

THE AUSTRALIAN MINING REVIEW

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JUNE 2019

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THAT WON AN
ELECTION

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TECHNICAL TALK

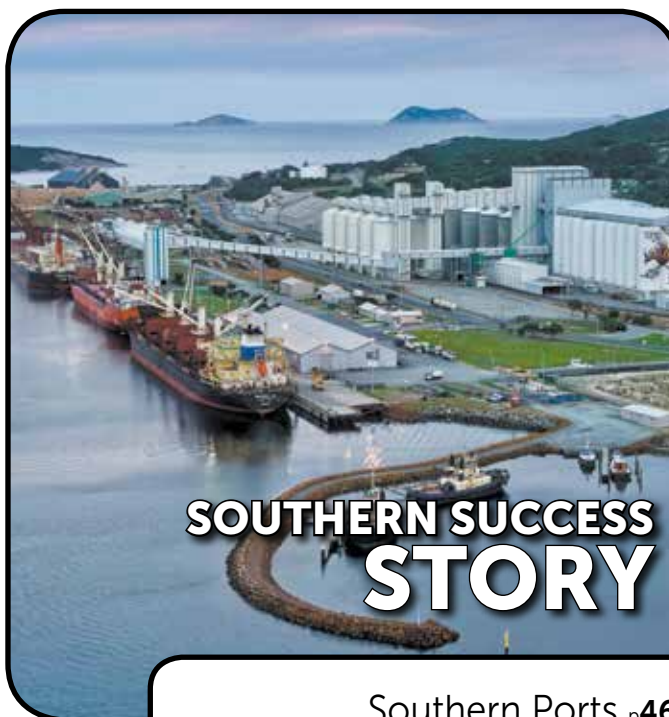
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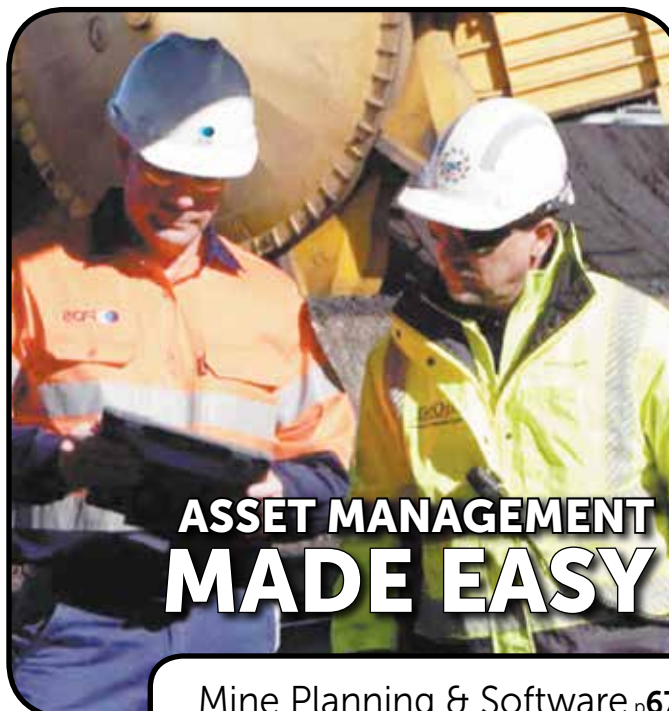
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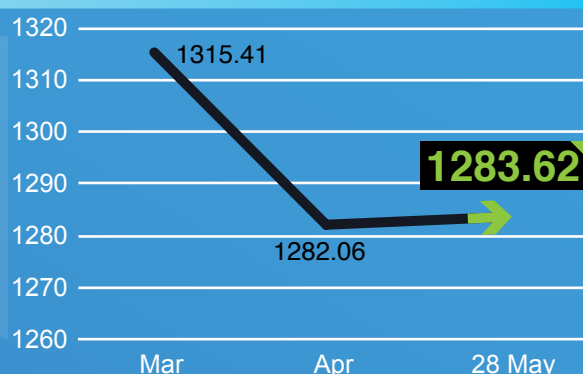
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MAJOR COMMODITIES SNAPSHOT

GOLD

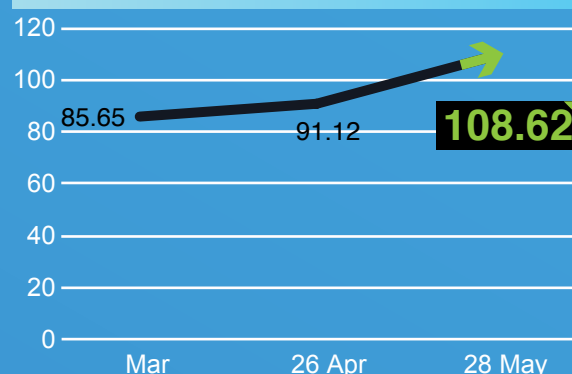
\$US/oz

The gold price was marginally higher toward the end of the month due to a strengthened US dollar and eased friction between China and the US.



