to clients in the local region. It now operates a second plant out of Richmond.

Batching plants can be quickly and easily established onsite, saving clients time and money as trucks don't need to travel long distances to get concrete where it is needed. Having a batching plant onsite is a valuable tool for any significant infrastructure project. This is particularly important in remote locations prone to high temperatures, which can impact the quality of concrete in transit.

What sets BRC apart from other concrete suppliers is its four mobile batching plants, which are capable of batching 30

to 40 cubic metres of concrete per hour in any location required. As a result, concrete pumping or spraying for large infrastructure projects can be completed in a fraction of the time, delivering significant cost savings.

"Our mission is to supply high quality concrete services to remote and rural areas of Queensland," said BRC Director, Allen Bell.

"We pride ourselves on being timely, responsive and committed to working with clients to meet their unique needs, providing competitive pricing on all services. Thanks to our state-of-the-art mobile batch plants, we are able to batch concrete at remote locations for large-scale projects.

Another service unique to BRC is a spraying service, which can be used to concrete

hard-to-reach areas, such as angled batter slopes. The business has continued to refine this service through extensive experience in concreting culverts and batter slopes along the Flinders Highway.

Mr Bell added that all products are sourced from accredited suppliers, mix designs are approved by Cement Australia, and trial mixes are tested by a NATA accredited organisation.

"Our exceptional customer service and quality assurance has secured us 'preferred supplier' status for the Department of Transport and Main Roads, as well as RoadTek, and we adhere to strict EPA guidelines in all works undertaken."

For more information, visit
<https://bellrural.com.au/>

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BRC
BELL RURAL CONTRACTING

CONCRETE SUPPLIERS



**CONCRETE PUMPING AND MOBILE BATCHING IN CLONCURRY,
RICHMOND, MT ISA & NORTH WEST QUEENSLAND**

If you need to get your mining or infrastructure project off the ground, you can count on **Bell Rural Contracting**. For 14 years, we've been servicing industrial, commercial and government clients with efficient and reliable concrete batching and pumping. Thanks to state-of-the-art mobile batch plants, we have the ability to batch concrete at remote locations for large-scale projects for the highest quality results.

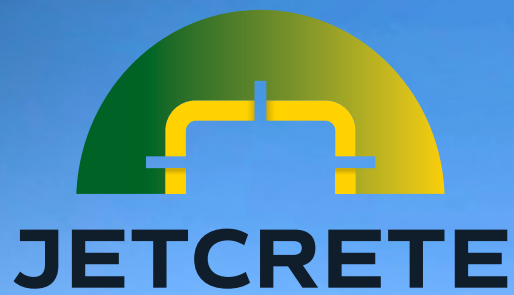


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AUSTRALIA'S LEADING GROUND SUPPORT SPECIALIST

With over 40 years' experience, Jetcrete has earned the trust of mining professionals and related industries by providing unparalleled ground support services across the country. Jetcrete's expertise lies in shotcreting, the application of specially adapted materials using cutting-edge techniques. As the largest shotcrete provider in Australia since 1992, the company has set the industry standard for underground shotcrete and fibercrete ground support.

Through collaborations with key industry suppliers, Jetcrete has introduced significant advancements in shotcrete technology, including robotic shotcrete units, hydroscaling for improved mining development efficiency, and 3D laser scanners for QAQC thickness verification. With a focus on complete support, they offer a comprehensive range of services to address all stages of underground shotcreting.

From on-site concrete, shotcrete, and CAF manufacturing, to supply, delivery, and application, Jetcrete's experienced team ensures seamless project execution. They also extend their capabilities to encompass surface and underground civil infrastructure works, including earthworks, machine foundations, drainage and culverts, concrete slabs, heavy workshops, and site offices.

Concrete manufacturing is a cornerstone of Jetcrete's operations. Since 2003, it has been at the forefront of the industry, owning and operating 16 batch plants across the nation. This strategic infrastructure ensures access to round-the-clock concrete, CAF, and shotcrete manufacturing, enhancing production capabilities, reducing costs, and ensuring stringent quality assurance. Collaborating closely with major suppliers, Jetcrete tailors specialised

mixes to meet the specific requirements of hard rock mines.

Jetcrete's delivery services cater to even the most remote and challenging sites. Its fleet of over 95 trucks, including low-profile transmixers and underground-approved concrete trucks, facilitates the timely and efficient delivery of concrete. By providing nationwide coverage, Jetcrete guarantees projects of any scale or location receive the support they need.

With a commitment to safety front and centre, Jetcrete has developed ground-breaking technological advancements to enhance project confidence and effectiveness. By eliminating high-risk tasks and improving worker well-being, Jetcrete's innovations redefine safety standards in the industry. The company's latest addition, the Ready Jet® Drum Blasting system, high-pressure cleaning by enabling remote-controlled cleaning of agitator drums. This eliminates the need for workers to enter confined spaces, minimises hazards, and significantly reduces cleaning time.

Jetcrete's comprehensive service offering extends beyond shotcreting and concrete

manufacturing. The company's remote shaft lining expertise eliminates the need for personnel to enter hazardous environments during the lining process. Compliant with AS/NZS 4871 standards, Jetcrete operates in Zone 1 environments safely and efficiently. The company also offers cable bolting services, utilising a multitude of cable bolting units, and employs laser scanning technology for precise shotcrete application thickness measurement. Furthermore, Jetcrete's resin injection services provide additional rock support for underground mining, including stabilisation and anchoring.

In the realm of civil construction, Jetcrete's capabilities cover a wide range of services for both surface and underground operations in remote locations. Jetcrete's civil construction division is equipped to handle diverse projects, including the construction of heavy-duty workshops, mine site offices, machine foundations and slabs, drainage and culverts, earthworks, and high wall stabilisation utilising a modified boom pump as a shotcrete applicator.

By offering these services, Jetcrete's clients receive comprehensive project support, from initial ground support to the con-

struction of essential infrastructure. Jetcrete's impressive track record and commitment to professionalism have made it the go-to choice. The company's dedication to continuous improvement, technical expertise, and emphasis on safety, have earned it the reputation as Australia's leading ground support specialist.

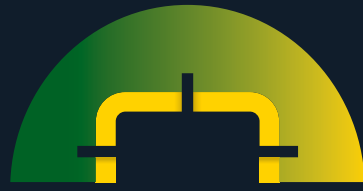
When partnering with Jetcrete, clients can expect unparalleled support from a team of experienced professionals who understand the unique challenges of the mining industry. The company's extensive experience in all aspects of ground support, combined with its state-of-the-art equipment and focus on training and education, ensures that projects are executed with precision, efficiency, and the highest quality standards.

Jetcrete stands out as Australia's premier ground support specialist, delivering complete support from the ground up. With a strong focus on safety, innovation, and technical expertise, Jetcrete has established itself as the trusted partner for mining professionals and related industries.

By offering a comprehensive range of services, including shotcreting, concrete manufacturing, remote shaft lining, cable bolting, laser scanning, resin injection, and civil construction, Jetcrete has the capability to support projects of any scale and complexity. When it comes to ground support solutions, Jetcrete is the name to trust, providing reliable and efficient services that ensure the safety and success of mining and construction operations in Australia.

For more information, visit
www.jetcrete.com.au

AMR



JETCRETE

Complete support from the ground up

As Australia's leading ground support specialist to the mining industry, Jetcrete uses the latest techniques and specially adapted placement materials to provide a shotcreting service for clients across the country.

With more than 40 years in the industry, Jetcrete has extensive experience in all aspects of concrete spraying. We are capable of providing a complete service for all stages of underground shotcreting service including onsite concrete, shotcrete and CAF manufacture, delivery and application.

Jetcrete is also capable of delivering specialist ground support services including shaft lining, cable bolting and resin injection.

Find out more about our services and careers, visit:

jetcrete.com.au

Dump trucks in the City of Kalgoorlie Boulder are known for their enormity.

KALGOORLIE-BOULDER: DOWN & DIRTY IN A GROWING REGION

■ By Kate Dzienis

Australia's largest outback city, with a population of more than 30,000 people, is a thriving municipality full of activity and expansion brought on originally by mining for gold.

With a history dating all the way back to June 1893 when two Irish prospectors chased rumours of a gold find and pitched camp 40km north-east of Coolgardie, Kalgoorlie-Boulder is now the WA 'centre for gold'.

Today, the city's fortunes have followed the boom of the mining industry and gold still does remain its principal industry together with recent discoveries of nickel and lithium.

Nickel has been mined in the area since the 1960s and lithium since the 2010s.

Now, with the two metals making their mark in the world, the Goldfields region has stepped up its game as demand for battery metals creates new opportunities.

According to City of Kalgoorlie-Boulder mayor John Bowler, who has stood tall in his position for seven years, the region has settled into a nice steady rhythm of production and growth.

"Industry is ticking along exceptionally well," he said.

"Gold prices have settled back in the last couple weeks but it's still very strong, while nickel is healthy and has a bright future.

"Lithium's been discovered in the region now and there are proposals for more lithium mines in the next four to five years.

"We're also nearing the completion of a \$700m rare earth processing plant here in Kalgoorlie so that's another industry.

"For a good 80-odd years, we only had gold, where we waxed and waned on the fortunes of one metal.

"After nickel was discovered in Kambalda, about 60km south of Kalgoorlie-Boulder, in the 1960s, that gave us two strings to the bow.

"For a long time, gold was seen as the metal of safe keeping, while now it's vice versa – when it's not as strong, copper and nickel are very good.

"This is a rare thing, especially in the last couple of years with the greater use for nickel as a battery metal.

"Gold prices, nickel and lithium are all very strong, and there is seemingly no short-term end to that trend."

As a City that supports the local mining industry and growing its own residential workforce, Mr Bowler says he is a realist and understands it's not always possible to head in that direction 100%.

"My preference is for no FIFO in Kalgoorlie-Boulder but I realise it may not suit a lot of workers," he says.

"Young workers in particular want to live in capital cities with the lifestyle and align themselves with companies who do FIFO, but most companies in the Goldfields try

to engage residents because it's a more stable workforce.

"FIFO is more expensive, but companies do ultimately need to have some of that." With that in mind, Mr Bowler reveals the region requires more FIFO accommodation so that housing is kept more firmly for locals.

"We've gotten FIFO recently by stealth – it's been increasing but there's not much accommodation for what the mining, drilling, service and trucking companies need," he explained.

"They've had to lease or hire single workers and put them into houses – we need single bedroom units for workers that cater to one- to two-week rotations.

"The good thing though is that Kalgoorlie-Boulder is bigger than most people would think and it's certainly accommodating.

"It has a great lifestyle and, many times, once people get here on FIFO and return to their families, the workers are encouraged to transfer here to live."

The City has been building one to two-bed-

room units over the last few years but get filled with workers very quickly whenever they are completed.

The shortage continues...

With 1,000 to 1,500 new workers predicted for a redevelopment or rebuild of the Super Pit mine, owned by Northern Star Resources (ASX: NST), and Evolution Mining (ASX: EVN) recently announcing a \$250m expansion of their gold plant to the north and west of town, demand for accommodation will – if not already, is – over and above the current shortage.

A solution to make room for this incredible growth is construction camps, according to Mr Bowler.

"Construction camps are even more short term than FIFO, but there's a demand there and it's amazing," he says.

"I mean, Northern Star sees the Super Pit as having a far longer future than its previous Canadian and American owners.

"The plant's an old one – so they either have to re-model or re-build a total new plant.

"The decision is up to them, obviously, but they're absolutely expanding.

"At the moment, they're doing a lot of drilling to go back underground when open pit mining is eventually finished.

"They have a lot of tenements on the eastern edge of Kalgoorlie that could see more mining, particularly if the east-west trans Continental railway line is relocated to the south of Kalgoorlie."

Kalgoorlie-Boulder has yet to reach its full potential. The City is providing current and future generations with a quality of life that is sustainable and prosperous and, no doubt, there is more to come.

AMR



The famous Kalgoorlie Super Pit.

WORKPLACE URINE DRUG SCREENING

Why It Doesn't Pay To Cut Costs

With state-of-the-art laboratory screening facilities in Kalgoorlie, Clinipath Pathology is best placed to provide fast and reliable laboratory urine drug screening in the Goldfields.

The Clinipath Brookman Street laboratory is the only facility in the Goldfields region of WA that holds NATA accreditation for laboratory urine drug screening.

Workplace drug testing is central to keeping all staff and mine sites safe.

Choosing a drug testing service with the utmost commitment to quality is critical.

At a minimum, this means accreditation by the National Association of Testing Authorities (NATA) for drug testing to Australian Standards. These Standards provide industry-wide procedures for workplace drug testing, including specimen collection, laboratory screening and confirmatory testing.

Collection procedures must be able to withstand scrutiny when challenged. While Australian Standards require specialist services to implement, especially in remote regions, compromising on quality in drug testing can prove more costly in the long run, with employees challenging testing procedures thereby undermining the integrity of an otherwise excellent workplace drug policy.

Screening procedures should identify uncomplicated samples reliably and efficiently, allowing the majority of workers to be quickly cleared for work. Screening procedures should also detect cheating. **This is increasingly important as products designed to cheat tests are becoming increasingly accessible online and through vaping shops.**

Confirmatory testing for unequivocal drug identification is the final step and should be supported by scientific and clinical expertise to interpret procedures and final results. Although agencies can be accredited separately, it may be preferable for your provider to hold accreditation to all sections to ensure full capability and seamless integration with other agencies involved.

The Kalgoorlie laboratory feeds into the metropolitan Clinipath laboratory, with mass spectrometry for confirmatory drug identification in full conformance with Australian Standards.

The central facility has scientists and doctors with decades of expertise, some of which have been called as expert witnesses to hearings on contested drug tests at the Fair Work Commission and Supreme Court of WA.

Contact Dr Chris Cruikshank and the Toxicology team for support +61 8 9371 4560 or toxicology@clinipath.net





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CAPRICORN METALS

BREATHES LIFE INTO NEWMAN GOLD EXPLORATION

(Image source: Capricorn Metals)
Birdseye view of Capricorn Metals' Karlawinda gold project.

Located in a largely unexplored and recently recognised belt of Archaean-aged greenstone rocks lies the Karlawinda gold project (KGP).

Situated approximately 65km south of Newman in the Pilbara province of WA, gold mineralisation at Karlawinda lies underneath laterite gold mineralisation in clays rich in kaolin and smectite.

Over its 12-year mine life, the advanced gold project is expected to produce about 1.2moz of gold.

Project background

After acquiring 100% of the project in 2016, Capricorn Metals (ASX:CMM) began construction of Karlawinda in December 2019 with work completed in June 2021.

First gold was poured a few weeks later with a 12kg (386oz) bar produced.

With a strike length of 2.5km and a down-dip length of 2.5km, the main gold production at Karlawinda comes from the Bibra gold deposit.

Karlawinda also contains several other exploration targets including the Francopan prospect, the Vedas prospect, the Carnoustie prospect and the Berwick prospect.

Due to its location in the Pilbara, very little modern and thorough gold exploration has been completed outside of the Bibra deposit.

Autonomous vehicles

To demonstrate and evaluate the capabilities of autonomous vehicles, Capricorn and mining and civil construction company MACA completed a stage one proof of concept trial of driverless trucks in March 2022.

The trial was undertaken in a cleared and safe area away from active operations. The technology was installed on a Hitachi EH3500 model 180T dump truck on a haulage cycle route.

Given the results of the proof of concept, a non-binding memorandum of understanding was signed between both companies.

"The autonomous haulage trials that MACA and its technology partners have completed at Karlawinda are a very exciting first step in innovation that could be a step change opportunity for the mid-tier open pit mining space," Capricorn executive chairman Mark Clark said at the time.

"Capricorn is proud to have facilitated the trials and is impressed by the proof of concept that has been achieved to date."

If Capricorn chooses to go autonomous, it will improve operating efficiency and availability which could deliver cost savings and improve the safety outcomes of workers in the active mine.

The autonomous vehicles would also lower fuel consumption and reduce maintenance and tyre wear.

Capricorn remains in discussions regarding its future using autonomous vehicles. Production

Open-pit mining from a single large multi-stage open pit is used to mine Bibra while other methods, including grade control reverse circulation drilling, blasting and load and haul activities, were chosen to suit the orebody and reduce dilution and ore loss.

The mining fleet consists of four 100t haul trucks, eight 130t haul trucks, and other

equipment including excavators, dozers, graders and loaders.

In Q3 2023, Karlawinda produced 30,841oz of gold — an increase on the 29,310oz produced in Q2 2023 — and keeping Capricorn in line with its annual guidance range of 115,000 – 125,000oz.

This result was achieved despite operating challenges late in Q3 which included 230mm of rain in the last week and a two-day mill shutdown to repair a plant electrical fault.

Mining and processing

Consisting of a crushing circuit, gravity recovery, crushed ore stockpile, grinding, adsorption, electrowinning and smelting qualities, the process plant has a throughput capacity of up to 5mtpa.

The run of mine ore is firstly passed through a primary crusher before it is stockpiled and passed through a semi-autogenous ball mill crusher. The ore is then grinded further.

Gold is recovered through conventional

cyanide leaching and carbon-in-leach recovery processes.

Once the process is completed, the tailings are deposited in either a tailings storage facility or an integrated waste landform. The water is recovered using recycling techniques.

Process water pond

Decant water from the tailings storage facility and general overflow is removed by a submersible decant pump and pumped directly into a process water pond.

Able to hold up to 10,000m³ of water, water from the process pond will be distributed to various end use points in the process plant.

Water that has been contaminated by hydrogen and carbon from the vehicle washdown bay and workshop is treated through an oil-water separator.

Treated water is then reused at the washdown bay and in dust suppression around the site. **AMR**



(Image source: Capricorn Metals) Decant water from the tailings storage facility runs into the process water pond.

PATHWAY TO AUTONOMY

MACA has a five-year open-pit mining services contract with Capricorn Metals' Karlawinda gold project in WA until late 2025 with scope of work consisting of early works, drill and blast, load and haul, as well as construction of a 2.6km airstrip.

Successful Proof-Of-Concept

Early last year, MACA and its technology partners SafeAI and Position Partners (collectively called Automation Partners) completed a six-month stage 1 proof of concept of a proprietary automated haulage (driverless trucks) technology system through field trials conducted at Karlawinda.

The trial involved the retrofit of an existing Hitachi EH3500 model 180t dump truck with autonomous hardware and software, with the technology able to be quickly implemented across a site or fleet on most types of equipment.

This field trial culminated in the achievement of successful autonomous load, haul and dump cycles in February 2022.

Autonomy 2.0

MACA general manager of strategy and growth Shane Clark says the company has been focusing on further developing the software behind the drive-by-wire (DbW) system since then.

"We are developing the technology into what we coin 'Autonomy 2.0', which is really taking the autonomous tool beyond what is currently available in the marketplace," he said.