IRON ORE

\$US/t
62% Fe CFR China

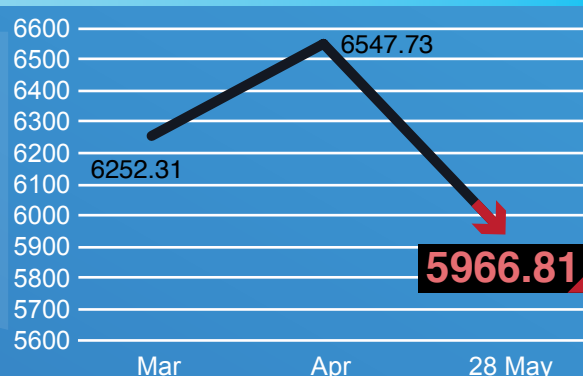


As Brazil's iron ore industry remains incapacitated, iron ore hit the milestone US\$100/t in May, prices not seen since 2014.

COPPER

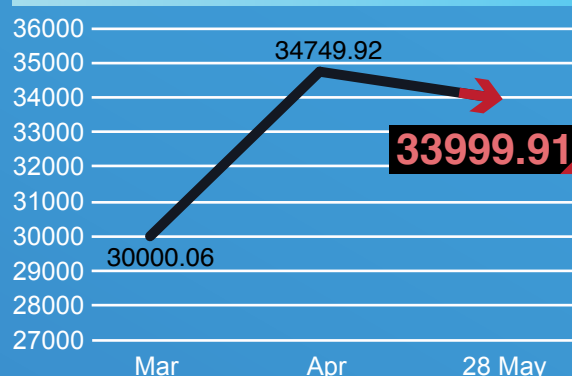
\$US/t
LME Price

Copper has remained under pressure with the London Metals Exchange price for delivery sliding about 10pc for the month.



COBALT

\$US/t
LME Price

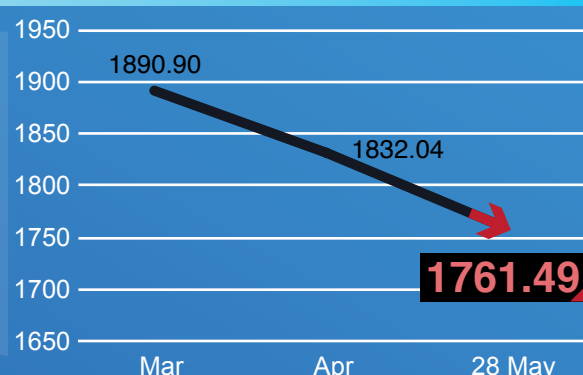


Cobalt has plateaued after falling dramatically in the first quarter; however, demand from the battery sector remains strong.

ALUMINIUM

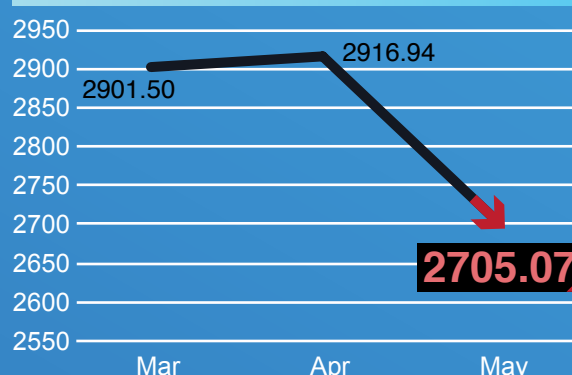
\$US/t
LME Price

Aluminium prices have continued to fall as a Brazilian court lifted production restrictions on Alunorte, due to environmental regulations.



ZINC

\$US/t
LME Price

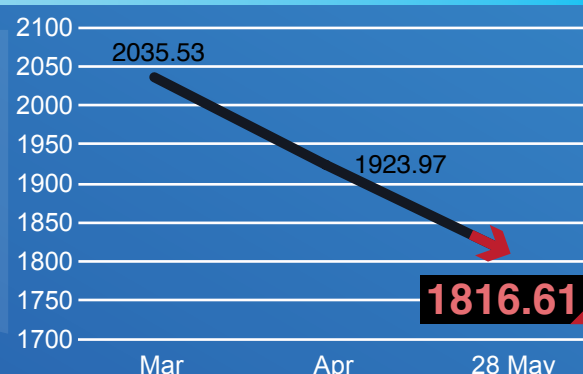


Zinc prices fell throughout May as Chinese smelters capitalised on April's nine-month high and put stocks back into oversupply.

LEAD

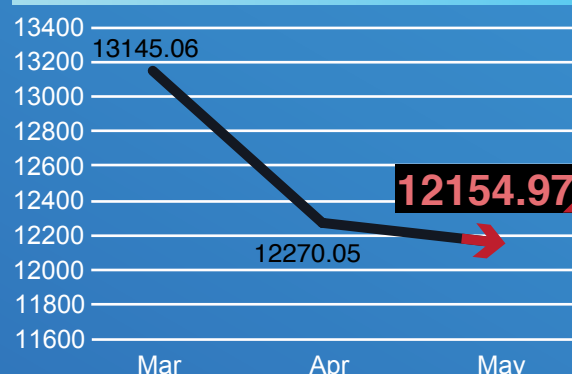
\$US/t
LME Price

Despite rallying slightly at the end of April, lead prices look set to continue falling as existing stockpiles meet supply deficits.



NICKEL

\$US/t
LME Price



Nickel finished slightly lower at the end of the month, however it has received some strong endorsements from big players putting mines back online.

COMMODITY FOCUS > URANIUM PG 18

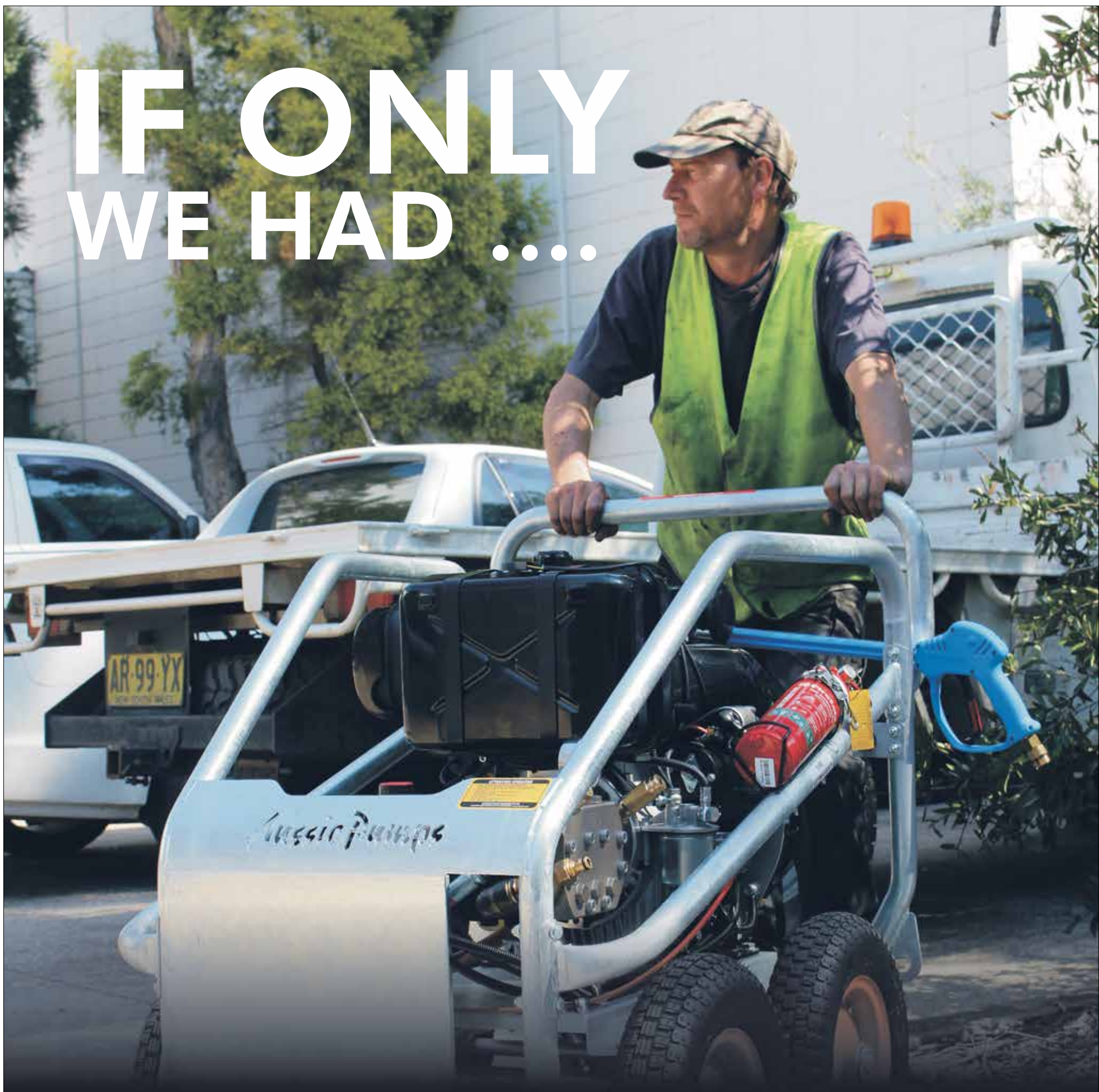
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Mining body welcomes new Ministry

RAY CHAN
NATIONAL

THE Association of Mining and Exploration Companies has welcomed the new Federal Ministry announced by Prime Minister Scott Morrison.