"This means adding advanced object detection functionalities, reliance on vision systems and advanced navigation inside the autonomous operating zone.

"We are now at the stage where we are looking at fitting this technology into additional vehicles and moving to have the first fleet in operation."

Long-Term Partnership

MACA is thinking long-term in its partnership with Capricorn Metals and Karlawinda.

"We want to concentrate on developing autonomous solutions that are fully capable of performing all types of work at the Karlawinda site," Mr Clark said.

"The next round of trucks we are going to retrofit with this autonomy solution are much smaller vehicles, which means we will have a mixed fleet of both 90t payload and 180t payload trucks."

The rationale behind this is that MACA wants to be able to service both the smallest mines and the largest operations – from the smallest to the largest market cap.

"Traditionally, contractors have struggled to keep that full breadth of operation and this is something that we are fiercely defending," Mr Clark said.

About MACA

MACA, a Thiess company, is an international contracting group that has been providing services to the mining, infrastructure and construction sector industries for 20 years.

An excavator loading an Hitachi 180t dump truck, retrofitted with autonomous hardware and software, during MACA's proof-of-concept field trial at Karlawinda last year.

It has mining clients across a range of commodities including Allkem, Atlas Iron, Regis Resources and First Quantum Minerals.

MACA delivers operational expertise and equipment tailored to the needs of mine sites, clients and end-users, with its specialist mining services covering project management, drill and blast services, load and haul services, materials handling, non-process infrastructure, as well as a self-owned fleet of high-quality mining plant and equipment.

MACA was recently awarded a five-year \$850m open pit mining contract extension at the Gruyere gold mine in WA, a joint venture (JV) between Gold Fields and Gold Road Resources, providing a comprehensive range of mining services of those listed above, as well as crushing, screening and light vehicle (LV)/heavy vehicle (HV) maintenance. **AMR**

CONTRACTOR OF CHOICE AT KARLAWINDA

MACA is a trusted contract partner of Capricorn Metals. From feasibility and construction into mining and technology, our operating divisions provide support at every stage of the Karlawinda Gold project.



**MACA
INTERQUIP**



**MACA
CIVIL**



**MACA
MINING**



**AUTOMATED
HAULAGE**

Our people have designed and deployed AI-powered autonomous haulage at Karlawinda, establishing safer, more productive and cost-efficient operations for our client that is helping to future proof our operating strategy.



maca.net.au

MOUNT GIBSON IRON

SHINING THE LIGHT ON 4 YEARS OF KOOLAN ISLAND OPERATIONS

By Ashleigh Melanko

(Image source: Mount Gibson Iron) Shine open pit in mid-2021, three to four months before mining was suspended.

Boasting hematite ore grades of 65%, Mount Gibson Iron's (ASX:MGX) flagship Koolan Island operation has celebrated four years of operation.

1900km north of Perth, Mount Gibson acquired Koolan Island in 2007 through the takeover of Aztec Resources.

Production from the satellite pits began in 2007 and a seawall was constructed to enable the dewatering of the high-grade Main Pit orebody.

Work began in 2011 and three years later, in excess of 20mt of ore had been produced and sold under Mount Gibson's ownership.

Seawall reconstruction

Mining was suspended temporarily in October 2014 to monitor and repair an unstable area in the upper part of the southern pit wall.

A month later, high tide caused the wall to slump even further and the Main Pit to flood.

Mount Gibson spent the next two years

completing detailed designs, technical evaluation and peer reviews with a feasibility study confirming compelling economics for the Main Pit.

Mount Gibson Iron chief executive Peter Kerr spoke about the construction and re-development process of the seawall.

"The seawall rebuild project involved re-establishing the embankment in a section of the natural rock wall that housed an ancient bay," he said.

"Within the embankment we excavated a 1m wide trench which was filled with a slurry clay and acts as a waterproof barrier, similar with approaches used for waterside civil construction projects such as Elizabeth Quay and Barangaroo.

"The seawall rebuild commenced in 2017 and was completed in late 2018, with mining underway from around that time and the first shipment occurring April 2019."

In April 2019, Mount Gibson restarted sales of its high-grade hematite iron ore with around 72,000wmt of ore sent to China.

Since then, shipments have accelerated with Mount Gibson targeting 1mwmt of high-grade iron ore in the June 2023 quarter for a total shipment of 2.9mwmt in FY23.

Restarting operations at Shine

While it was in its first year of operation, Mount Gibson suspended activities at the Shine Project in October 2021 in a bid to reduce spending and preserve the value of the site.

The company credited this to significant adverse movements in iron ore prices, shipping freight rates and product discounting.

The site was then placed on care and maintenance pending an improvement in the iron ore market conditions.

Mr Kerr said suspension of operations at Shine was the only option given the high transport and shipping costs.

"From an operational perspective, Shine was an efficient and productive small-scale operation, however, the substantial discounts that applied at that time to me-

dium grade iron ores such as Shine ore and the substantially higher transport and shipping costs compared with Koolan Island, made suspension the only prudent option," he said.

"These cost challenges, and the uncertainty over the future extent of discounts on lower grade ores, remain significant considerations to any proposed restart."

Situated 375km northeast of Perth, Mount Gibson acquired Shine in early 2014 but development was postponed amid softening market conditions.

Development began in late 2020 and in October of that year, Mount Gibson declared initial ore reserves of 2.8mt at a grade of 59.4% iron in the stage one pit. Annual production was forecast at around 1.5mwmt over a two-year period.

Shine was cleared in February with blasting and mining of overburden beginning in late March 2021.

Partnering with local communities

A co-existence agreement with two Aboriginal Australian people, the Dambimangari



(Image source: Mount Gibson Iron) Two new Komatsu PC4000 excavators.



(Image Source: Mount Gibson Iron) Koolan Island crushing circuit, ROM pad, shiploader and wharf.

(Dambima/Worrorra-Ngardi) traditional owners of the land, has been in place since 2006.

In return for the employment of local Indigenous and business opportunities for the region, Mount Gibson can develop Koolan Island and ship the ore from the island.

This agreement aims to ensure that by the eighth year of operation, 30% of the workforce is filled by Indigenous peoples. Mr Kerr is pleased the relationship is still going strong.

“Mount Gibson’s longstanding and positive relationship with the Dambimangari People is something of which we are extremely proud and work hard at to maintain,” he said.

“Since the original co-existence deed was signed in 2006, the relationship has evolved and grown into a successful partnership of respectful co-operation that has significantly benefitted both parties.

“Dambimangari workers make up a significant proportion of the over 20% of

our Koolan Island workforce who are First Nations people, and we continue to work with them to boost those figures further.

“We also work hand in hand with the Dambimangari across a range of other areas, including managing local flora and fauna such as the northern quoll, responses to the spread of cane toads in the Derby region and in assessing potential future commercial opportunities for Koolan Island once mining is complete.”

Future exploration opportunities

While Koolan Island is Mount Gibson’s main operation, the company is aiming to branch out into other materials.

Mr Kerr said the company’s next focus is on base metals.

“As we’ve noted for some time, our longer-term ambition is to extend the life of our business beyond the current Koolan Island life by harnessing cashflow from Koolan Island to invest in new resources development and production opportunities, notably in other commodities such as base metals,” he said.

“We’ve already stepped up our internal exploration activities, focused on base metal in the general vicinity of our closed Talling Peak mine in the Midwest, where

we’ve been conducting small scale drilling programs at several locations to better understand the regional geology.” **AMR**



(Image source: Mount Gibson Iron) Final stages of seawall construction in 2018 before dewatering began.

RECRUITMENT PROCESS OUTSOURCING ADAPTED TO YOUR RESOURCING NEEDS

Adaptive Resourcing is a talent advisory and recruitment outsourcing business based in West Perth. Over the last 10 years, the business has set a benchmark for innovative recruitment ideas using a unique model to offer a genuine alternative to more traditional recruitment agencies.

One of the services Adaptive offers in the mining space is recruitment process outsourcing or RPO. RPO is often considered a behemoth – a large contractually exhausting and financially expensive piece of work that is only reserved for large companies.

Adaptive Resourcing are very proud to promote RPO as a fast, efficient, and inexpensive solution to meet any company's resourcing needs.

Proudly Supporting Mount Gibson Iron
Adaptive Resourcing is proud to support

Mount Gibson Iron as its RPO partner.

For the restart of mining operations at Koolan Island, Adaptive Resourcing installed a talent acquisition team, fully equipped with systems, processes and leadership to meet this challenge in a matter of weeks.

Subsequently, over the past 5 years Adaptive Resourcing's team has recruited every role within the business and delivered special projects and mine restarts with a constant focus on process improvement.

Adaptive Resourcing works closely with Mount Gibson Iron to ensure that all vacancies including operations, processing, maintenance, tech services and supervisory roles, are broadcast widely to attract a diverse set of applicants to compliment Mt Gibson's impressive candidate database.

Additionally, targeted search processes are applied for critical, hard to fill roles.

But RPO isn't just for companies of that scale.

Recruitment Horsepower Always On-Hand

Adaptive Resourcing also supplies services on to other developing and mid-tier mining companies under the concept of "there when you need us and not when you don't."

This allows companies without a consistent need for recruitment to draw on Adaptive Resourcing's resources when there is a need for recruitment horsepower without introducing a fixed cost to the business.

Adaptive Resourcing is also called upon by progressive companies needing a short-

term solution for pre-FID recruitment, feasibility studies, and project ramp ups.

Outsourcing doesn't need to be complicated.

Nor does it need to be expensive.

Over 10 years Adaptive Resourcing has demonstrated that an RPO can provide companies with cutting edge tech, experienced staff and a proven process without a significant time burden or expense.

To discuss how a different approach to recruitment may be the right move for your business, call Adaptive Resourcing.

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DIGITALISING ORE FLOWS

FOR PRODUCTION AND PROCESS IMPROVEMENT USING SCANTECH ROCKS2DATA ANALYSERS

Pursuit of improvement opportunities inevitably requires more data – data from material flows not currently measured, and high quality data that provides confidence in decisions based on that data. Such data is generated through representative real-time measurement of conveyed material quality at various points between the mine face and mill feed. Real-time data enables effective decisions that improve operational performance.

Scantech International has developed and implemented a range of conveyed based analysers specifically for this purpose.

GEOSCAN GOLD is a premium elemental analyser featuring the highest specification prompt gamma neutron activation analysis (PGNAA) technology available. TBM moisture analysers utilise transmission microwaves to provide reliable moisture measurement in many commodities.

Sizescan is a next-gen 3D Infrared camera technology used in PSD (particle size distribution) and FOD (foreign object detection) applications with many demonstrable advantages over commonly used systems.

GEOSCAN GOLD is proven in multiple commodities to provide multi-elemental data each thirty seconds of conveyed flow at high precisions at throughput rates up

GEOSCAN-SizeScan-TBM for real time multi-elemental, PSD and moisture data.

to 15,000 tph irrespective of belt speed, particle size, mineralogy, dust, moisture or segregation/layering. Many elements from carbon upwards are measured. Moisture data and Sizescan data is available every few seconds ensuring that measurements can be combined and utilised for parameters that may not be directly measurable, such as ore hardness. Moisture data on its own or in combination with particle size data can be used for material flow control (e.g. indicating stickiness and clumping), dust management, dry tonnage determination, metal accounting, dewatering optimisation, and TML (transportable moisture limit) monitoring.

Scantech's Rocks2Data approach ensures operations have access to reliable, frequent, accurate measurement data to manage ore supply quality and hence feed quality and process performance. Improvements in ore quality and consistency of process feed through bulk sorting to remove coarse waste produces major benefits including better process recoveries.

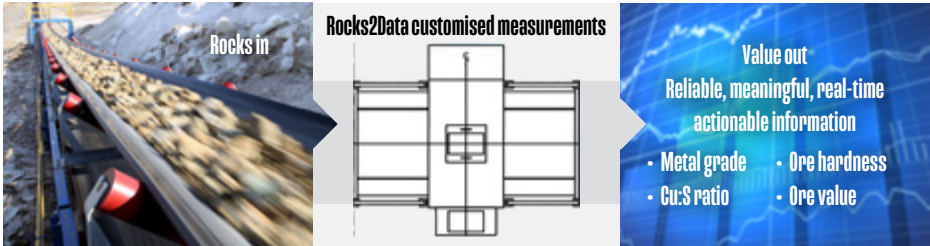
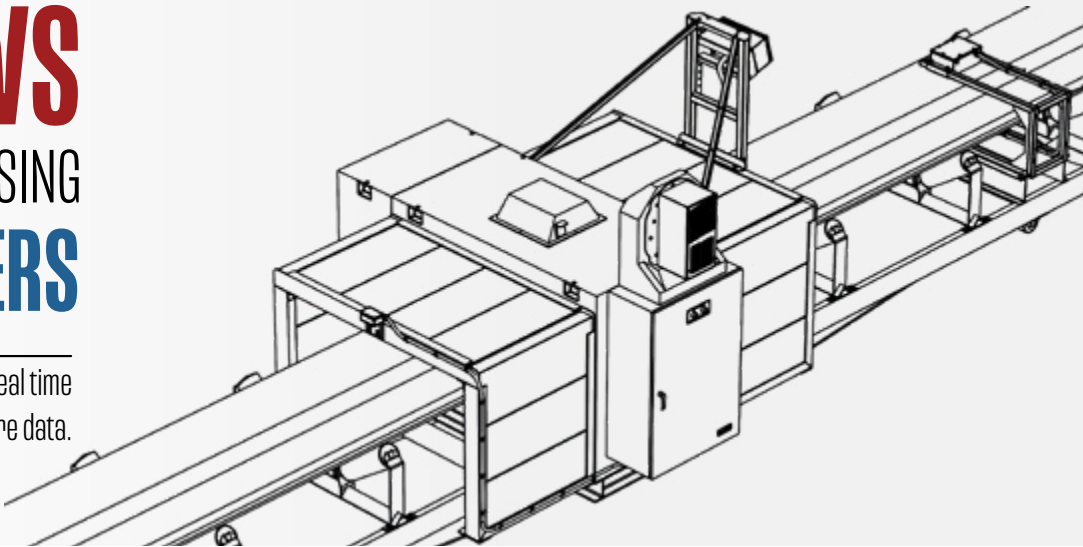
Rejecting waste generates major savings in energy, water, grinding media, and reagent consumption and reduces fine tailings generated per tonne of concentrate or product.

Reducing process feed quality variability alone can deliver up to 10% improvements in metal recoveries as a step change for mining operations. Bulk sorting has been shown to reject 5 - 20% of feed tonnes and increase feed grade by 10 - >20% while conveying material at full production rates. Representative data produced by bulk sensing technologies on post-crusher conveyed flow provides a representative

measurement of mine product and plant feed that enables effective ore reconciliation, metal accounting, ore tracking, ore blending, bulk sorting, feedback to mining teams and feed forward control for process operators.

The enabling technologies are vital for achieving improvements in process performance, resource utilisation, ESG outcomes and sustainability of mining operations.

For more information, visit www.scantech.com.au
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DRIVING PERFORMANCE IN CONCRETE CONSTRUCTION

Commercial pressures in construction push all construction processes to reach further, move faster, all at a lower cost, which creates a constant demand for organisational and technical innovation.

One person well aware of the pressures faced by industry is BCRC Chairperson, Professor Marton Marosszeky, an experienced structural, materials and repair engineer, the former director of the BRC and ACCI research centres at the University of NSW, and a former Multiplex Professor for construction innovation.

"Under these commercial pressures, construction has adopted a more and more fragmented supply chain approach to project delivery, creating countless interfaces between the parties involved, from the client, designers, materials suppliers and installation contractors," said Professor Marosszeky.

"Inadequacy at any interface leads to quality problems in concrete construction. Failure to achieve the desired quality and durability standards arises from ineffective or insufficient communication and problem resolution early in the process."

There is a correlation between safety and quality in most industries, including the construction industry. This correlation arises from the fact that success in both safety and quality require excellence in operational planning and execution involving

all members of the supply chain. A few key areas highlighting the correlation between safety and quality are as follows:

1. Shared Objectives: There is a common objective of ensuring the wellbeing of individuals and promoting customer satisfaction. Both aim to prevent errors. Defects, accidents, and hazards can negatively impact workers, customers and the general public.

2. Risk Reduction: Focusing on safety measures and practices often leads to a reduction in operational risks, including potential safety hazards, occupational injuries, and environmental incidents. Similarly, emphasising quality processes helps identify and mitigate risks associated with product or service defects, non-compliance, and customer dissatisfaction.

3. Systems Approach: Safety and quality management systems often overlap, as they both require organisations to establish processes, procedures, and controls around compliance, performance monitoring, and continuous improvement. Implementing management systems that engage and integrate the entire supply chain can enhance overall organisational effectiveness in all operational areas including safety and quality.

4. Organisational Culture: Cultivating a culture that values safety and quality fosters a positive work environment, drives employee engagement, and performance

improvement. When safety and quality are embedded in the organisational culture, employees are more likely to be vigilant, proactive, and committed to upholding high standards in all aspects of their work.

5. Cost Reduction: Safety incidents and poor quality can both contribute to financial losses due to increased rework, waste, legal liabilities, reputational damage, and productivity impacts. Further than that, by investing in communication, integration and problem solving in relation to safety and quality with all supply chain members, organisations find that their projects go faster and are more profitable.

While safety and quality are interconnected, it's important to note that they are not synonymous. Each requires its specific focus and unique approach. However, organisations that prioritise both safety and quality tend to create a culture of excellence and demonstrate a commitment to operational excellence and stakeholder satisfaction. Loushine et al., (2004) rank the characteristics of creating a safe workplace or improving quality, and "Employee Involvement" rank #1 in both categories.

Industry-specific regulations, standards, and best practices further emphasise the correlation between safety and quality, providing guidelines and frameworks for organisations to integrate both aspects into their operations.

Several occupational safety and health

standards clearly state a link between safety and quality, OSHA, 2017, states that "a strong safety program can help foster a positive work environment and contribute to the overall quality of the organisation's products and services".

Both the ISO 9001, for quality management standards and ISO 45001, for occupational health and safety standard acknowledge the relationship between safety and quality and promote an integrated approach to managing both aspects within an organisation (Quality Management Systems 2016).

For more information, visit <https://bcrc.com.au/>

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The quest to achieve higher productivity, generate greater profits, and improve safety and efficiency in mining and quarrying applications has forced asset owners to employ payload management technology into their operations. This becomes even more important when assets mature and lower ore grades are extracted, along with longer haul distances.

By integrating advanced onboard weighing systems into earthmoving equipment such as haul trucks, loaders, excavators, and conveyors, operators and site managers can accurately capture valuable data in real-time, monitor and track material weights, productivity and machine performance in the most challenging conditions.

Onboard weighing systems not only provide accurate load measurement to prevent overloading, machine damage, and risk to site personnel, but they help operators optimise payloads and lower costs associated with fuel usage, labour and transportation.