AMEC chief executive officer Warren Pearce said that in particular, the group was pleased to see Senator Matt Canavan continue as the Minister for Resources and Northern Australia.

“Senator Canavan has been a fierce supporter of our industry, both within Government, and on its behalf to the community,” he said.

“Mr Canavan’s reappointment delivers stability to our Industry. Hedevloped the National Resources Statement, a blueprint for the future success of our industry, and we look forward to working with him to implement these important initiatives.”

AMEC also welcomed the appointment of Sussan Ley to the environment portfolio, especially with the review of the EPBC Act expected later this year.

Mr Pearce said the inclusion of the emissions reduction portfolio with Angus Taylor’s energy portfolio was a significant development that will benefit Australia.

“AMEC will be looking to the see the Coalition Government place a high priority on reducing energy costs,” he said.

“AMEC will work closely with the new Ministry to reduce the cost of doing business and lift investment in mineral exploration to discover future mines.”

Pioneer named in business finals

RAY CHAN
WA

ONE of the world’s most inspirational women in mining has been named as a finalist in the Business category for the 2019 WA Australian of the Year Awards.

Dr Erica Smyth, who has made a significant contribution to WA’s resources sector over the past 45 years, is renowned for her long-standing commitment to the community, which extends from charitable organisations to medical research, high education, science, technology, aged care, women’s interests and the arts.

One of the first female geologists in WA in the 1970s, she spent her early career at BHP and later Woodside, moving from minerals exploration into project management, government approvals, corporate affairs and community interactions.

Dr Smyth has chaired or been a director of more than 20 listed and private companies, charities and government boards and is one of few women to chair an ASX-listed company.

The Awards honour outstanding Western Australians who have made a positive impact on the lives of others.

Twenty-eight finalists were selected across seven categories, with the winner of each category announced at a gala dinner on Friday, May 31, as this paper went to press.

Coal mine fuels ALP election loss

RAY CHAN
NATIONAL

THE Labor Party’s handling of the Adani mine controversy in Queensland has been singled out as a reason for its failed election campaign.

Former Labor leader Bill Shorten’s inconsistent messaging on the issue has been criticised, as has Queensland Labor Premier Annastacia Palaszczuk’s perceived failure to speed up approval of Adani’s coal mine, which promises thousands of new jobs.

Prime Minister Scott Morrison’s government’s return to power was bellwethered by a blue sweep through Queensland, as voters deserted federal Labor in apparent protest at the party’s stance.

But Ms Palaszczuk rejected the claim that her government’s handling of the Adani project led to the election result, having last month told the miner to return to the drawing board over plans to protect an endangered finch (see story below).

“Every mining application in this state has to go through the relevant approvals,” she said.

“I’m not the independent mining regulator.”

Analysts have also suggested that former Greens leader Bob Brown’s protest against the mine, which wound through central Queensland during the campaign, only served to galvanise voters for the LNP.

Many Labor strategists now expect the Palaszczuk government will have to sign off on the Adani mine if the party is to have any chance of remaining in charge when the state goes to the polls next year.

In the run-up to the Federal election, Labor and the Greens had stressed their desire to see Australia shift towards renewables, but the Liberals said the ALP’s targets would cost billions of dollars and cost jobs.

Mr Shorten was also slammed for a lack of detail and for not revealing how much his plan would cost.



Clearing work being done at Adani’s mammoth \$16.5b Carmichael coal mine, rail and port project, which has come under intense scrutiny by environmentalists, as well as State and Federal politicians, since it was brought to the table six years ago. Image: Adani

The Coalition has long been supportive of fossil fuels, with Mr Morrison famously bringing a lump of coal into parliament in 2017 while he was treasurer.

Adani Mining chief executive officer Lucas Dow said the result showed that Queenslanders were proud of their coal mining industry.

“They know it is an economic powerhouse that creates jobs and sustains their regions, and also provides billions of dollars each year for the benefit of the State,” he said.

“Queenslander miners are sick of people telling them that they should be embarrassed and ashamed of what they do, when they should be heralded for working to the highest environmental standards and bringing prosperity to the State.

“People right across regional Queensland told us they were outraged to hear Qld’s Deputy Premier telling our biggest export industry and an entire coal mining workforce to reskill and get new jobs.”

But Mr Dow said that even after the weekend’s election, where Queenslanders had their say, the Premier and Deputy Premier still had a tin ear to their own voters.

“While there are many reasons people vote the way they do, we know from

our own conversations, the grassroots regional rallies, the open letters to politicians, the editorials from local publicans, and the plight of small business owners, people see through the political rhetoric and tactics,” he said.

“As evidenced by the election results, Queenslanders have no tolerance for political actions that are unjust and put people’s livelihoods at risk.”

The Australian Resources and Energy Group AMMA congratulated the Morrison Government on its successful re-election, with chief executive Steve Knott claiming that the Australian people had voted for aspiration.

“The Federal Election result has made it patently clear the vast majority of Australians want the jobs and prosperity delivered by the resources and energy industry, including the Adani coal project,” he said.

Meanwhile, the result has also been welcomed by miners who stood to be impacted by Labor’s proposed franking credit crackdown, in particular those who aim to deliver shareholder returns through dividends and investment in growth.

Had Labor won, mining stocks paying high franked dividends stood to become less attractive and less highly rated from a valuation perspective.

Queensland gives Andani the bird

RAY CHAN
QLD

EMBATTLED Indian miner Adani is vowing to press on to get the earth moved at its Queensland mine operations.

The company said while it was ready to begin building the mine in the Galilee Basin in central Queensland, approval processes were continuing to hinder progress.

The miner met with the state’s Environment Department in early May, where it was told a number of new commitments need to be met before the plan is approved, including its management plan for an endangered finch, further delaying the controversial multi-billion-dollar project.

Adani Australia chief executive Lucas Dow said the Government was trying to stall, but the company would work “feverishly” to meet the new demands.

“After more than 18 months and seven revisions, the Queensland Labor Government still cannot commit to a date to finalise Adani Mining’s two outstanding environmental management plans,” he said.

“Adani Mining is calling on the



Black-throated finches are small birds known for the distinctive black mark beneath their beaks. The finches have been found near Adani’s Carmichael mine lease site in the Galilee Basin.

Premier to take charge and show leadership, requesting the Queensland Labor Government commit once and for all to a date to finalise the plans.”

Mr Dow said that delaying the approvals process by requesting an eighth round of new revisions went well beyond what was required to meet Adani’s environmental requirements.

“Although we believe the current

version of the black-throated Finch management plan already meets our project conditions, we are not going to be pig-headed about it and we will review the feedback from the Queensland Department and respond accordingly,” he said.

“However, Department officials have refused to commit to a timeframe to finalise the plan, even if we were to accept the State’s new round of requests in full.

“We have endured more than 18 months of endless requests for 11th hour changes, not to mention an external review lead by an individual who heads up an organisation whose members have stated anti-mining, anti-coal agendas, all while the Department has been waving through environmental approvals for other coal mines that also contain black-throated finches,” he said.

Adani managed to get federal approval for its groundwater plan on the eve of the Morrison Government hitting caretaker mode in the election campaign.

Federal Resources Minister Matt Canavan said the State Government’s decision was a classic example of siding with the Greens, who have vehemently opposed the project.

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Dr Madeline Taylor.

Collective way to help farmers, miners co-exist

GERARD MCARTNEY
NATIONAL

A SYDNEY Law School energy and natural resources expert says a collective bargaining agreement for farmers will help them co-exist with miners and their operations.

In her new book, *Agricultural land use and natural gas extraction conflicts*, Dr Madeline Taylor said the move towards renewables, in particular the expansion of the liquified natural gas market, has brought about tensions between miners and producers whose land and livelihoods can be irreparably damaged by such activities.

Dr Taylor posits a state-centric model, rather than the somewhat ad hoc adaptive management approach, as a way to level the playing field and ensure the best interest of all parties involved.

“Instead of having this linear relationship between state, landholder and unconventional gas licence holder, collective bargaining could actually create a pyramid-like relationship,” she said.

With the state at the centre of regulation, a collective bargaining arrangement could give farmers agency in the determination of their future, and the future of Australia’s food security.

It would provide conduct standards for negotiation, guide parties’ behaviours and keep procedures transparent and effective.

Dr Taylor argues that it is in the public interest to develop our natural resources as much as it is to nurture and sustain our agricultural industry – and that these are not mutually exclusive aims.

“Rather, they are in line with the state’s obligation to develop its natural resources in the best interest of its citizens – that is the right of self-determination in international law,” Dr Taylor said.

“If we had regulation in place, we could have some very sustainable and equitable co-existence – which is the aim of all parties at hand.

“In an era of climate change, a transitioning energy sector and a struggling agricultural sector – and with new major resources projects like Adani’s proposed Carmichael coal mine on the horizon – it is vitally important that practitioners and policy makers take the time to consider the coexistence of farming and mining.”

Flower power derails gold pit



Eremophila resinosa was declared rare flora in 1982, and was listed as endangered under the World Conservation Union in 1994.

GERARD MACARTNEY
WA

FOUR rare shrubs continue to hold up a \$100m open pit development at Ramelius Resources’ Greenfinch expansion, adjacent to the Edna May underground mine in WA.

Ramelius Resources’ revised clearing application permit has been knocked back for the second time by the Appeals Convenor which, according to the company, did not actually view the submission.