The *Australian Mining Review* recently caught up with SmartTech, an authorised dealer of Loadrite in Australia, to learn how Loadrite scales have transformed operations at Sunshine Coast quarry and concrete producer, Cordwells.

Fourth generation family-owned business, Cordwells, has been an integral part of the Sunshine Coast's growth since its establishment in 1965 by founder Vic Cordwell upon his return from World War II.

A lot has changed since Vic started out in the early days, screening sand and gravel onto a flatbed truck, loading and unloading by hand.

The next generation family members have helped exponentially grow the business, building a reputation for ready-mix concrete production, cement haulage, sand and gravel production, geotechnical and concrete testing, and hard rock quarrying.

LOADRITE REVOLUTIONISES MATERIAL MANAGEMENT AT CORDWELLS



It's certainly no surprise Cordwells are keen adopters of new technology like Loadrite scales to support their quarry and concrete production operations.

According to Cordwells Operations Manager, Martin Cordwell, the company relies heavily on trusted technology such as Loadrite to drive efficiencies across their operations.

"Loadrite is a key component to our success as it provides real-time feedback on the weight of materials loaded and unloaded from our fleet of trucks, loaders and excavators, which ensures accurate and efficient material management," Mr Cordwell said.

"By tracking our production output,

we are able to identify any trends and cross-check these with downtime and performance. This gives us the confidence that we are loading out the correct material weights when selling products, but also assisting our sales and operations teams on market trends and daily breakdown of stock needs in advance.

"Our Loadrite scales make the loading process so simple, giving operators piece of mind that they are loading out correct weights when distributing axle weights, and correct load limits on the trucks.

"Another major plus of the system is the automation of weigh dockets, which customers can receive as soon as the truck is loaded. This guarantees they are getting

the correct payloads while tracking the total tonnages required".

Like in any successful mining or quarrying operation, real-time data is pivotal to all aspects of Cordwells' daily production and overall asset management. Utilising this technology is making them more efficient, helping them achieve safe loading limits, and drastically reducing the time spent on administrative duties.

Mr Cordwell explained that as the company continues to grow, they will be able to leverage the current systems in place, while further strengthening the company processes through the use of Loadrite scales.

"We decided to partner with SmartTech as we felt they were a standout when it came to going that little bit extra to deliver on our exact requirements. When we first approached them, their team did everything possible to look after us. Even after constant date changes, shifting ideas, and tight deadlines, they worked hard in making the process seamless at every stage.

"When you get looked after the way we have, why would you look elsewhere. We are excited about building a continued working relationship into the future as we expand and introduce new technology into our operations," he said.

From suburban backyards to major infrastructure projects on the Sunshine Coast, Cordwells delivers quarry materials and concrete for a wide range of customers. Other notable civil works have included several dam wall upgrade projects, and most recently the Ewen Maddock Dam, which features over 3,000 cubic metres of concrete and 10,000 tonnes of various quarry materials, all of which were supplied by Cordwells.

For more information on Loadrite, visit www.smarttechaustralia.com.au/

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TRIMBLE EARTHWORKS FOR MOTOR GRADERS

HELPS MINES REDUCE CO₂ EMISSIONS



The mining industry plays a pivotal role in driving economic growth and providing essential raw materials for various sectors. However, the environmental impact of mining cannot be ignored, particularly in relation to carbon emissions. As Australia works toward net-zero emissions by 2050 and a 43 percent reduction of 2005 levels by 2030, mines must prioritise and actively pursue measures to reduce their carbon footprint.

One such measure mining operations can employ to reduce carbon emissions is the improvement in mine haul road construction and maintenance practices. This is due to the heavy reliance of mines on the transportation of materials and equipment, which often occurs on haul roads within the mine site. These roads play a critical role in ensuring the smooth flow of operations. However, the design and maintenance of haul roads can significantly impact fuel consumption, and consequently, carbon emissions.

It is therefore critical to explore how the mining industry can implement technology to assist in uniform mine haul roads construction and maintenance, and how achieving them can contribute to emissions reduction and promote sustainable mining practices.

Uniform mine haul roads are designed with careful consideration of factors such

as gradient, curvature, and road surface conditions. By ensuring consistent and optimal road design throughout the mine site, vehicles can travel more efficiently, with lower fuel consumption and emissions. Gradual gradients and wider curves minimise the need for excessive braking and acceleration, resulting in smoother and more fuel-efficient transportation.

According to SITECH WA Specialty Applications Consultant, George Harris, Trimble Earthworks for motor graders is a technology being adopted by miners to support them in not only reducing costs, but also reducing CO₂ emissions.

"Advancements in technology like this offer a unique opportunity for emissions reduction in creating uniform haul roads, and it's something SITECH WA have been providing mining companies with for many years," said Mr Harris.

"Historically, the focus of applying GPS technology to the mining environment aimed to reduce vehicle wear and tear, and prolong vehicle tyre life. Uneven or poorly maintained haul roads can cause increased wear and tear on mining vehicles, leading to higher maintenance requirements and increased fuel consumption. By implementing uniform haul roads with well-maintained surfaces, mines can minimise vehicle damage, extend equipment life, and reduce the frequency of repairs and replacements.

This, in turn, lowers emissions by reducing the need for additional machinery and associated fuel consumption. This remains highly relevant, but further focus needs to include the advantages of GPS machine control in creating haul roads, which can drive down emissions through reduced fuel consumption."

With the arrival of cab-mounted GNSS receiver systems such as Trimble Earthworks, added simplicity and reliability is achieved, allowing these systems to operate in the harshest of conditions, day-in and day-out.

Mr Harris commented that although the general consensus is that GPS systems for motor graders are just for the 'big miners' due to the associated costs, nothing could be further from the truth.

"Determining the return on investment when looking at all the advantages a Trimble Earthworks system offers, combined with the environmental benefits, it's never been easier to justify the capital expenditure," he said.

"Taking into account the cost of carbon offsets, it makes sense that adopting this system can have a real, positive impact on an operations bottom line.

"Uniform haul roads contribute to improved vehicle fuel efficiency. By providing a smooth and consistent driving surface, these roads reduce rolling resistance, a major factor impacting fuel consumption. When vehicles encounter fewer bumps and irregularities, their engines can operate more efficiently, resulting in reduced energy expenditure and lower emissions. Additionally, a well-maintained road surface ensures tyres are properly inflated, further enhancing fuel efficiency."

The development and maintenance of uniform mine haul roads requires collaboration among mining companies, contractors, and suppliers.

By working together, these stakeholders can share best practices, leverage expertise, and develop standardised road construction and maintenance guidelines. Collective efforts to implement uniform haul roads across the industry can amplify emissions reduction and contribute to a more sustainable mining sector.

Well-built mine haul roads have the potential to significantly reduce carbon emissions in mining operations. By optimising road design, minimising vehicle wear and tear, improving fuel efficiency, managing speeds effectively, integrating technology, and fostering collaboration, mines can achieve tangible emissions reductions and contribute to a more sustainable future.

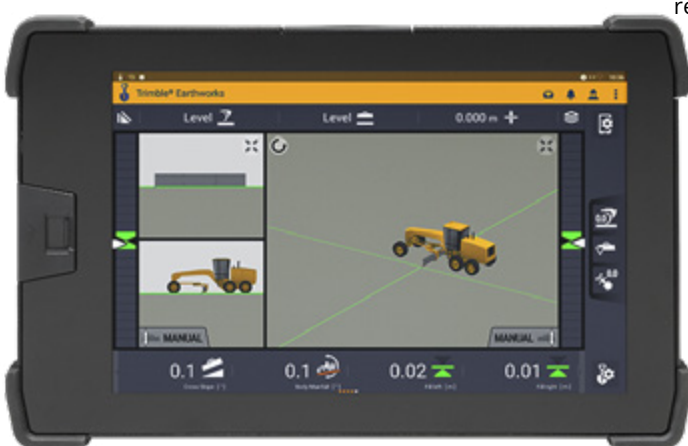
The implementation of uniform haul roads not only benefits the environment, but enhances operational efficiency, reduces costs, and positions mining companies as leaders in responsible resource extraction. It is imperative for the mining industry to embrace well-built and maintained haul roads as an essential component of their sustainability strategies and contribute to a greener, more efficient future.

"For mines, the focus on reducing carbon emissions goes beyond compliance," said Mr Harris.

"It is an opportunity to drive positive change and spearhead the transition towards sustainable mining practices. By adopting low-carbon technologies, optimising processes, embracing renewable energy sources, and mitigating their environmental impact, mines can contribute to global climate goals and ecosystem preservation. Such efforts will not only secure their social license to operate, but also position them as key players in a sustainable future. It is time for the mining industry to rise to the challenge, and with Trimble Earthworks, it's never been easier to prioritise carbon reduction and pave the way for a more sustainable and responsible approach to resource extraction."

To discuss how Trimble Earthworks can benefit your operation, please contact the SITECH WA team on 08 9392 7700 or sales@sitechwa.com.au.

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AIMING FOR NET ZERO? REDUCE EMISSIONS

With Trimble® Earthworks for Graders

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OVERCOMING THE CHALLENGES IN HARD ROCK MINING WITH SMART TECHNOLOGY

One of the biggest challenges in hard rock mining is the equipment's extreme wear and tear, especially bucket lips and GET. The resistance from abrasive rock can significantly accelerate bucket and lip wear, requiring more dig energy and decreasing payload.

Ensuring that equipment is fitted with the most advanced lips and GET can make all the difference in increasing payload, enhancing machine performance, and reducing maintenance requirements by getting more from your equipment. The high wear rates in hard rock mining contribute to increased downtime for maintenance and repairs, impacting operations and productivity.

Cutting-edge innovation delivering results

Through extensive product research and development—allied with over 40 years of experience working with miners around the globe in the most challenging conditions—the experts at CR Powered by Epiroc (CR) have designed game-changing cast lips to suit the specific needs of hard rock mining: DecaEdge™, for wheel loaders and RazerEdge™ for hydraulic excavators. These innovative cast lips transformed the industry's landscape with an unmatched focus on durability, performance, and sustainability.

CR has designed cast lips that are lighter than traditional plate lips. The lip is cast as a single piece with integrated noses with

mechanically attached GET eliminating the need to weld on teeth and shrouds. Being a single piece, it also requires less steel, eliminating weak points and offering better penetration, thanks to its engineered slimline profile and optimised cutting geometry. But don't just take their word on that. The numbers also speak for themselves.

Through data collected via CR's Titan 3330™ payload monitoring system, their team of experts were able to gain real-time metrics on payload accuracy and fleet efficiency and ultimately gain visibility of the performance of their cast lips.

For instance, putting RazerEdge cast lip to the test at a Lithium mine site in Australia, with high impact and high abrasion digging conditions, operations achieved the

remarkable result of increasing production rate by up to 7.5%, digging for 15,000 hours without requiring maintenance on the lip.

At an Iron Ore site, CR worked collaboratively with the mine to deliver a tailored solution which saw the DecaEdge cast lip making a significant impact on the site's productivity and safety. The DecaEdge's performance included digging for 17,364 hours with zero maintenance or downtime, exponentially increasing machine availability, resulting in a A\$69,000 reduction in GET costs per loader per annum, and A\$80,000 annual savings forecasts on preventative and reactive maintenance per loader.

Don't lose time on lost GET

Another concern in hard rock surface

mining is lost GET. It significantly impacts mine operations and personnel safety and causes critical issues—from damages to machinery and chutes to shutting down operations—reducing machine availability and compromising employee safety.

With that in mind, the team at CR have developed GET Trakka™, a digital GET monitoring system that embeds a tracking device into CR's teeth and shrouds, securely placing it in a specially designed cavity in the GET, giving the operator real-time GET tracking and monitoring reports and alerts. When a GET is lost, the operator receives rapid alerts with detailed information about which one was lost and where, all from a safe distance.

Tailored solution for the harshest operating conditions

CR offer a wide range of cast lips and GET solutions to suit your entire fleet, ranging from the smallest front-end wheel loaders and hydraulic excavators to the largest machines available in the market. They offer customisable options to suit varying operational requirements, such as rock types, machine types and bucket sizes.

Allied with their unparalleled customer-first service and industry expertise, mines worldwide have choices and the support of CR's team of experts to tailor solutions to optimise individual performance and adapt to specific mine challenges, no matter how harsh the environmental conditions. **AMR**





Add an Extra Edge to Your Hard Rock Digging

CR Powered by Epiroc has been in the business of digging for over 40 years, innovating and developing cast lips and GET using the latest technology, to withstand the harshest conditions.

Our DecaEdge™ and RazerEdge™ cast lips have been digging hard rock all over the world, offering the ultimate bucket protection and superior penetration with unmatched high performance, significantly extending the life of your bucket and reducing maintenance requirements.

Digging an extra edge? Let's start the conversation.



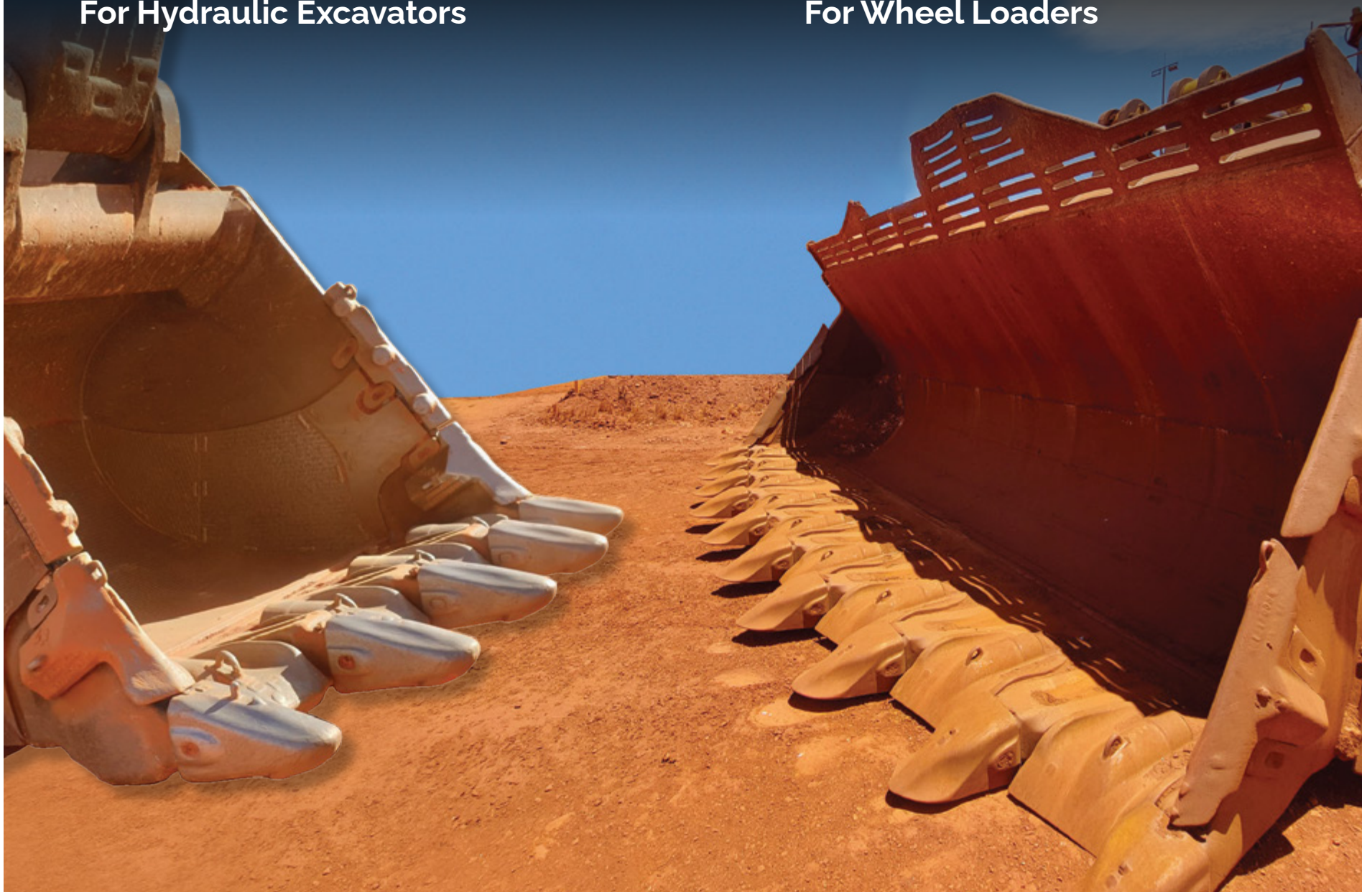
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RAZEREDGE™

For Hydraulic Excavators

DECAEDGE™

For Wheel Loaders





Treotham

LUBRICATION-FREE BEARINGS YOU CAN'T BEAR TO BE WITHOUT

Day in, day out, mining operators put their earthmoving gear through their paces as they navigate the challenges of the worksite.

In mining and construction applications, these machines have a tough job, and yet they are expected to perform reliably in every environment, while being constantly exposed to heavy loads and harsh conditions.

These places added pressure on both the machines and their components, which play a critical role in keeping these workhorses out of the maintenance sheds and on the playing field for longer.

Lubrication is generally the only protection for the dozens of components, such as bearings, that make up these complex machines.

Traditionally, lubrication points are maintained manually using cost-intensive 'loss lubrication' systems, which continuously press lubricating grease from the machine's interior to the outside. Maintaining all the required lubrication points on equipment like an excavator not only takes

time, but inadequate or irregular lubrication can lead to expensive breakdowns, therefore limiting machine availability.

However, quality lubrication-free bearings are now giving machines and their owners an opportunity to extend component wear life, reduce their maintenance costs, and improve their environmental impact.

'Self-lubricating', 'lubrication-free', or 'dry running' plain bearings simply refer to plain bearings that don't require additional lubricants. This means, machines, systems or devices don't need not be stopped in order to relubricate the bearing points to keep the equipment from failing, nor are oil changes or fully-automated relubrication systems necessary.

Over the past three decades, Australian owned company Treotham have led the industry when it comes to automation control and high-quality components for industrial markets. This includes the supply of iglidur® polymer bearings, which have been specifically developed for use in dirt and adverse weather conditions, and have now been added to the igutex® range for applications under extreme loads.

According to Treotham WA Branch Manager, Tim Robinson, the company's iglidur® plain bearings continue to exceed customer expectations on mine sites around the world."

"The new igutex® TX2 and TX3 range are designed for the toughest applications, and feature new fabric bushings made from high-strength filament fabric," Mr Robinson said.

"They are heavy-duty, high performing bearings that provide equipment owners with a cost-effective solution compared to lubricated metallic plain bearings that require grease as part of the system.

The igutex® TX2 & TX3 plain bushings were developed for use in particularly highly loaded bearing locations (e.g. mining and construction machinery, agriculture and plant construction). Due to its incorporated solid lubricants, the high-strength, wound construction ensures low-friction and maintenance-free operation, without the need for external lubrication."

Mr Robinson added that where injection-moulded plain bearings fail due to ex-

treme mechanical loads, wound bushings play to their strengths.

"The extremely strong filament allows for maximum resistance with its special, interwoven design. At the same time, no additional grease lubrication is required thanks to the incorporated lubricants.

"The igutex® TX2 and TX3 fabric bushings are well-suited for the mining and construction industry, wherever high loads, corrosion-free, and dirt-resistant bearings are required."

The maintenance-free properties of the iglidur® and igutex® plain bearings reduce costs for lubrication and maintenance, which proves cost-effective even in high dimensions and low volumes. From a sustainability perspective, these bearings are also environmentally-friendly as no additional lubricants are required, and the good coefficient of wear offers longer service life.

For more information, please visit
<https://www.igus.eu/info/fiber-composite-plain-bearings-high-load>

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High load, low wear Bearings for mining and bulk handling industries.



Wound plain bearings reduce wear in heavy duty applications

The new **igidur® TX2** plain bushings were developed for use in particularly highly loaded bearing locations.

Due to its incorporated solid lubricants, the high-strength, wound construction ensures for a low-friction and maintenance-free operation entirely without external lubrication.

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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
- Bevelling - 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**



THE STATE-OF-THE-ART, HEAVY DUTY COMBINATION PLASMA/OXY/MACHINE CENTRES CAN PROCESS A WIDE VARIETY OF MATERIALS AT AN EXTREMELY FAST RATE.



| 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, ZINCANEAL, 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.

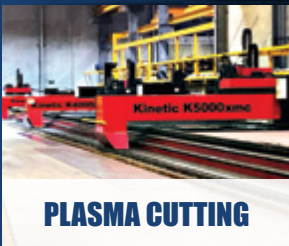
A continual process of system and service development and refinement is where our key advantage lies. We constantly find new ways to add value to the service we deliver to you.

Progressive service and quality is about staying one step ahead.

Services



LASER CUTTING



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A TRUSTED LIFELINE FOR REMOTE SITES.

Established in 1989, Laverton-based Desert Sands Cartage specialises in supplying remote outback and mining projects in regional WA and the Northern Territory with potable water, sand, fuel, and various other bulk haulage requirements.

Desert Sands also offers earthworks and mobile and on-site concrete delivery to clients for various construction projects.

In response to increasing demand for portable concrete supply and delivery, Desert Sands Cartage recently increased its capabilities by adding a Porta-Batch mobile concrete batching plant to its fleet, with a 50-tonne cement silo.

The batching plant can produce more than

32 cubic metres of concrete per hour and can be deployed at most remote locations in the Outback.

This is one of two similar batching plants Desert Sands Cartage has put to work to supply large-scale construction projects in remote areas.

Servicing Remote Regions

Desert Sands director Rex Ryles says his company can mobilise to remote locations to service its clients, whether it be to batch and deliver concrete using its new Porta-Batch plant, deliver earthworks materials and services, alongside many other services for mining, civil, and local government projects.

"We can also provide potable drinking wa-

ter for personnel mobilised on-site for all stages of the mining process, for example, exploration, earthworks, and construction phases," he said.

"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."

No job is too big or too small for Desert Sands Cartage, with clients ranging from the local Shire to larger operations such as Gruyere gold mine, Anglo Gold Ashanti sites, and various other large-scale mining projects.

A Range of Cartage Solutions

Desert Sands Cartage Contractors provide services including but not limited to:

Side tipper haulage, mobile batching plant/concrete delivery, supply and delivery of potable water alongside diesel and petroleum fuels, screened sands, river rock and blue metal materials.

Other services include maintenance grading, road building, site works, construction and excavator and loader-work.

Desert Sands can also provide contract screening, semi-drop deck hire, front-end loader hire, road maintenance and constructions for local government organisations, general civil works, bulk tipper haulage and much more. **AMR**

For more information, visit
www.desertsandscartage.com.au
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FEELING THE VIBE

As a subsidiary of one Europe's leading manufacturers of electric and pneumatic vibrators, Aussie industrial vibration specialist Oli Vibrators is making waves down under.

The company's products are powering critical plant equipment in some of the country's flagship mining operations including shifting a range of materials in different applications.

When Copper Resources Australia needed a pan feeder capable of moving 275 to 350 tonnes of crushed copper sulphide ore per hour, it was clear which vibrator motors would be reliable enough to deliver a controllable flow within the conveyor system.

ToThink Engineering, an Australian owned equipment company specialising in vibrating screens, vibrating feeders and apron feeders, were engaged to devise a solution.

The new solution would replace an under-performing machine that had previously been installed onsite. The machine was used in a reclaim application feeding a conveyor under a stockpile. Its poor performance led to operators having to utilise wheel loaders to up the production rate by

shifting material from the stockpile, and re-introducing it further along in the process, bypassing the pan feeder altogether. The replacement feeder also had to fit within a similar space to the previous model.

Fitted with two Oli MVE3000/1 vibrator motors, ToThink's VRF900X2500 pan feeder proved the ideal solution.

Knowing the world-renowned reputation of OLI technology, ToThink continue to partner with Oli Australia to secure reliable, high-performance vibrator motors for use in their pan feeders and vibrating screens.

The new VRF900X2500 pan feeder is consistently delivering 380 tonnes per hour of material to the tunnel conveyor.

In addition to the feeder's high performance, the customer benefited from both availability of spare parts, and specialist technicians locally in Australia, for both the vibration motors and rubber springs.

According to Oli Australia General Manager, Mark Thompson, the joint effort between Oli Australia and ToThink Engineer-

ing was a great example of two Australian companies delivering equipment that is assembled and manufactured here in Australia.

"Although the past two years have proven a challenge for most industries, our business has managed to effectively combat supply chain challenges, whilst continuing to maintain sufficient stock levels to keep our customers productive," said Thompson.

"We navigated through some turbulent global disruptions, but in the end it really

came down to more diligent forecasting to ensure we could service our customers.

"2023 is gearing up to be a huge year for the Oli Vibrators team with new innovative products on the horizon," he said.

"We're well stocked and focused on expanding our product portfolio to meet the evolving needs of our customers here in Australia."

For more information, please visit <https://www.olivibra.com/>

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QMW INDUSTRIES IS PROUD TO INTRODUCE

THE FLS63 FUEL LUBE SERVICE MODULE (63,000LTR VOLUME)

The FLS63 module has been engineered, tested, and manufactured for ergonomic use with optimal efficiency for fuel and servicing in-pit operations. The QMW FLS63 is designed for the 90t nominal payload class.

QMW Industries have developed the FLS63 module entirely in-house, using tried and tested components sourced from proven OEMs globally. The module is robust, stable, and designed, tested, and manufactured to meet relevant Australian and International standards for the Australian mining industry.

The module has a 48,000-litre capacity main fuel tank and includes a variety of product tanks with varying volume capacities for your specific application and Minesite requirements. The FLS63 module includes (9 or 10) product tanks that can be custom configured for Grease, lubricants, waste oil, coolant, and water. The fuel system has low, medium, and High Flow capabilities through dedicated hose reels. Multiple flow rates can be paired with Grease flow rate output to match the fuel and grease refill on Ultraclass Trucks and Excavators.

All products including high-pressure grease and low volume grease are dis-

pensed through hydraulic rewind hose reels located in cabinets that are ergonomically accessed from the left side of the module. All fuel and lubricant tanks are filled through the rear hose reel cabinet, with easily accessible fast fill fittings. All levels are monitored and include a fail-safe automatic shutoff when the tank is full.

All service and operational requirements of the module are completed on the robust touch screen that is located in the service cabinet. The electronic control system allows for easy operation of all functions on the module, including diagnostics, run time statistics, service intervals, troubleshooting, and system health information.

A remote control is also integrated into the functionality of the system, allowing for dispensing functions, pump activation, and the ability to unlock and retract the hydraulic hose reels away from the control panel of the module and eliminates the hoses being dragged across the floor.

Q-Carbon – a Dynamic system with Fleet pairing for optimised refill and service times - QMW Utilise the fixed displacement flow of the Hoist Circuit and convert to load sense hydraulics using modulating logic valves. A Flow Turbine is integrated to

provide system diagnostics of flow, pressure and temperature of hydraulic fluid. The system is filtered on the pressure and return side and an effective cooler is combined with the OEM brake cooler to provide unmatched heat mitigation. Proportionally controlled valves are used to provide optimum efficacy. Multiple functions can be utilised simultaneously with host truck running at low idle. With no idle up required this allows the module to be functional in the trucks leanest fuel burn.

A combination of 800 LPM of fuel delivery, 30 KG per minute grease delivery and 50 LPM oil delivery can all be provided as a combined usage at low idle. Motor & pump speeds have precise PWM control and can be customized for each site. Data logging of transactions and totaliser of fluid dispensed is included within the Q-Carbon system, Diagnostics - all inputs and outputs are easily viewed for service technicians to rapidly identify faults and perform service tasks.

Also included as standard fitment on the FLS63 module is all your Minesite safety/compliance requirements including, but not

limited to; work lights, roading lights, signage, fire extinguishers, eyewash station, spill kits, drip trays, nozzle holders, hose stops etc.

The FLS63 Fuel Lube Service Module is a specialised product that offers convenience, safety, and efficiency to the mining industry and is a must-have for anyone operating fuel lube service modules in the mining industry. QMW also has a range of smaller Off-Highway and On-Highway Lube and Fuel truck module designs to suit a range of OEM models.

Contact us direct at QMW Industries to enquire on **+61 7 3275 2544**

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Glove friendly – capacitive touch screen control.





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- Water Trucks On-Highway & Off-Highway
- Crane booms, Jibs & lifting devices
- Tyre handlers – wheeled loader.
- Machinery attachments
- Control systems
- ROPS & FOPS – Canopy's & Cabins
- Operator cabins for earthmoving & mining machinery
- Machinery Conversions – Special Application
- Elevating work platforms



- Control systems for Mobile Machinery
- MEWP Machine Conversions
- Hose Burst Protection Valve Installations
- Hydraulic Installations - Field Service & Installs
- Remote control systems
- Height Limiter Systems
- Autonomus Remote Oil Sampling
- Mechatronic System Design
- Auto Electrical - Field Service & Installs



www.qmw.com.au



OTRACO TRANSFORMS TYRE MANAGEMENT

As a global leader in off-the-road tyre management solutions, Otraco ('Off The Road Australian Company') has seen miners increase their productivity and reduce total cost of tyre ownership for over 50 years. The company was founded in 1972 at Mount Whaleback mine in Western Australia.

At the forefront of tyre management, Otraco had developed methodologies for tyre life analysis (such as fitment period batching, axle fitment bias compensation, and tyre numbering system), the tyre pressure and temperature monitoring system, and a detailed understanding of tyre explosion mechanisms.

Otraco's focus in the early days centred around its WA operations including Savage River, the Argyle diamond mine, Koolan Island and Hamersley Iron (now Rio Tinto). The company then expanded operations into NSW including major gold operations, then later moved into the QLD Bowen Basin and NSW Hunter Valley coal fields.

Following its success locally, Otraco moved into overseas markets starting with Rio Tinto's Kelian gold mine in Indonesia, and several Chilean copper mines. Further growth saw the company expand its footprint into South Africa, Botswana and Namibia.

Today, Otraco employs around 1,000 people globally and operates on more than 55 project sites in three main regions – Australia, Africa and the Americas. Its current clients include BHP (Otraco has remained onsite at Whaleback iron ore mine since 1972), Rio Tinto (Otraco has continued Australian operations with Rio Tinto Iron Ore since 1993), Anglo American, Glen-

core, Codelco, Newcrest and Yancoal, to name a few.

An industry-leading safety performance and 'Safety First, Always' culture underpins the company's depth of operational experience. In May 2023, Otraco recorded a LTIFR of 0, and a TRIFR of 2.8.

According to Otraco General Manager, Greg Glennon, the company is always looking for better and safer ways to improve tyre management operations for its clients, and look after the safety of its people.

"Our safety focus is part of the candidate screening stage for all our national assessment centres to ensure our teams have the right safety mindset from day one," he said.

"To support our global operations, Otraco has developed, and maintains, 'best practice' work statements (OBPs) in conjunction with our in-house technical resources team. This incorporates practical experience, engineering know-how, safety-first assessments, as well as incorporating specialised tooling to make our jobs easier, safer and more efficient. Our OBPs ensure our clients and team members benefit from the safest and best practice tyre management services across all our sites."

Since 2010, Otraco has operated a training facility in Perth, dedicated to OTR tyre service training. Otraco became a registered training organisation in 2017 (RTO code 51112) and offers qualifications in Certificate II Automotive Tyre Servicing Technology and various units of competency,

including leadership in the workplace, supervisor on-site operations, communication, risk management, conducting health and safety investigations, and forklift truck operation licensing.

Mr Glennon says Otraco is proud of its purpose-built facility, which also features light and heavy vehicle bays, the latest technology, and top tier trainers with operational mine site experience.

"This facility provides training for employees across the entire Otraco group, and keeps all our tyre technicians at the highest standards on every site. We also provide training packages to external clients at our facility." In 2021, Otraco was divested to Bridgestone Mining Solutions Australia, a company offering comprehensive pit-to-port solutions for the mining, industrial and construction industries. The following year, Otraco celebrated 50 years of 'keeping the big wheels turning! Celebrations were supported by some of Otraco's key clients, including new owners, Bridgestone.

"We believe Bridgestone ownership will allow Otraco to grow into a multi-dimensional, international tyre management service provider with even stronger capabilities, geographical reach, and OTR tyre knowledge," said Mr Glennon.

"This will position Otraco as the 'leading provider' of OTR and LME tyre management for decades to come, enabling us to better support our clients, whilst provide exciting career opportunities for our employees."

For more information, visit
www.otraco.com

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Safety Innovation

Reduced Total Cost of Tyre Ownership

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Experience

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than 5 years' experience

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Keeping the big wheels
turning for 50 years

LEADING THE WAY

BESPOKE NITROGEN TYRE INFLATION SYSTEMS FOR SAFETY, PRODUCTIVITY AND COST SAVING GAINS

Pulford Air & Gas has established itself as a leader in the design and manufacture of bespoke Nitrogen Tyre Inflation Systems for the mining industry over the past two decades, with numerous installations already in operation in mine sites across Australia, delivering mine site operators a whole host of benefits over the conventional method of tyre inflation.

Safety Gains

Every year mines across the country encounter numerous stoppages in production due to 'hot tyre' events, which can lead to tyre fires or explosions, resulting in potentially catastrophic consequences such as personal injury to loss of life.

By filling tyres with nitrogen and reducing the amount of oxygen in the tyre to less than 5.5 percent, Pulford's Nitrogen Tyre Inflation System can prevent a tyre explosion or fire, from internal and external heat sources or from electrification. This provides mine site operators with more confidence that their trucks will offer greater safety in the case of a 'hot tyre' event.

Productivity, Cost Saving and Efficiency Gains

Keeping equipment downtime to a minimum is essential when it comes to improving productivity and reducing costs. With the elimination of catastrophic tyre explosions, the standard 24-hour park up rule could be changed dependent on the type of 'hot tyre' incident. The result, a reduction in downtime from hot tyre events.

Pulford's Nitrogen Tyre Inflation System offers rim protection from oxidation, eliminating the cost of buying sealants and taking trucks off the road for this maintenance requirement. Nitrogen additionally improves tyre pressure retention, contributing to a safer running tyre, as well as improving fuel economy. The tyres also have

a longer life, reducing tyre consumption and disposal for a clear environmental advantage.

A Tailored Solution

Every Pulford Nitrogen Tyre Inflation System is tailored to meet the customer's specific application and site requirements. For ease of installation and maximum flexibility, the system is fully containerised making it easy to move to a new location if required.

An efficient on-site solution, the Nitrogen Tyre Inflation System from Pulford has been designed and developed with Australian conditions in mind. The system can be matched to specific fleet sizes and truck types, and it can be designed for any

range or application from 1 m³/hr up to 3000 m³/hr, offering faster tyre inflation than most conventional systems. The inclusion of a large storage vessel ensures the system can instantly inflate up to two 57" tyres and offers fast recharge times for multiple inflations. Pulford's system produce over 98 per cent purity for single inflation fills, with no need to double inflate.

Established in 1925, Pulford Air & Gas is Australia's oldest air compressor company, specialising in the design, manufacture and service of quality air compressor and nitrogen gas systems. **AMR**

For more information visit
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WHEN
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MATTERS

WHEN
PRODUCTIVITY
MATTERS

WHEN
SAFETY
MATTERS

WHEN
EFFICIENCY
MATTERS

WHEN
PRODUCTIVITY
MATTERS

Nitrogen Tyre Inflation Systems

When safety matters, when productivity matters, when efficiency matters, Pulford's Nitrogen Tyre Inflation System is the clear choice.

Trust the experts in nitrogen tyre inflation systems, with almost two decades of experience and numerous installations across Australia.

FLEXIBLE | BESPOKE | PRICELESS

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AIR & GAS

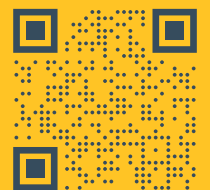
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PERFORMANCE FIRST

When it comes to safety and reliability on the worksite, you can't take shortcuts. In the mining industry, a wide range of ropes are used to secure and fasten equipment, support vehicle recovery efforts, and facilitate critical lifting and rigging operations, all while keeping workers safe.

For over 140 years, Australasian company Donaghys has been developing high performance ropes and braids to meet the demands of the industrial, lifting, mining and telecommunications industries.

Featuring high strength with minimal elongation and recoil, Donaghys' wire replacement ropes are lighter, safer and stronger than steel for many industrial applications.

Founded in 1876 by John Donaghy in Dunedin, New Zealand, its vision and legacy remains today, a name synonymous with rope, cordage, and twines across Australia and New Zealand, your total rope solution.

Backed by a reputation and work ethic integral to the communities in which

it operates, Donaghys is a 'can do' company dedicated to growth opportunities, research and development, one that keeps pace with the ever changing requirements of progressive industries. This has fuelled its evolution into a leading supplier of performance products.

"With Donaghys you get service, quality and innovative rope solutions backed by over 140 years' experience," said Donaghys Product Manager, Chris Fretwell.

"Rope is our business, we know it, we live it, and we integrate it into our extensive product range. Our ropes are built to last, are performance based, and we offer cost-effective solutions that meet our customers' specific rope requirements.

"Donaghys' innovation is the outcome of dedicated people with a shared passion for delivering the highest standards, a commitment to development programs, state-of-the-art manufacturing and continued investment in new technology."