Instead, the original 48.4ha plan was re-examined and DIMIR’s position upheld

and ratified by the minister.

The clearance application was first rejected in November 2018 due to the prevalence of the endangered *eremophila resinosa* plants in the area.

Ramelius then launched an appeal with a revised application that reduced the footprint of the disturbance from 48.8ha to 26.3ha.

The revised submission was rejected on May 15, with Ramelius instead being invited to formally resubmit another revised application for formal assessment, which the company said would take another six months.

Ramelius Resources managing director

Mark Zeptner did not hide his disapproval of the outcome.

“We are very disappointed that the Greenfinch open pit is now subject to further delay,” he said.

“To be invited to submit a revised proposal and not have it assessed was surprising and only adds further delay to a process that has been running for more than 18 months.

“There remains \$100m of gold value sitting in the ground and almost 100 jobs on standby.”

Mr Zeptner said that the company would take a positive and proactive approach to its clearing application as it goes forward.

Indigenous business wins Rio contract

RAY CHAN
WA

RIO Tinto has signed a landmark new contract with a growing Pilbara traditional owner business in a strong recognition of its expanding capability in rail maintenance.

Yurra Pty Ltd, majority owned by the Yindjibarndi Aboriginal Corporation (YAC) – the appointed representative of the Yindjibarndi people – will provide civil maintenance services on and around Rio Tinto’s Pilbara rail network in WA.

The five-year contract, worth about \$20m, will see Yurra grow and develop their local workforce while also bringing in other specialist expertise to help build new capabilities.

It will also maximise benefits for the wider community in Roebourne and beyond, by directly supporting 20 new local indigenous jobs and providing further internal training pathways for local indigenous people.

The Roebourne-based YAC is the representative body of the Yindjibarndi people, a traditional owner group with whom Rio Tinto has held an Indigenous Land Use Agreement with since 2013.

YAC chief executive Michael Woodley said the business was proud of the partnership with Rio Tinto.

“Through ongoing contract opportunities, we will continue to push the boundaries to improve and raise the living standards of indigenous peoples of the region,” he said.

“This opportunity shows that we are collectively looking to the future and that



Yurra has successfully tendered culvert relining works for Rio Tinto over the past three years.

Yurra has become a trusted contracting partner.”

Rio Tinto iron ore managing director of rail, port and core services, Ivan Vella, said the company had worked with Yurra since the inception more than six years ago.

“Along the journey, they have demonstrated a strong ability to deliver a range of services,” he said.

“They bring a high level of capability in the contracted areas and do this on very competitive terms.

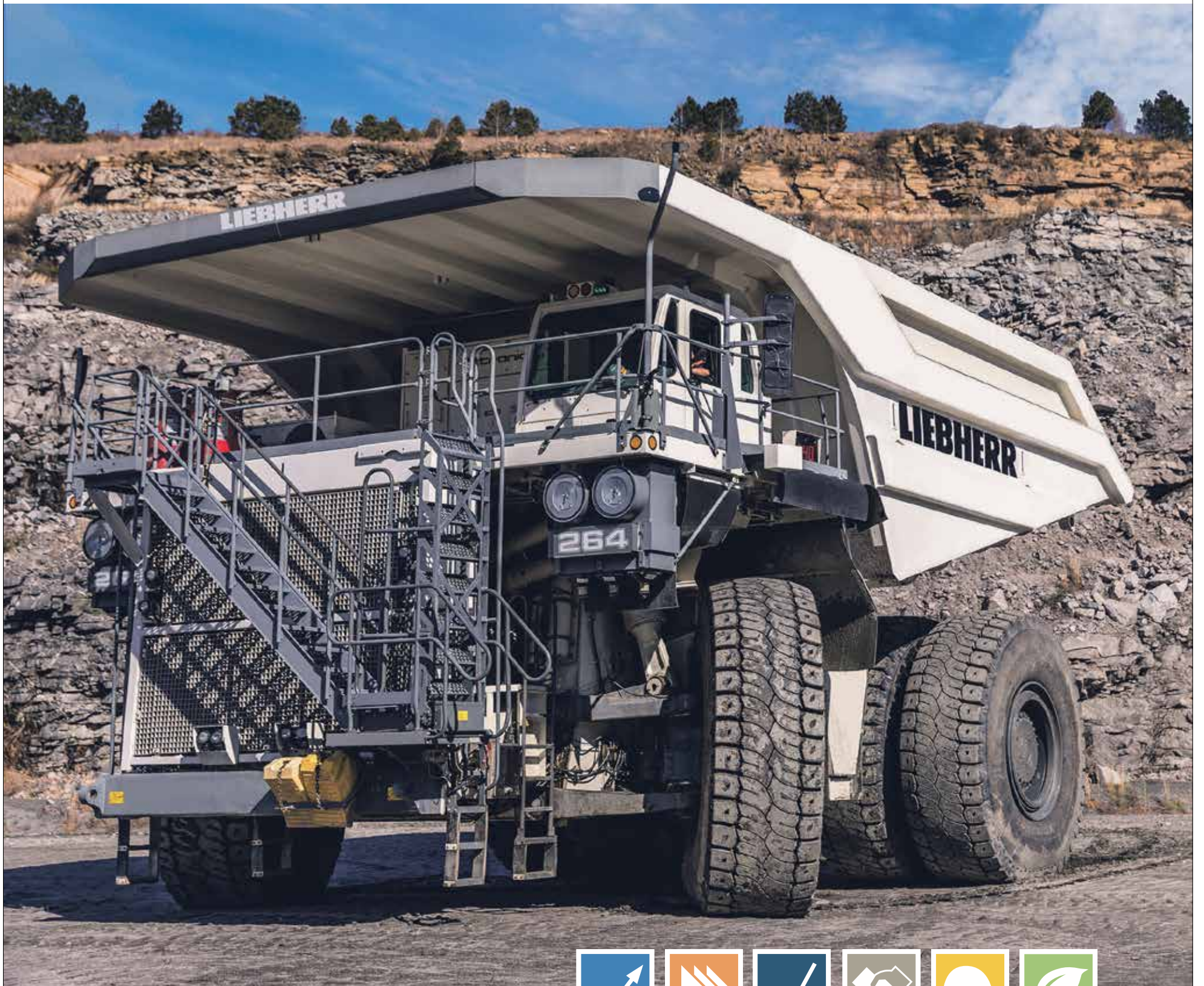
“Yurra’s ability to maintain high levels