With a rich heritage in rope innovation and

a product range designed to suit industrial and safety applications, it's no surprise that Donaghys has become a preferred supplier to mining's major players.

The company is serious about safety and its vehicle recovery strops and shackles are a true reflection of this. The range of heavy-duty tow strops for industrial and 4x4 vehicle recovery are engineered to reduce the risk of worksite injuries. Many mine sites have banned wire ropes for these applications.

One product in particular is the heavy-duty Mongoose vehicle recovery strop, which is strong, lightweight and flexible, helping reduce back and hand injuries. With no fish-hooking that is commonly associated with steel wire ropes, the 12-strand UHMwPE tow rope is designed for light vehicle 4x4 vehicle recovery.

These strops are fitted with a heavily protected 600mm to 1,000mm soft eye splice in each end, as well as a tight heavy-duty HT Nylon cover to minimise ingress of dirt and assist cleaning. It also features an ultra-high strength to weight ratio, is light-

weight and flexible, and offers safer handling.

Mr Fretwell says Donaghys also supply soft UHMwPE shackles that have proven the ideal replacement for traditional metal snap and screw shackles.

"Our soft shackles are a versatile tool for a diverse range of applications. They are a versatile, adjustable solution designed to connect strops or slings to vehicles, blocks or sheets on a boat. They are resistant to rust and corrosion, light, safe and easy to handle, and won't damage surrounding soft surfaces. If broken, they won't shatter as in the case of traditional metal shackles."

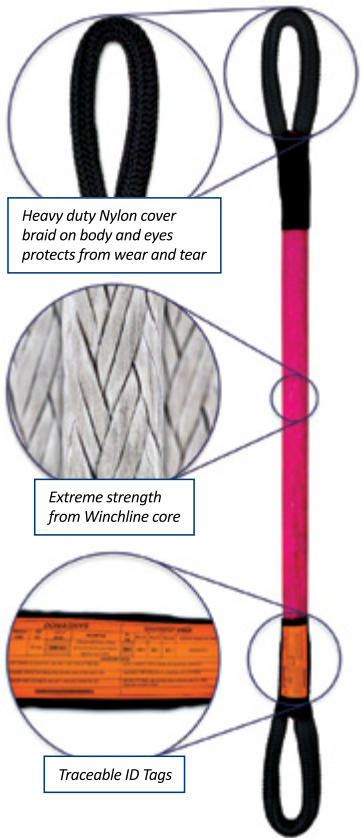
BREAKING NEWS

Donaghys can now provide Australian Standards Approved Stealth (HMPE) Lifting Slings custom-built to AS 18264:2022.

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12 Strand UHMWPE Strop with soft eye in each end

FEATURES

- Extreme strength to weight ratio
- Lightweight and flexible to reduce risk of back injuries and assists on-site handling
- Low elongation
- Minimal re-coil and kinetic energy at break
- Traceability (durable I/D tags)
- Reduced hand injuries ie. no fish-hooking like steel wire rope
- Heavy duty tight HT Nylon cover to minimise ingress of grit and assist cleaning
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- Certified to tonnage rating
- Available on request with marine grade round thimble
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Soft UHMWPE Shackle

- Match your Mongoose Tow Strop with our range in 30 to 500 tonnes
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- The perfect replacement for traditional metal snap and screw shackles



STEALTH UHMWPE 12 STRAND WINCHLINE

- Extreme strength to weight ratio
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- Will not kink
- Easy to splice
- Abrasion resistant coating reduces likelihood of snagging and provides superior winch drum grip

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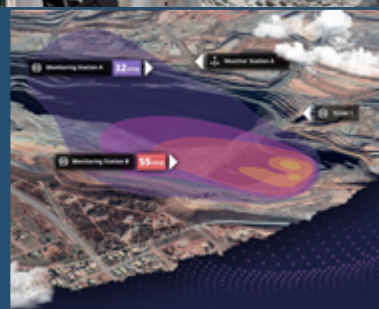
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Access complete visualisation of proposed and executed blast events with our blast dispersion modelling.



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Customisable alerts are delivered to any device throughout your business via the Miningzone interface, and our industry app, Weatherguard. Alerts are specific to the GPS positioning of each device, optimising your personnel's risk awareness. You can visualise the storm utilising Storm-tracker, our GIS solution, which maps multiple weather layers over your geofenced site and infrastructure.

This fully redundant system with an uptime of 99.9% and IT support gives you complete visibility of severe weather.

Industry-leading hyperlocal forecasts

OpticastTM and Oracle are Weatherzone's advanced nowcasting and forecasting systems. Independently verified to outperform other industry models, they give you a strategic advantage when weather impacts your enterprise.

Armed with rapid-update, highly sensitive weather data, you can mitigate operation-

al and safety risks, and plan to make the most of optimal conditions.

Opticast is powered by machine learning, intelligently adapting to your local climate. With almost 500,000 forecasting points across Australia, we have your mine covered, no matter how remote.

Oracle is our satellite-derived nowcasting system, providing site-specific situational awareness. Visualise rain, wind, cloud, temperature and lightning in high-resolution, up to 3 hours in advance. Oracle moves beyond static radar systems, delivering uninterrupted nationwide coverage.

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Closely monitor and gain a visual understanding of potential blast events. Our Blast Dispersion Modelling ingests your site's unique environment, topography and forecast parameters. This allows you to more accurately simulate blasts and report on proposed and actual outcomes.

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Our cloud-based, fully auditable report

trails assist you in fulfilling your licence and legislative requirements. As blasts are executed, supervisors can add their pre and post-blast observations to ensure requirements are met.

With precise forecasting and reporting capacity, you'll leave no stone unturned as you plan your blasts.

Customised Operational Forecast System

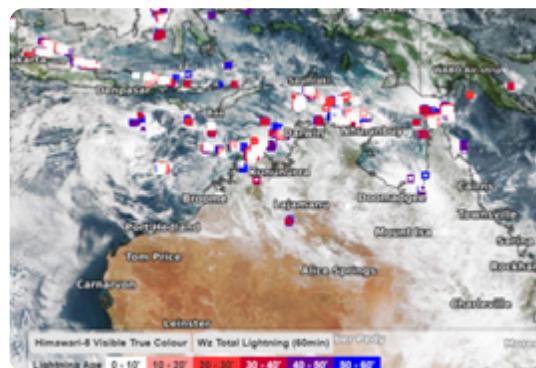
Benefit from a valuable decision-making tool, enabling you to visualise and respond to any weather threat to your operations, immediately and up to seven days ahead. Our Operational Forecast System (OFS) is tailored to your site-specific weather conditions, parameters and procedural requirements.

Expert daily commentary from our meteorologists gives you the assurance to plan key work schedules and maintenance.

You can immediately identify potential and current weather impacts, relevant to your operations. Presented in a simple, colour-coded format, you can view weekly forecasts, 12-hour blocks, or drill down to one hour resolution for complete situational awareness.

We monitor your site 365 days a year, 24/7, providing real-time risk communication and alerting via your Miningzone interface, SMS and email. You'll know when weather systems pose a threat and can mount a targeted response.

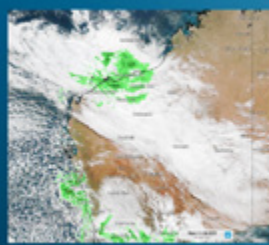
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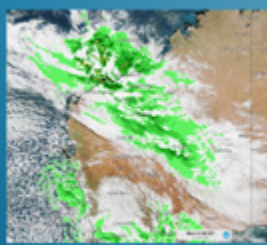
Utilise accurate lightning proximity alerting, provided by Weatherzone's Total Lightning Network, to protect your staff and assets.

Visualise rainfall effectively with Oracle. Increase the time to prepare your site for heavy falls not captured by static radar systems

Weatherzone Oracle



Ground-based radar



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Miningzone's Actionable Insights

Miningzone is your **customisable, IP-secure interface** centralising all your key meteorological and environmental solutions. Your teams can utilise concise insights and alerting to drive their confident decision-making.



Powerful Operational Forecasts

Visualise weather threats in real-time, and out to 7+ days. Your onsite parameters are ingested into our **Operational Forecast System**, which then delivers **targeted risk forecasts with meteorologist commentary**.



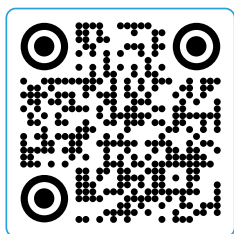
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Improve your forecast accuracy with onsite meteorological observations. Our **ObsConnect Weather Station** provides **exact, real-time monitoring of onsite conditions**, vastly improving forecast modelling and situational awareness.



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A CULTURE OF LOCKOUT/TAGOUT USE

WE MUST HAVE IT

I wrote this back in 2008 – and now in 2022 I am happy to see that most States/Territories have taken on the use of lockout/tagout – especially for electrical work.

We must, however, aim for it to become “second nature” to isolate and lockout all kinds of dangerous energy sources before working on them.

There are many workers who still put their lives or health at risk in their daily work, by not using lockout systems or devices.

Most people will agree that it is necessary to ‘turn off’ (isolate) an electrical circuit, before working on it. It is also easy to understand that it is important to close a valve to a high-pressure steam pipe, or hydraulic pressure system, before working on the associated equipment.



“Many accidents or ‘near misses’ can be prevented if all companies were to implement and use proper lockout / tagout procedures. We must encourage the development of a ‘lockout culture’ or ‘lockout attitude’ in all Australian workplaces.” Erik Larsen.

However, what causes many accidents or ‘near misses’ is the fact that the electrical switch or the isolation valve might be ‘turned off’, but is not being locked in the proper position, so it can unintentionally be ‘turned on’ by someone unaware of the work situation in progress.

Imagine this scenario:

The office workers computer will not function, so he/she decides to check the office switchboard. A circuit breaker on the switchboard is in the off position.

The office worker decides this must be the reason why the computer will not operate and turns the circuit breaker on. A short while later a scream can be heard from the storeroom – from the local electrician now being electrocuted, while installing a new power point on the same circuit.

If the circuit breaker had been fitted with a lockout device and a padlock – this would not have happened.

To use a ‘Lockout System’ is really quite simple – in its basic form it means to attach a padlock to, for example, a circuit breaker, fuse or valve, to prevent it from being operated – or a block of wood under a heavy machine part that could fall/move.

All workplaces should have lockout procedures in place – relating to the

complexity of plant/equipment in use – which specifies the how and where to isolate. I.e, a machine might have electrical, pneumatic and hydraulic connections – which all have to be isolated and locked out during repair and maintenance.

A faulty plug-in machine might just have to have the plug locked in a box, to be safe.

Similar to introducing seatbelts in cars, hardhats and eye protection on worksites years ago – in my opinion a culture or attitude of lockout/tagout of energy sources must be encouraged to develop in Australian workplaces

Accidents do happen – but don’t have to

When we think of energy sources, it is mostly electrical circuit breakers, fuses, high pressure valves and hydraulic systems, that spring to mind. There are however other potential hazards, such as booms or machine parts that will move when pressure is lost, or brake systems that will release if power is removed.

Every year many workers in Australia are either killed or seriously injured, resulting from preventable accidents caused by energy sources – including stored energy – or caused by unsafe work near or on live electrical equipment, or dangerous machinery.

The equipment is available.

These days Lockout / Tagout equipment is readily and easily available.

A wide variety of lockout devices – products which enables workers to place padlocks on circuit breakers, fuses, plugs, hoses, valves and machine parts – are available as standard items, which are easy to use and inexpensive, when compared to the cost of a life or a bad injury.

Lockout Devices and Danger/Warning Tags are being produced and marketed by Cirlock and other companies. Cirlock is the Australian company that for over 30 years have produced most of its own lockout parts in Australia, which can be obtained from most electrical and industrial wholesalers or safety shops and online.

What to do about it.

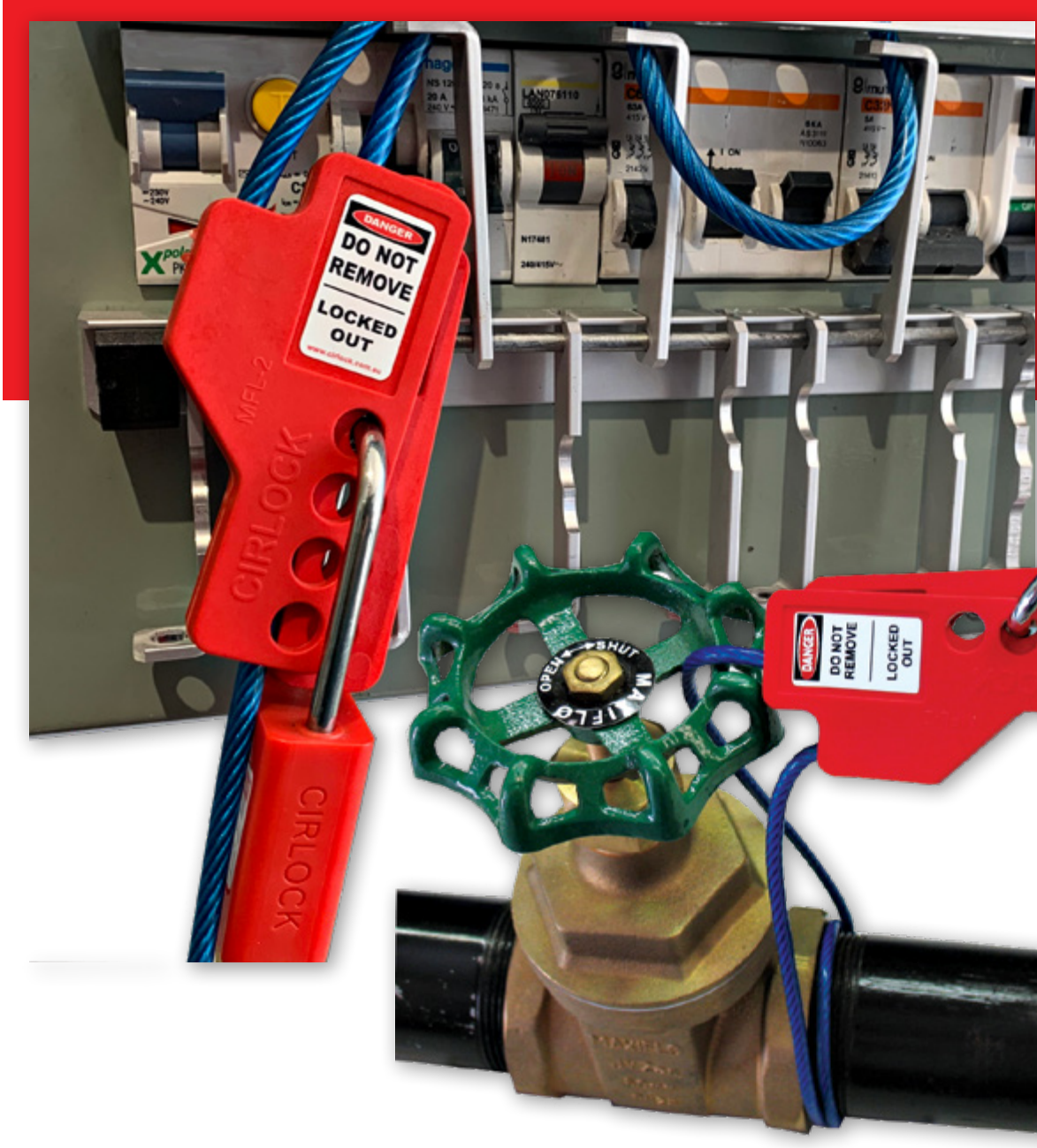
It is likely to take about a generation before use of lockout / tagout equipment become ‘second nature’. Legislation and codes of practice has come a long way but more is needed.

Education should be used - The use of lockout / tagout should be part of all apprenticeships and other technical training and educations. Engineering studies should include practical ways to make energy sources safe to work with (lockable).

We must encourage everyone to have a better lockout / tagout attitude because it saves lives.

Erik Larsen has been involved in the development and implementation of lockout systems across Australia since 1992.

Written February 2022. ©Erik Larsen 2022.



MFL-2 MULTI FUNCTION CABLE LOCKOUT DEVICES

The MFL-2 Multi Function Cable Lockout Devices from Cirlock are versatile devices which can be used to lock out several different energy sources, including valves and steering wheels on vehicles.

They can also be used to limit the number of padlocks needed on a job as the cable can be fed through several lockout devices on one electrical board, with 1 padlock applied. The flexible cable is also handy for those tight situations where a hasp won't fit, and group isolation is required. Accommodates up to four padlocks.

The Cable Lockouts are available as standard with one or two metre cables, and are available with a steel wire cable, or a non-conductive plastics cable, for use where metal cannot be used (eg electrical cabinets). Additional cables can be supplied in various lengths, making these devices suitable in many situations.

Proudly Made in Australia by Cirlock and sold at your local electrical wholesaler.
<https://www.cirlock.com.au/products-shopping/Cable-Lockout-Device-5mm-Steel-Wire-Cable-p109853486>

CIRLOCK LOCKOUT / TAGOUT EQUIPMENT

LOCKOUT EQUIPMENT

GROUP LOCK BOXES

When multiple people need to work on the same equipment, a Group Isolation Box is often used. The equipment is Locked Out by a maintenance padlock (or a supervisors padlock), the key is placed inside the Group Isolation Box and all workers place their keys on the outside of the box preventing access to the Equipment Key until all work is complete. It keeps each team member safe and also eliminates the need for multiple padlocks on individual isolation points.

LOCKOUT PADLOCKS

Cirlock's Lockout Tagout Padlocks come in 8 different colours, with various shackle sizes and shackle types (Non-Conductive and Stainless Steel) and can be keyed differently, keyed alike or master keyed, to suit your requirements.

Cirlock Padlocks are available for immediate dispatch.



See our full range on our website: www.cirlock.com.au
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MINTO 11KV COUPLER FOR ABOVE GROUND MINING



**MINTO 11KV
COBRA COUPLER**



CMI Electrical recently released the Minto 800A 11kV COBRA couplers which are rated to IP66.

Specifically designed for above ground mining, tunnel and roadway applications. The 11kV Cobra are an innovative and compact design with many features and use state of the art materials which prolongs the service life of couplers in the field.

Below is a summary of some of the key features for the Minto 800A, 11kV COBRA coupler:

- Fully rated for a continuous operation 11kV @ 800A
- Modiewark No Contact - Voltage Test compatible windows, one on each phase
- Teflon Insulators
- Silver plated high purity copper current path elements

- Lower heat losses for longer service life
- Removable Stainless-Steel faceplate, which can be easily replaced if damaged
- Choice of armoured or rubber cable clamps
- Easily opened for inspection and re-termination
- Small and Large Gland body to suit cable type and size
- Choice of Rubber Cable or Steel Wire Armoured cable glands
- Unique gland design offering ease of use and additional cable support
- Custom designed ergonomic handles for lifting and handling

For more information on this product and our complete range, you can get in touch with **CMI Electrical Products** on **1800 264 222**, or go to their website at <https://www.cmielectrical.com.au>

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Expertise and Precision is our purpose.

CMI Electrical Products are specialists in the manufacture and distribution of electrical cables and associated components for industrial, mining, infrastructure, commercial, petrochemical and information technology applications throughout South East Asia and Oceania.

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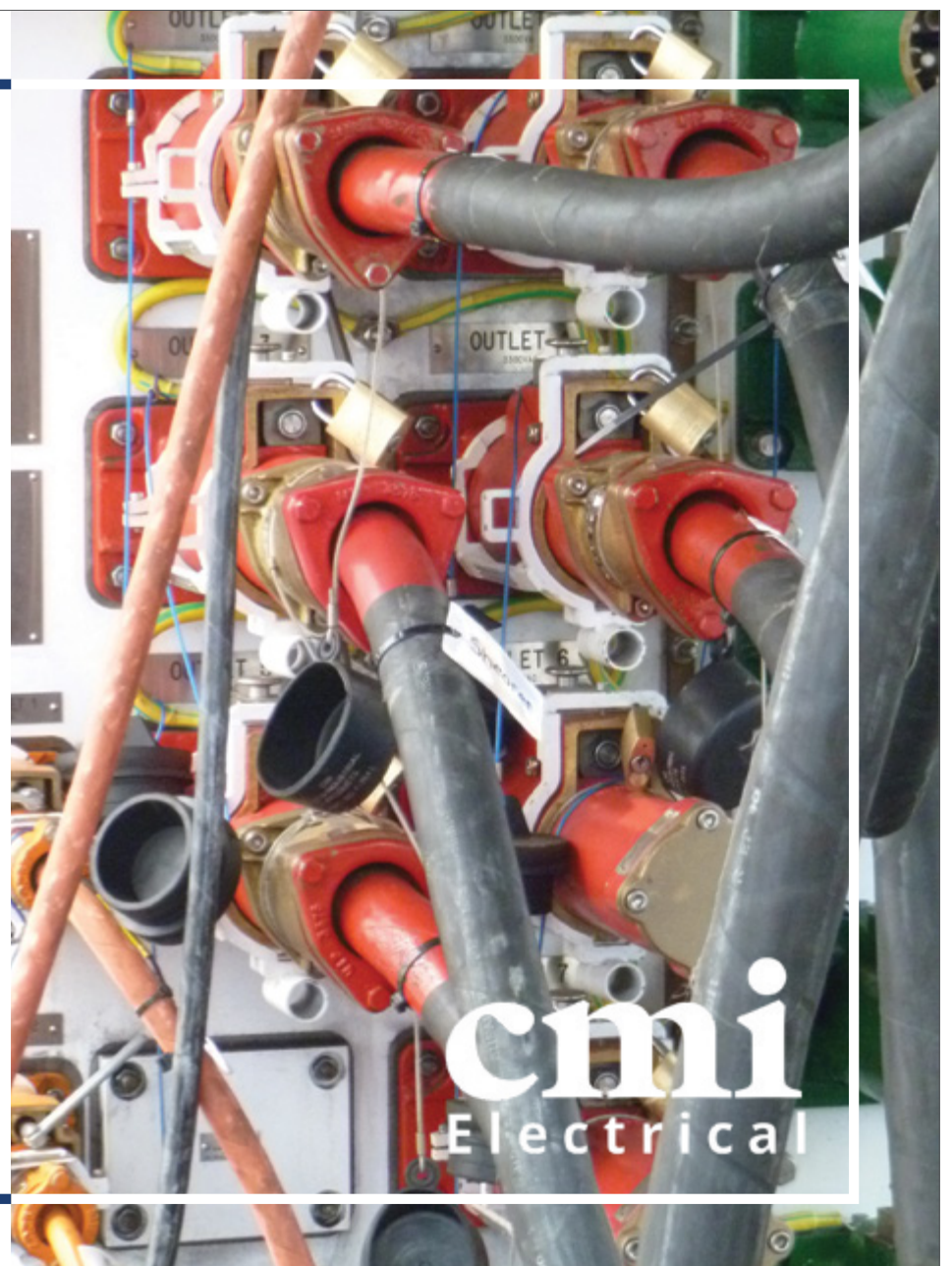
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- > Email: sales.australia@angusfire.com

SOLUTIONS FOR MINING EQUIPMENT

Keeping mining and heavy construction equipment in top operating condition is a constant challenge for today's mining and construction contractors.

Maximising equipment up-time is critical to shortening project completion times and increasing bottom line profits.

Removing equipment from the job site to a repair facility can delay project completion and put a damper on profits.

That is where CLIMAX can help.

CLIMAX has the on-site repair and maintenance machines that will minimise maintenance times and keep mining and construction equipment working for companies and their customers.

Thousands of worldwide mining and construction companies rely on CLIMAX to keep their fleets of tractors, loaders, excavators, draglines, cranes, and other heavy-duty equipment out-in-the field maximizing their profits.

Mining operations are almost inevitably remote, gruelling, complicated, and cramped.

Competition is fierce and profit margins are thin, while downtime can be devastating. In this kind of environment, it is easy to

see why portable machine tools in general and CLIMAX in particular, were discovered by the mining industry long ago.

Companies that serve today's mining industry face formidable challenges.

These include difficulties inherent to the business itself, as well as those caused by a still-uncertain economy.

Mining repair projects, especially those underground, must be undertaken in close, cramped quarters that make an already arduous task even more demanding.

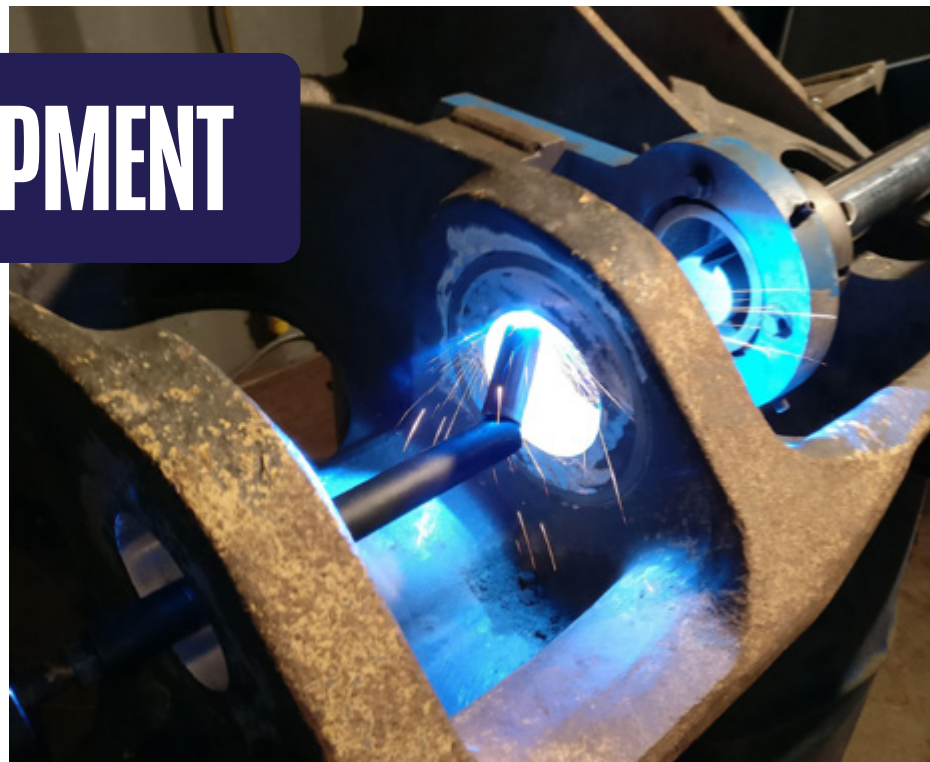
For contractors, even winning a job is a tough task; competition is fierce, customer loyalties tenuous, and concerns with bottom line issues intense.

One of the biggest challenges faced by customers in their work for the mining industry is expediting the rigorous process of underground repairs.

Adjustability and equipment versatility are critical to enable workers to perform a variety of repairs efficiently and effectively in extremely close quarters.

Finding a tool that can meet these demands is a top priority for mining and construction contractors.

The CLIMAX BB5000 is a compact, flexible



line boring machine that installs in 30 minutes.

The line of automated on-site welders interface with the boring bar system, enabling one set-up for both items, to help decrease weld time and improve productivity.

The system's adaptability to bore and welding simultaneously makes it useful for repairs on mining and heavy construction equipment.

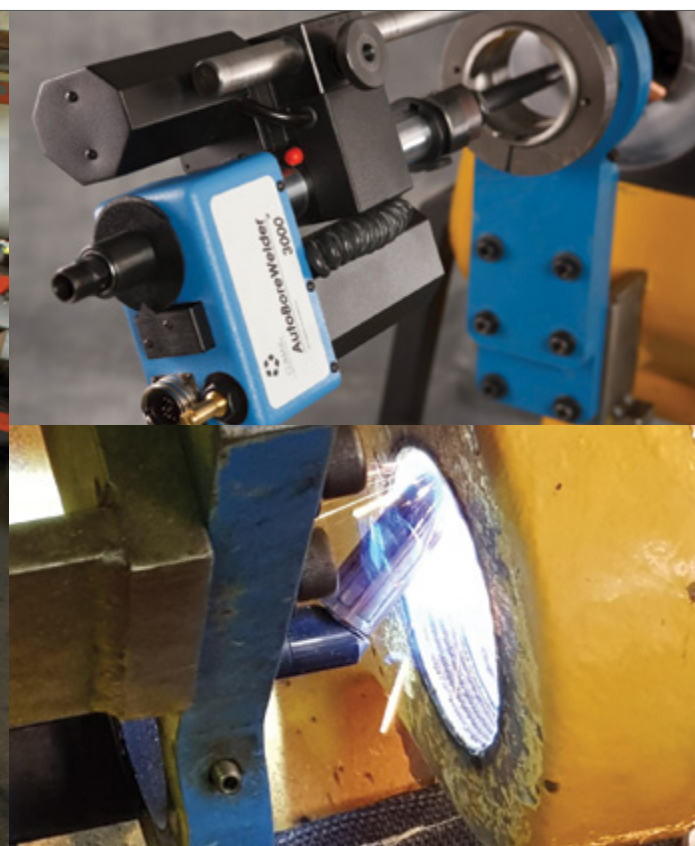
Customers trust CLIMAX for mission-critical machining, welding, or valve testing projects, in a wide variety of industries including oil and gas, mining and heavy construction, power generation, ship

building and repair, aerospace and defence, and many others.

With CLIMAX sites and factory-certified representatives covering the globe, its team is committed to delivering an outrageously good customer experience – every interaction, every time, everywhere – 24/7.

Go to www.climaxportable.com for more information on products. Contact Field Machine on **1300 368 368** for applications, engineering, custom design, training, start-up and commissioning, after-sale service, spare parts, equipment repair and maintenance, and rentals.

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FIXING AND FASTENING THE MINING INDUSTRY

Australian mines are part of a vital and thriving industry that contributes significantly to the country's economy. Creating jobs, driving innovation, and generating revenue helping to make this country a leading global supplier of minerals.

Mining sites in Australia ensure sustainable and responsible resource extraction in an industry driven by a skilled and diverse workforce. It is that very workforce that relies on cutting-edge equipment and technology to be active and operational day-in and day-out.

Your crew faces day-to-day challenges that can affect uptime and bring smooth operation to a halt.

One of these is readily available access to fasteners and industrial supplies and Unit-

ed Fasteners can ensure that your process operation continues to run smoothly through the reliable supply of high-quality Fasteners, Fixings and Industrial supplies.

We're Australia's largest independent distributor of fastening products and industrial supplies.

Over the years we have established ourselves as a market leader and are recognised for exceptional service, timely delivery, competitiveness, and total solutions.

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Our people are technical experts and solution focused individuals, driven to fully understand our customer's needs. From project design to project implementation, we provide advice and specification support along the way.

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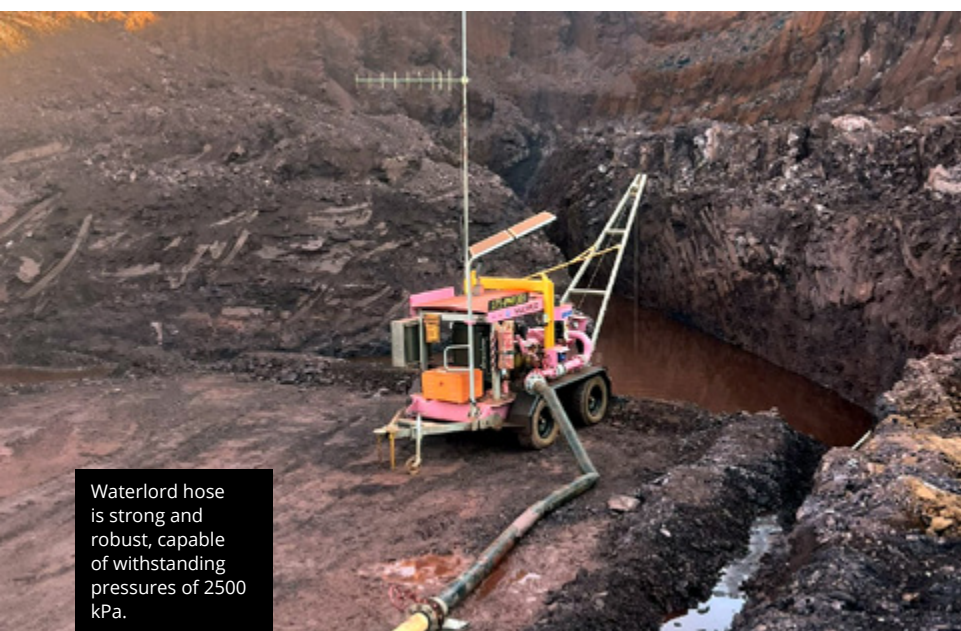
The flexible pipeline easily takes the contours of the terrain and around equipment.



The Hamersley drive unit gets its hydraulic power from a supplied plant.

Another success for the Hamersley rapid in-pit dewatering system

A recent trial of the Hamersley System for rapid in-pit dewatering at a sizeable Australian mine in the Pilbara proved to be a game-changer. The innovative system from Crusader Hose was validated as an efficient and user-friendly method. Installing 500 m of flexible layflat hose was completed in a fraction of the time compared to a rigid pipeline of poly.



Waterlord hose is strong and robust, capable of withstanding pressures of 2500 kPa.

Crusader Hose manufactures flexible layflat hose and fabricates reel systems for the mining sector. Keen on introducing their Hamersley™ rapid in-pit dewatering system to yet another mine, they approached a large iron ore mine in the Pilbara region of Western Australia to consider their innovative solution to an age-old problem – mine dewatering. After months of negotiations, the mine dewatering manager agreed to the proposed trial.

Despatched from Melbourne, a total of five x 200 m of Waterlord™ layflat hose with couplings wound onto five reels and the Hamersley drive unit were delivered within 1 week after reaching the agreement. Two technical experts from Crusader Hose flew out to the mine to conduct the training and oversee the installation.

The team assembled in the pit to learn about flexible layflat pipelines and the handling features of the Hamersley drive unit. The 8" Waterlord hose is strong and robust, capable of withstanding pumping at 2500 kPa. Its flange couplings connect lengths easily with bolts allowing pipelines to be installed quickly. The Hamersley drive unit with its hose on reels gets its hydraulic power from a supplied plant. With the push of the levers, the Hamersley takes out all the effort in handling the flexible hose pipeline.

After the mobile pump was driven to the deepest part of the pit by a 4WD ute and positioned, the hose was connected and pumping soon followed.

The speed and ease at which the hose was laid surprised many of those present. The flexible pipeline easily took to the contours of the terrain and even went around excavator buckets that were on the side

of the track. From the bottom of the pit to the poly line, the 500 m pipeline was installed in roughly two hours. No heavy lifting. No welding. No digging. No need for supports.

Once the pump was started, the layflat pipeline was brought to pressure and proceeded to drain the pit to much elation. Never having experienced flexible layflat hose solutions before, one of the impressed operators said, "We have many such like situations, and we'll be looking to use more layflat hose."

Introducing mines to the Hamersley System for rapid in-pit dewatering has been a challenge, according to Francois Steverlynck, Managing Director of Crusader Hose, as many dewatering engineers are reluctant to make a paradigm shift from poly pipe to flexible layflat. "We've been knocking on the door of the mining industry for many years, knowing we have the technology and systems to make their job easier and more efficient. We've worked successfully with those who listen and welcome continuous improvement at their workplace. Once they experience the benefits of a layflat hose solution, they can't believe they've waited so long. Our most recent successful installation is yet another attestation of our engineering and manufacturing capabilities," said Francois.

One of those mining managers who trusted Crusader Hose's claim and agreed to the most recent trial said, "There is an expectation by us leaders to seek new technologies for more efficient and safe mining practices, and, I believe, this engineered system from Crusader Hose does just that."

Crusader Hose systems are Australian Made. **AMR**

GENERATORS THAT ARE MORE SILENT THAN EVER

Welcome to a new era of silent generators. Aussie company High Tech Generators (HTG) is excited to introduce the world's quietest diesel generator to the Australian market. HTG has formed a strategic partnership with the highly respected generator manufacturer NED, an Italian company that produces high end generator sets, shelters and hybrid systems, made to measure or in series.

Renowned for diesel generators that are used in some of the world's harshest environments, and thanks to the continuous investment in R&D, NED successfully patented its sound proofing system on its hyper silent HUSH55 range of diesel generators to guarantee sound levels 55db@7meters. Now with further enhancements noise levels have been achieved below 55db. In fact, the latest HUSH55 (60kva stage V) has recorded very low sound pressure level of only 47 db (A) at 7m, without impacting the high-end performance of the generator.

NED takes care internally of the entire production process, from the design to the construction of the canopies, up to the realisation of the electrical panels, combining Italian design and innovative patented solutions. The entire structure of the generator is manufactured in cold galvanised steel, and the canopy is made without any type of welding, thereby ensuring maximum durability over time. Thanks to the project modularity, it is also easy to maintain or replace the single components.

All NED products are manufactured in its own 4,000m² production facility in the town of Fragnano (TA), Southern Italy.

The facility is equipped with state-of-the-art production technologies including numerical control machinery, assembly systems without any external welding and automated epoxy powder painting, all of which contribute to extended product life.

Due to the ability of NED to control every aspect within the manufacturing process, this allows flexibility and capability in customising generators to suit specific customer requirements.

Customers can be assured they are receiving the best of the best when it comes to generator technology. NED utilises the highest engineering standards in the manufacture of their machines, which are designed to reduce downtime and deliver a long-term return on investment.