of efficiency and low overheads despite their continued growth is a credit to their management and leadership team.”

Additionally, Rio Tinto has awarded a contract to another majority-owned YAC business, GSBC Yurra, valued at almost \$10 million, to refurbish the Rocklea Palms Accommodation Village in Paraburdoo. The work is expected to be completed later this year.

Yurra’s other major clients include BHP, BGC Contracting, Downer, Woodside and Sodexo.

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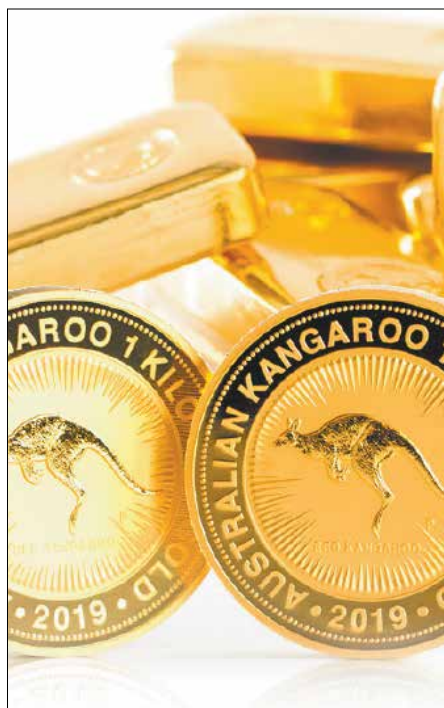


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The Victorian Government will raise the gold royalty from zero to 2.75pc.

Government seizes golden opportunity

GERARD MCARTNEY
VICTORIA

VICTORIAN treasurer Tim Pallas has taken Victorian gold miners by surprise after imposing a 2.75pc gold royalty on the sector.

Miners say they were not consulted about the increase from zero to 2.75pc, and that it appeared to be a reaction to the renaissance of Victoria's all but washed out gold industry.

The Kirkland Gold Eagle zone discovery at its Fosterville mine in 2015 kickstarted a wave of investment that had not been seen for decades.

Arete Capital followed Fosterville's lead and doled out \$50m to restart the Stawell goldmine which employed about 200 people, up from only 10 people when Arete acquired it in 2017.

AuStar Gold resumed mining at the Morning Star mine in January, 2019, and recorded record pours in April reporting 6.074kg of ore bullion in nine days.

Minerals Council of Australia Victoria executive director James Sorahan said that the royalties would affect the security of hundreds of jobs in regional communities.

"The Andrews Government has not consulted or listened to regional communities that rely on highly paid, high skilled jobs that mining delivers in Victoria," he said.

"Despite its own Resources Strategy stating that mining operations are the backbone of many regional towns, providing employment, opportunity and a sense of community, the government has not consulted industry or local communities before announcing this new tax on regional jobs."

While a gold royalty would be in line with the rest of the nation, bar Tasmania, the 2.75pc rate is significantly higher than the 2.5pc imposed by the country's largest gold-producing state, WA.

In 2017, the WA government attempted to raise the royalty rate to 3.75pc, but was blocked in the upper house after a strong, united lobbying campaign by big players such as Newcrest, Newmont and Barrick.