For more information, visit
www.hightechgenerators.com.au or
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THE LEADERS IN TRANSPORTABLES

Northern Transportables is a locally established, owned and operated business delivering the highest quality portable buildings, customised to suit your specific needs.

With its head office, fabrication and manufacturing facility situated in the NT, Northern Transportables offers a creative and innovative design experience through innovative 3D modelling. As specialists in the portable building industry, the company works together with its clients throughout the design process for a smooth process from start to finish.

Their professional design team includes qualified structural drafters and building information modellers (BIM) to capture clients' visions, and to ensure durability and strength in line with Australian conditions.

Trusted to deliver innovative and depend-

able portable buildings, Northern Transportables prides itself on manufacturing and producing a product that meets challenging projects and time frames. The production team consists of skilled tradesmen, apprentices and trainees, transport and logistics staff supported by qualified professionals, including accounting and finance, contract and project management, human resources, QHSE, governance and risk management.

KEY PROJECTS

Newmont Australia – Tanami Village Expansion: Northern Transportables saw the design, manufacture and dispatch of a \$5 million project to expand Newmont Australia's Tanami Village in the Tanami Desert. Overall project requirements were to facilitate accommodation of up to 115 personnel and consisted of 28x4-person buildings, 1x3 person building, and 3xlaundries and locker rooms.

Fortescue Metals Group – Rail Camp 95: The company was tasked with designing, constructing and installing portable buildings at FMG's Rail Camp 95. Requirements for this \$19.5 million project included design, engineering, manufacturing, transportation of portables from Darwin to the Pilbara (3,500km), project management, and the supply and installation of 400 rooms, underground services, power station, wastewater treatment facility and spray field, water treatment facility and facilities for dining, office, recreation, gym, tavern and maintenance.

GEMCO – South 32: Northern Transportables designed and constructed high end workers accommodation in a \$11 million project, suitable to withstand the tropic conditions on Groote Eylandt in the Gulf of Carpentaria. Scope of work included detailed design considering structural, mechanical, electrical and acoustic engineering disciplines, the manufacturing of

2xlaundry buildings, linen stores, diner refurbishment, gym, commercial laundry, verandas between buildings, and various other buildings, packing of buildings to ensure safe sea travel, and all onsite works to complete the project.

Prefabricated and manufactured onsite, Northern Transportables delivers its products using its own fleet of National Heavy Vehicle Accredited and Western Australian Heavy Vehicle Accredited prime movers and trailers.

For the most reliable, durable, high-quality portable buildings to suit any and all projects, Northern Transportables is Australia's best in the business.

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VANS TRIED AND TESTED IN THE AUSTRALIAN OUTBACK

The Australian landscape is unrelenting and can create some unique challenges for companies operating in remote areas. Vehicles and plant equipment must therefore be purpose-built to withstand tough conditions, whilst meeting the specialised needs of personnel onsite.

Whether you're running a mining camp, traveling between multiple project sites, or simply need some extra workspace, mobility is a key consideration. This is particularly important when making decisions on the suitability of products when servicing the mining and resources sector.

Aussie owned company Vansite specialises in the design and manufacture of mobile caravans for industrial and commercial use. The team work with clients to design fit-for-purpose products customised to their specific requirements – from mobile

site offices, accommodation or ablution facilities, to kitchenettes and crib rooms, entire mobile camps or a combination of all these options.

Vansite's mobile units are built tough with durability and dependability in mind.

"Our mobile caravans are specifically designed to withstand the rigours of the Australian outback, or simply the day-to-day urban environment," said Vansite Director, Grant Gasnier.

"The goal is to provide an innovative solution that stands up to the challenges of remote locations. Whether it's a short or long-term project, our mobile caravan is the ideal solution for those companies wanting to source a flexible product with multiple applications."

Vansite's models range from 2000kg to 6500kg, many of which can be towed by

a 4WD. Vans can be mobilised and demobilised with minimum downtime or outlay, meaning work starts sooner and cost efficiencies are significantly improved. This is particularly relevant in emergency situations and areas prone to severe weather events, where speedy evacuation is necessary.

Mr Gasnier added that their all-in-one mobile office, which comprises a crib room, toilet facility and generator, is increasingly in demand.

"These vans incorporate a small kitchen that essentially increases the available office space, as it also doubles as a lunchroom," he said.

"Air-conditioning is standard and water tank options allow the van to be self-sufficient. We have five models which cater for work crews from five to up to twenty-four people, making them ideal units for sites

that need to provide efficient workspaces for personnel in remote locations, or for short-time frames."

Stand-out features that reflect the high quality of all Vansite products include a fully galvanised chassis and insulated panel construction, as well as multiple power, water tank, and communication options. Vans can also be custom branded with clients' company logos. Purchase, lease or hire options exist and can be offered within a fast turnaround time.

It's easy to see why Vansite has become the manufacturer of choice for miners requiring high-quality flexible solutions that serve multiple applications in industrial settings.

**For more information,
call 0409 520 520 or visit
www.vansite.com.au**
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Built Tough Industrial Caravans

An Australian owned and operated company, Vansite is a competitive player as a supplier of Commercial and Industrial Vans. We provide mobile solutions for a variety of clients, including the mining, energy and resource sectors, government departments, events management and construction industries.



Our Manufacturing Portfolio Includes:

- 5.8 Series Combination Site Van (seats 4-6 workers)
- 7.2 Series Combination Site Van (seats 8-10 workers)
- 7.2 Series Semi Autonomous Control Facility
- 8.7 Series Combination Site Van (seats 15-18 workers)
- 10.0 Series Site Van (seats 21 workers)
- 6.3 Ablutions Trailer (Male and female 4 pans + 3-person urinal)
- 8.0 Series 2 Bedroom or Movie Room Trailer (includes slide outs)



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PIPELINE TO SUCCESS

Founded in 1975, Trans Vent is a proudly Australian spiral tubing manufacturer dedicated to supporting the occupational health and safety of the industrial and mining sectors.

With a team of specialists across their Queensland and New South Wales locations, the business combats dust and fumes with their expertly crafted tubing and piping products.

Sales Manager Daniel Cronshaw said their solutions were manufactured in Australia, made from Australian steel and specially designed to enhance workplace safety.

He said their product mix and services were also uniquely shaped by Australian mining needs and a commitment to efficient, reliable and affordable work.

"We pride ourselves on short manufacturing times and always try and offer a quick turnaround," Mr Cronshaw said.

"For certain products, we also have a large stock holding.

"For operators in remote locations, we engage our sister company CMP Manufacturing – which supply mobile mills for onsite pipe forming.

"Whether the project is large, small or challenging, we are able to help."

TRANS VENT PRODUCTS:

SPIRAL WELDED PIPE

The spiral welded tubing and piping is welded instead of lock formed at the seams, providing improved strength, and making it virtually leak-proof. Ideal for high pressure, the product comes in a large range of sizes and a variety of thicknesses, grades and mild steel or stainless steel.

DUCT, FITTINGS AND ACCESSORIES

The fittings and accessories come in a variety of sizes and materials, each boasting an array of applications. This includes dust and fume extraction and other uses such as column formers, pier liners, air conditioning, tunnel and mine ventilation, void and span tubing and much more.

Trans Vent accessories and fittings include round bends, oval bends, joiners, end caps, flanges, mounting brackets transformations, reducers offsets, T and Y pieces, volume dampers, register take-offs and insulated ducting.

PIPING SOLUTIONS

Trans Vent galvanized steel culvert tubing is suitable for drainage and under-the-road irrigation applications.

Both affordable and available in a variety of corrugated profiles, the product is strong and flexible, coming with the op-



tion of getting precast concrete drain trimmings for finishing ends.

SPIRAL PIERS

Lightweight and cost-efficient, pier liners are perfect for concrete foundation forming, while void forming tubes are ideal bridge spans and concrete decking.

Similarly affordable and uniquely made of steel, Trans Vent column formers are highly resistant to water, can be built to required lengths and do not struggle under the weight pressures.

SPIRAL DUCTING

Round spiral ducting is a great alternative to square ducts and used often for AC ducting, ventilation, dust, and fume extraction and more. Similarly, oval ducting is ideal for space saving in air conditioning, dust and fume extraction and ventilation applications. Trans Vent also offers insulated ducting across a range of sizes, including 25mm or 50mm insulation.

For more information, visit www.transvent.com
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TRANS VENT



DEDICATED SPIRAL TUBING AND DUCTING EXPERTS



Trans Vent is a dedicated spiral tubing and ducting manufacturer, providing strong and reliable products since 1975.

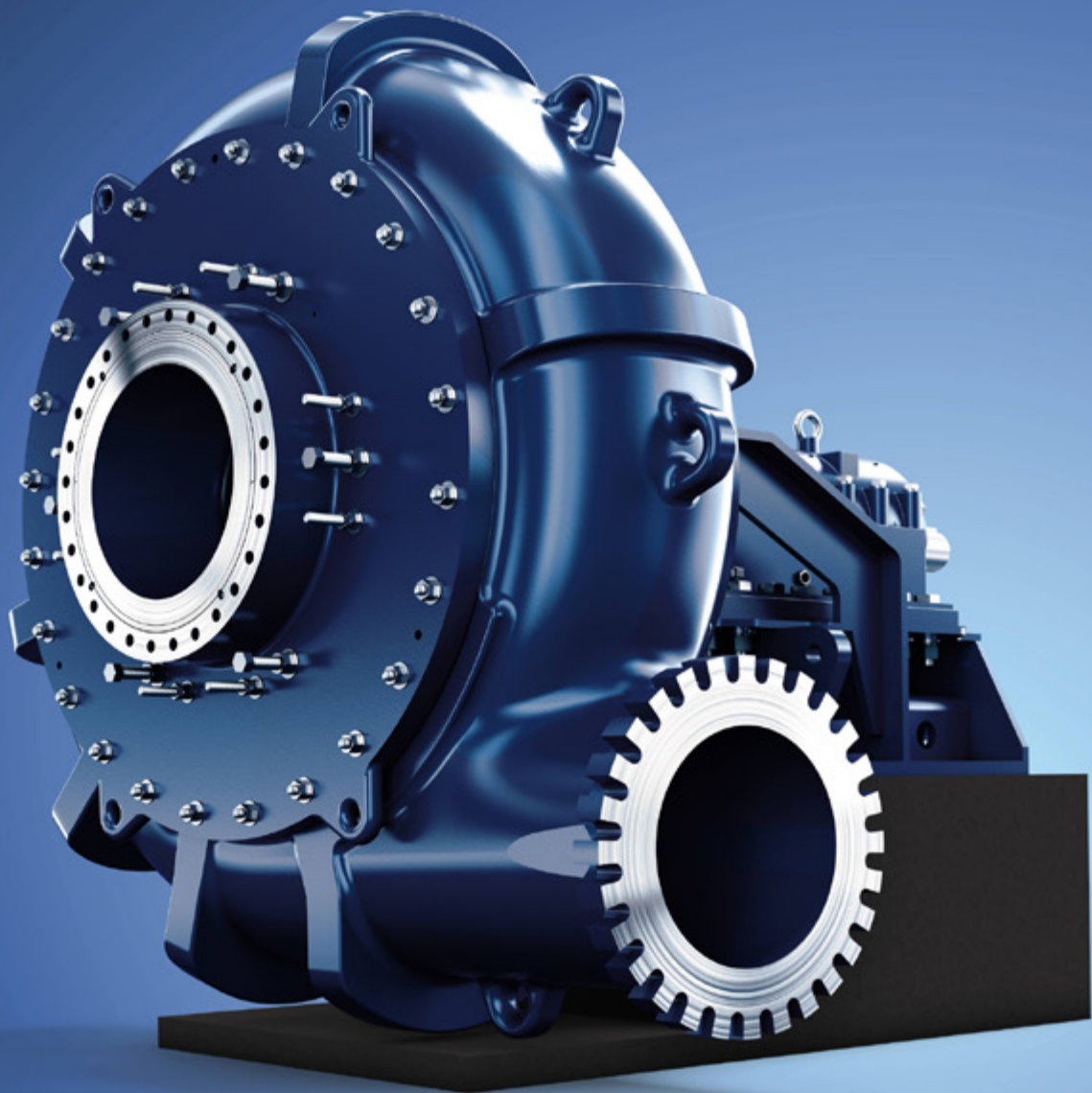
The Trans Vent team can offer:

- Sizes to suit all applications ➤
- Onsite delivery ➤
- Products suitable for high pressures ➤
- Versatile and varying fittings and accessories ➤
- Excellent customer service ➤
- Upfront pricing ➤

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MEET THE KSB GIW® MDX-850



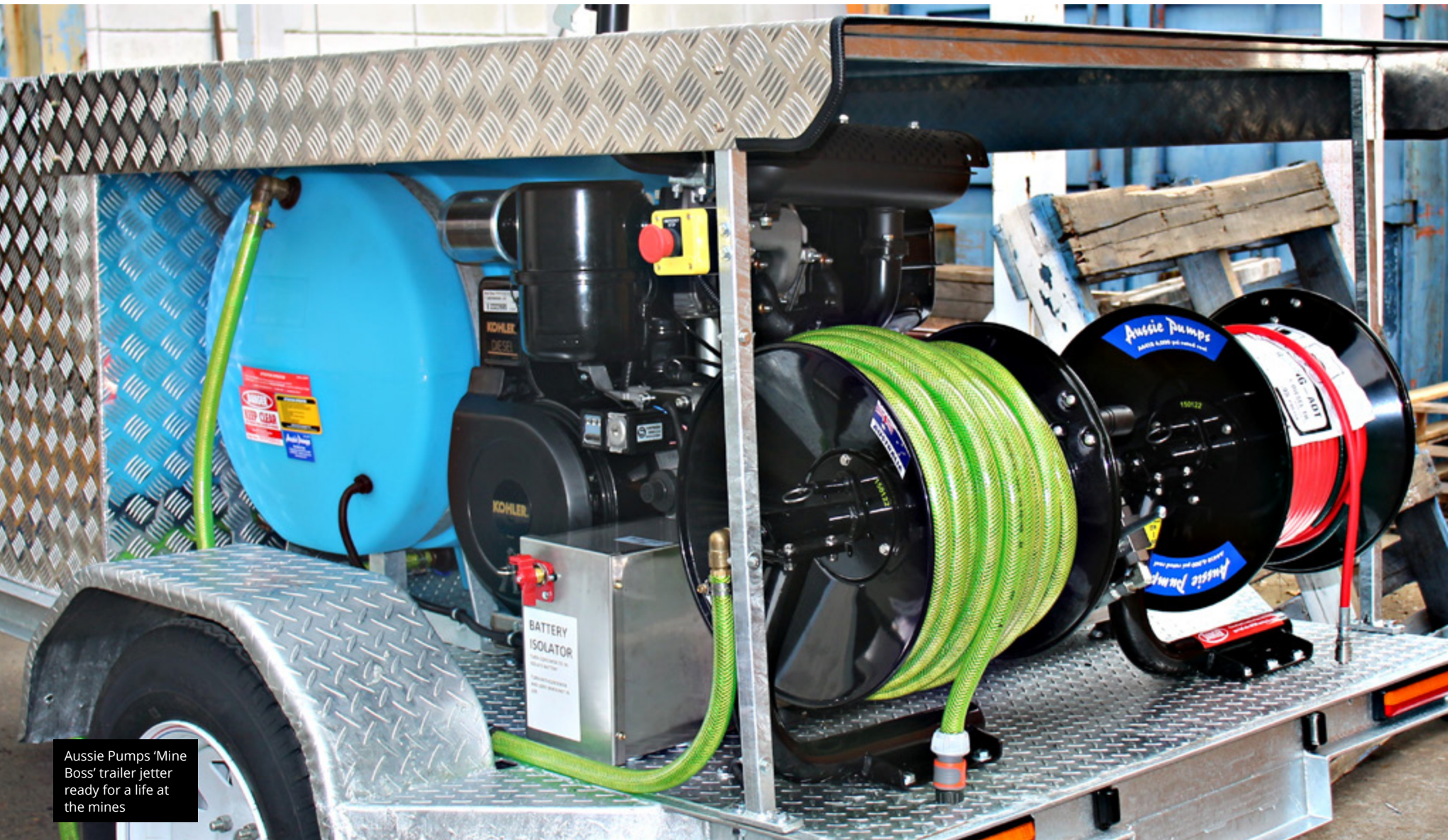
The MDX-850 is the latest and largest addition to the already impressive line of KSB GIW® slurry pumps. Due to mining operators experiencing increased demand for minerals and ore, the need for a mill duty pump larger than the MDX-750 was clear. Capable of pumping service class four slurries upto 16,000m³/hr, this pump will meet your plant design tonnes and maintenance wear life expectations.

The KSB GIW® MDX is equipped to tackle the most extreme slurry pumping duty conditions. With its patented wearing parts and material technology, the MDX matches operating cycle times with scheduled mill outages meaning fewer disruptions and increased operational efficiency.

Learn more at www.ksb.com.au or speak with a KSB representative 1300 073 887.

KSB
MINING





Aussie Pumps 'Mine Boss' trailer jetter ready for a life at the mines

JETTING AUSSIE STYLE ... FOR MINES TOO!

There is no doubt Australia is prone to extreme weather conditions, from fires, floods and droughts, to soaring summer heat and chilled winters. The mining landscape is no different. Asset owners need to operate in harsh environments and fluctuating weather events, ones that challenge even the best.

Service providers must therefore supply reliable, efficient and durable equipment that can withstand the tough demands of the modern mine site.

One company that has risen to the challenge when it comes to designing a product range for Australian conditions is Aussie Pump Industries (known as Aussie Pumps). The company introduced high pressure jetting machines to the market almost 30 years ago. Since then, it has made significant gains in product development based on operator feedback.

According to Aussie Pumps Chief Engineer, John Hales, the company has a proud heritage and proven track record in product development.

"Our innovative approach and merciless pursuit of quality and performance has really worked," said Mr Hales.

"We believe our Jetters are the best in the world. We've asked users what they want and what they like, and the feedback indicates the top priorities are efficiency, speed and safety.

"The Aussie Pumps slogan 'Faster, Smarter, Safer' has been front of mind during the development of our high pressure product range. The result is our Cobra and King Cobra Jetter range, which has evolved into what we call the Mk3 Deluxe versions."

BENEFITS OF JETTING IN MINE PROCESSES

The Aussie Pumps 4,000 psi and 5,000 psi drain cleaner range has built a reputation for quickly clearing clogged and choked drains and pipes in process plants up to nine inches in diameter. Although the company started out building jetters for plumbers, they soon discovered these were being utilised in abattoirs, piggeries and more recently, mines.

Plant and maintenance managers have achieved substantial cost savings in cleaning choked pipes without completely dismantling the process. This has reduced downtime and the occurrence of failures, and improved plant efficiency.

Hales highlighted that their jetters were

originally powered by Honda petrol engines, however the company can now also produce diesel drive and three-phase electric drive options.

"Our range features both Class A and B units, with Class A machines being the preferred choice by many operations," he said.

"Safety standards are important, but operators of Class A machines don't require R.T.O. certification to comply with the Safety Standard AS/NZS 4233.1. However, they still require training for their own safety."

"We have a 'Safe Operator' training course to help with that, which is a free online course and based on Aussie Pumps' long association with the mining industry and feedback from the field."

HIGH FLOW PYTHON

The most capable machine in Aussie Pumps' Jetter range is the 'Python'. It delivers 4,200 psi and a flow of 31 lpm with the ability to clear blocked drains up to nine inches in diameter. The 'Python' can be ute, trailer or skid-mounted. At the heart of this machine is a heavy-duty gearbox drive Bertolini drive pump referred to as

'Big Bert', which is covered by a four-year warranty.

The 'Python' is now supplied with a stainless steel reel, including 60 metres of sewer hose. Pump protection is also built in to prevent damage or injury in the event of a pressure spike.

A jetter nozzle toolbox is supplied with every machine along with a 'safety plate' to protect the operator from returning jetting nozzles. This toolbox is packed with a range of nozzles tailored to various types of chokes, and includes standard penetrator nozzles (i.e. Aussie Predator, Negotiator, Compressor), as well as the Aussie Turbo Root Mulcher designed for tree roots.

TRAILER MOUNTS & PORTABLE MINI-REEL

Aussie Pumps' Diesel engine drive Jetters for the mining industry or remote communities are built into heavy-duty hot-dipped gal trailers, and fitted with large toolboxes. A roof covers the pump-motor group, and the high-pressure and low-pressure reels are easily accessible from the rear. The accessories, like the portable Mini-Reel and wash-down kit, are secured within the toolbox. This makes the entire product self-contained and extremely mobile,



Aussie Pumps 'Mine Boss' diesel jetters commence production as pump/motor units

allowing jobs to be completed fast and efficiently.

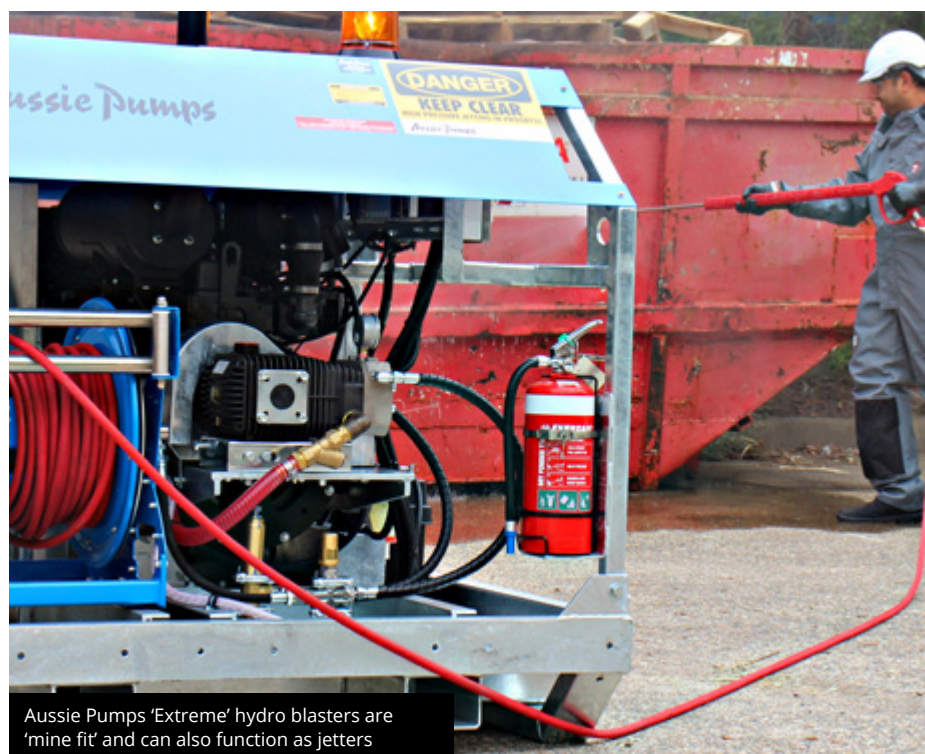
The big trailer mounted jetter has a range limitation of its 60 metre sewer hose. In order to overcome this issue, the company has worked with plumbers to develop a handy stainless steel portable Mini-Reel, which is fitted with an additional 60 metres of sewer hose. This enables the jetting of pipes and drains up to 120 metres from the 'mother ship'.

Weighing only 24 kilograms, the operator can carry the Mini-Reel to the jetting site, and even tackle chokes in internal pipes. The pressure supplied to the jetting nozzle is controlled by a ball valve on the Mini-Reel. For added convenience, the handle on the reel incorporates three quick-connect tails to hold extra nozzles, keeping them close to hand. The reel also features a pressure gauge.

Hales says the Mini-Reel has become an essential tool for maintenance plumbers due to its versatility. Having a jetter with that level of capability presents many opportunities.

"The convenience of being able to take the reel and nozzles to the drain entrance, whilst maintaining control of the 'mother ship', is a huge advantage. Pipes can be cleared faster with less mess and less damage," said Hales.

"The machine comes with a gun kit, so it can be used to clean-up the worksite too. We're seeing more and more contractors using these jetters to branch out into pressure cleaning other mining equipment and vehicles. It wasn't Aussie Pumps that found these applications, but rather operators who realised just how versatile these machines are."



Aussie Pumps 'Extreme' hydro blasters are 'mine fit' and can also function as jetters

SAFETY RULES

5,000 psi jetters can be dangerous beasts. Working with worn hoses can pose a high degree of risk and will reduce performance dramatically. Additionally, machines that are not regularly maintained will break down. These failures and associated hazards can be minimised through the operator training.

Fortunately, Aussie Pumps offers a free online 'Safe Operator Training' program, which explains the principles of high-pressure water jetting and the risks involved. It covers the relationship between the pump, unloader valve, gun, hose, lance, and most importantly, the nozzle.

How these individual parts integrate with one another to deliver the right performance of the pump, is critical. Operators can complete the online course at their own pace, and it is expected to go viral now since being released internationally.

THE FUTURE OF AUSSIE PUMPS

"Our Jetter range is gaining respect throughout Southeast Asia and other parts of the world," said Hales.

"It's really interesting for us to see the success of our jetters in China, one country where you would expect cheaper third world products to dominate," he said.

Aussie is proud of its innovations and recognise that the mining industry has played an integral role in Australia's prosperity. "We believe every major mining camp needs jetters to maintain a healthy working environment," said Hales.

For more information, visit
www.aussiepumps.com.au

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HOW 3D SCANNING MAPS MINES AND PLANTS IN FINE DETAIL

In the world of traditional surveying, the measurement of critical infrastructure can be time-consuming and prone to error, with only a few hundred measurements done in a day, while also carrying safety risks the longer personnel are on site.

Now, laser scanners have the ability to capture more than one million three-dimensional measurements per second, with entire plants and mine sites scanned in days or weeks, creating a “digital twin” of the infrastructure.

Reality capture, as it is called, creates a “digital twin” of the infrastructure or physical object, providing better visualisation and faster modelling on to a computer or a handheld device through the cloud.

Delonix founder and structural engineer Philippe Vatin says the speed and precision of 3D scanning is mind-boggling and the mining industry has captured on to this technology.

“3D scanning is the process of creating a digital model of the existing world using an automated process,” he said.

“We capture anything at a very high speed because the laser scanner machines pick up to two million points per second,” he said.

“That’s a lot of information and, because we are capturing so many points quickly, we can rebuild a three-dimensional model efficiently by mapping all these closely-spaced points together on a computer.”

The process of 3D scanning involves capturing three-dimensional attributes of a physical object, including its shape and texture, through methods such as laser scanning, structured light and photogrammetry.

Data is recorded from the surface of the object using a 3D scanner, which creates a “point cloud” of data, or a photorealistic cloud of points, from the object’s surface,

with the information then processed to construct a digital 3D model from its 3D mesh of points.

Using the combination of laser-based and photo-based tools, this laser technology provides a more accurate and precise outcome than traditional surveying.

“Delonix uses predominantly Leica equipment and technology as we believe they are the best in LiDAR scanning at the moment,” Mr Vatin said.

“We are able to scan from an accuracy of 50-micron, useful for reverse engineering a mechanical part, all the way up to a few millimetres, as well as capturing full site and ground topography for plant design.

The earliest known use of 3D scanning was in the medical field in the 1960s.

Its use then evolved to the entertainment industry, where 3D scanning is still being used to create digital models for movies and backdrops for video game, such as the wildly popular Fortnite and Call of Duty.

Over time, this technology has become more refined, accurate and affordable, with the mining industry using it to create digital 3D models of entire mine sites and processing plants.

Mining majors are now using 3D scanning and reality capture to improve safety, productivity and data accuracy.

Delonix currently services clients such as Pilbara Minerals, Northern Star Resources (for the KCGM Super Pit), Lynas Corporation, First Quantum Minerals, BHP and CBH, helping their operations improve some of the following through 3D scanning:

1. Mine Planning and Design: 3D scanning accurately maps and models existing mine structures and geology, providing necessary detail for efficient mine planning and design, as well as creating virtual reality models for improved visualisation and planning.

2. Exploration and Ore Body Modeling: High-resolution 3D scans helps create detailed ore body models, improving the ability to predict the location of valuable mineral deposits and design more effective mining strategies.

3. Volume and Quantity Surveys: 3D scanners provide quick, accurate volume measurements, allowing for precise inventory management and ensuring accurate calculations for financial reporting and planning.

4. Equipment Maintenance and Inspection: 3D scanning creates detailed models of mining machinery and infrastructure for predictive maintenance, troubleshooting and planning upgrades.

5. Safety and Risk Management: By scanning the mining environment, potential risks can be identified and mitigated, for example, identifying areas of potential ground movement or instability through regular 3D scanning.

6. Restoration and Reclamation: After a mine is closed, 3D scans can help in planning and documenting the restoration process, ensuring that the land is returned to its original state or to a state that’s suitable for new uses.

The high degree of precision offered by 3D scanning, combined with the ability to handle large-scale projects quickly and efficiently, makes it a valuable tool for the mining and resources industry.

“You can get the centreline of two bolts, or the diameter of a hole, or you can get all the finer details of any surface, even curvature, limitation, damage... everything basically,” Mr Vatin said.

“What used to take about half-an-hour, as well as logistical challenges involving elevated work platforms and staff abseiling down the side of a building, now only takes a few seconds with a 3D scanner on a tripod or on the ground.”

Mr Vatin says few companies, however,

have the ability to capture full-size plants in detail.

“The technology is currently being used in other fields on a small-scale as it requires significant IT infrastructure to handle the big data swiftly and simultaneously, not including the technical skills required to maintain the large amounts of data,” he said.

“Delonix has bucked the trend and made significant investment in this direction.”

Delonix Solutions has bundled together all of its scanning services under a single brand called RealClouds, which enables clients to work with point cloud data easily.

RealClouds provides cloud hosting of client data, as well as device streaming to workstations or held-held mobile devices, allowing clients to visualise or add notes, photos or models to their digital twin on-the-go.

RealClouds also maintains, updates and backs up all of the data and information, which is typically well over a few terabytes for most large clients.

“We handle all the big data associated with 3D scanning through our cloud server, called RealClouds, where clients can log-in, visualise and maintain their point-cloud information from their remote workstation or hand-held devices,” Mr Vatin said.

“Our servers stream the images to clients’ iPhone, iPad or workstations, where they can easily use and interrogate large data sets that are well in excess of 1TB of data.”

Delonix, based in Perth, specialises in innovative computer-aided design engineering and its team of about 50 staff has experience in a wide range of surveying and mapping applications, including mine surveys, road and rail construction, industrial plants and more.

“The only thing we don’t do is underwater,” said Mr Vatin. **AMR**



ENGINEERING | DESIGN | SURVEYING



THE DIGITAL TWIN MADE REALITY

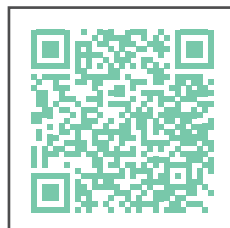
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ADVANCING UNDERGROUND MINE SURVEYING WITH SLAM SOLUTIONS TO IMPROVE SAFETY AND EFFICIENCY

Underground mining operations have long relied on accurate surveying techniques to ensure safety, optimise production, and maintain operational efficiency. Although traditional surveying methods are effective, they can be a time-consuming and complicated task often at the expense of mining production, subsequently leading to cost implications. Globally, mines are adopting new technologies to further improve workflows, and provide a larger return on investment, whilst keeping safety and efficiency at the forefront of everything.

For mine engineers, frequent and accurate underground data is valuable for ensuring regular safety checks, planning, and analyses. In the past decade, SLAM technology has further optimised this process, providing a less intrusive and faster way to capture 3D information. Early adopters of SLAM solutions have entered a new era of mine surveying.

UK technology firm GeoSLAM (A FARO Solution) have led the SLAM revolution since 2013, providing mine operators around the world with the technology and expertise to confidently integrate SLAM into their daily work.

What is SLAM?

SLAM stands for Simultaneous Localisation and Mapping. SLAM-enabled devices take data from sensors to build a 3D repli-

ca of the environment around them and where they are positioned within that environment. LiDAR-based SLAM algorithms use lasers to effectively construct or update a map of an unknown environment while simultaneously tracking features within the environment to locate the device's relative position.

Unlike static-based methods of data capture, SLAM works at its best when in motion. Therefore, mapping an environment is as simple as walking around it with a mobile laser scanner. This is particularly useful for underground mapping because it limits the engineer's exposure to potentially dangerous areas.

Regular data collected from SLAM devices often leads to faster decision-making, cost-effective changes to plans, or highlights safety concerns.

Production Progress Mapping

Monitoring the progress of production is essential for efficient resource extraction. SLAM solutions offer a powerful way to accurately capture data on a large scale. Equipped with LiDAR sensors, mobile laser scanners can swiftly traverse mine tunnels, capturing detailed 3D point clouds of the mine's geometry.

Using the data collected, surveyors can generate Digital Terrain Models (DTMs) and a 3D map of the tunnel. These digi-

tal replicas provide valuable insights into the progression of production, helping mine operators to monitor excavation volumes, track the advancements of drifts and assess the accuracy of blasting operations.

Comparing to real-time data, information from SLAM enabled devices increases the time to make decisions, optimising the mines output cost effectively. In addition, this doesn't come at the expense of the mine's productivity and data can be captured as often as needed.

Convergence Analysis

The stability of underground excavations is paramount to ensuring the safety of miners and the integrity of the mine infrastructure. Convergence analysis, which involves monitoring the convergence or deformation of excavated walls and tunnels, is crucial for identifying potential stability issues.

SLAM and mobile LiDAR solutions offer a game-changing way to analyse convergence. With the ability to collect large amounts of data fast and regularly, mobile LiDAR devices offer an efficient means of monitoring convergence. By comparing successive point cloud datasets, in some cases daily, engineers can assess the rate and extent of convergence, identify areas of potential instability and make informed decisions regarding ground support.

Regular data capture, with limited disruption to a mine's operation, enhances the accuracy and efficiency of convergence monitoring, enabling proactive measures to be taken promptly. The innovative technology significantly reduces the time spent in potentially hazardous areas, increasing the safety to workers by limiting exposure to potentially dangerous environments.

Further, the versatility of mobile scanning devices provides avenues for accessorises, for mapping areas that might be deemed too dangerous for workers to go. This might include mounting the scanner to autonomous vehicles or drones.

Vertical Shaft Inspection

Whether used to transport workers up and down the mine, or for removing excavated ores and minerals, vertical shafts are an important part of the mining process. Equally important is making sure these shafts are fully serviced, working at full capacity and continue to be structurally sound. Not only for miner safety, but for the overall production of the mine's underground operations. SLAM solutions offer significant advantages for analysing vertical shafts, where other forms of data capture would struggle.

Using mobile LiDAR scanners, engineers can capture detailed point cloud data of a shaft environment. This might include the walls, floors, or equipment. Regular



scans provide precise measurements for assessing deformation or detecting potential hazards like cracks or cave-ins early. The mobility of scanners means that an engineer only needs to lower the scanner down a vertical shaft, on a secure cable, capturing data as it descends and ascends. This eliminates the need for personnel to physically enter hazardous environments, improving worker safety.

Gathering the comprehensive data required for assessing the 3D models and comparing to previous scans, is simple and repeatable. Like analysing convergence, this leads to faster decision making, increasing safety to workers, and decreasing unnecessary costs to the mine.

Mine safety with mobile LiDAR

Safety is of paramount importance in underground mining operations, and investment in new technologies mitigate risk to workers. Mobile LiDAR and SLAM improve safety by reducing the need for personnel to enter hazardous areas for surveying purposes. With their ability to capture detailed data from a safe distance, these systems minimise the risks associated with traditional methods of underground mine surveying.

Additionally, by conducting regular scans faster, surveyors can spend more of their time analysing the data, reviewing safety and inefficiency concerns. For global users

of SLAM technology, this has proven to be a cost-effective way of mapping their assets, providing a great return on investment, and increasing safety aspects simultaneously.

Static scanning and SLAM

Given their historical use in mining, it is no surprise that static scanners are a firm favourite among mine surveyors. So, what is the place for SLAM systems? Given their sub 1mm accuracy, there will always be a place for static scanning in underground mining. Static scanners and SLAM enabled mobile LiDAR can easily complement each other in underground mining, offering a comprehensive approach to data collection and surveying. By combining the strengths of both types of scanners, mining professionals can achieve more accurate and detailed results.

Static scanners could be utilised to provide a more accurate and intricate detail of a mine, on a less regular basis, covering critical locations such as major intersections, shaft bottoms or areas prone to instability. Whereas mobile LiDAR devices can cover those places including harder to reach areas, providing a broader dataset. Due to the ability to scan faster and with less disruption to the mine, mobile scanners can be used to keep data up to date in between the less frequent static scanning.

By merging the high-resolution data from



static scanners with the broader coverage data from mobile scanners, surveyors are left with a more complete understanding of the underground environment and where inefficiencies and safety concerns are.

GeoSLAM (A FARO Solution)

GeoSLAM has provided SLAM solutions to the mining sector globally for over 10 years and continues to provide new ad-

vancements and accessories to further simplify workflows.

Their ZEB series of scanners are lightweight, easy-to-use, versatile, and designed with harsh environments in mind. Forward thinking mining companies that have already adopted mobile scanners from GeoSLAM are reaping the rewards, through more efficient workflows, and safer working environments. **AMR**

Contact GeoSLAM

Contact a local GeoSLAM representative today for a free demonstration and for a breakdown of how they can help optimise your underground mining operations with faster data capture.

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