The ton for a tonne



Image FMG.

The iron ore price spike has filled government coffers, but could also threaten Australian market dominance.

GERARD MCARTNEY
NATIONAL

IRON ore prices surged past the US\$100/t milestone during May to reach US\$108/t in the fallout from Vale's catastrophic tailings disaster.

Brazil, the world's second largest producer of iron ore, has essentially closed for business, and Vale has pulled about 5.6pc of the global iron ore supply from the market.

Vale chief financial officer, Luciano Siani Pires, said that the company would not be fully operational before 2021.

This undersupply has been coupled with above average Chinese consumption and export of steel, following stimulus packages by the Chinese government

to kick-start its contracting economy, while worldwide steel consumption has remained relatively stagnant.

The spike has delivered billions of dollars of revenue to the Pilbara's big players: Rio Tinto, FMG BHP and Hancock Prospecting.

Rio Tinto said that every US\$10/t of iron ore would deliver another US\$2b in free cash on an annualised basis, while in the first half of the year, FMG founding chairman Andrew Forrest accepted personal dividends of close to \$1b.

But this unprecedented surge will likely be short-lived.

The federal treasury expected that the supply disruption windfalls which filled its coffers would return to about US\$55/t excluding freight by March 2020, which "may not be such a bad thing".

If iron ore prices were to be sustained at \$100/t for an extended period of time, Australia and Brazil's market dominance could be susceptible to a new iron ore powerhouse winning a place at the table.

When iron ore peaked at about \$US185/t in 2010 and 2012, the duopoly was faced with the possibility of a West African iron ore province establishing itself.

Iron is the fourth most common element on the planet, but getting it out of the ground and separating it from various ores requires vast amounts of money and infrastructure.

Analysts believe the challenge for Australian producers will be to determine how long supply will be constrained, and how to fill that gap.

Leinster discovery 'just the tip'



Yurra has successfully tendered culvert relining works for Rio Tinto over the past three years.

EMMA DAVIES
WA

AUSTRALIAN battery metals technology and exploration company, Trans Pacific Energy Group (TPE), has announced a maiden discovery of a blind zinc-gold-silver mineralised system at its Kathleen Valley project.

North of Leinster in WA, Kathleen Valley is situated within a highly prospective region for copper, nickel, zinc, lithium and tantalum and lies in the middle of one of the world's most prolific metals and minerals belts.

TPE advisory board member and lead geologist, Neil Hutchison, said the significance of the discovery could not be underestimated, as "it could be the tip of something big".

"Our geological and geophysical teams are extremely positive about the drilling results, as well as the Down Hole Transient Electro-Magnetic (DHTEM) results which support the potential for a much larger scaled system that has strike and depth potential," he said.

"Mineralisation to date has been intersected at a depth of 60-100m below surface, which is very shallow given the deep nature (>400m) of other mines in the region.

"It has the potential to develop into a much deeper system as drilling unlocks the geological and structural controls on this mineralised system."

TPE chief executive Arthur Darivas was also positive about the discovery and said the scale of the project would likely be much larger than originally expected, with drill results confirming hard rock lithium

potential at the site.

"This is a major find, in the right location, and with the right findings," Mr Darivas said.

"We are extremely excited and look forward to continuing this momentum as we continue to develop our projects."

Mr Darivas said Kathleen Valley was a prime position, close to existing mines and any project developed would avoid the typical infrastructure challenges and costs that many exploration companies face.

"This is early days for our find, but we are incredibly pleased with the results and feel that the location will be a big plus as we look to develop the project," Mr Darivas said.

The project is held under option as part of a 50:50 partnership with Metal Rocks, with TP Energy holding an option to secure an additional 30pc interest in the project.

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The Samarkand drill site at Bonya.

Tungsten tests at Bonya project show promise

RAY CHAN
NT

PORTABLE x-ray fluorescence (XRF) determination has revealed promising tungsten grades of up to 0.61pc, as well as high-grade copper, in drill samples from the Samarkand prospect at the Bonya Tungsten Project in the Northern Territory.

Bonya is 60pc owned by Arafura and is held in a joint venture with Thor Mining, with both parties contributing to the cost of the program in proportion to their project equity.

The drilling program comprised 2184m of reverse circulation drilling on the Samarkand, Jericho, White Violet and Tashkent deposits, as well as about 200m of trench sampling across each of the Marrakesh and Tashkent deposits.

The Jericho deposit, in particular, has been mined historically with a surface stockpile estimated at several hundred tonnes of scheelite ore at surface adjacent to the deposit.

Interim XRF results for Samarkand show highlights of 15m grading 0.44pc tungsten trioxide (WO₃), 8m at 0.36pc WO₃, and 11m at 0.61pc WO₃.

The drilling also hit copper, with highlights including 5m at 0.5pc copper, 12m at 0.69pc copper and 6m at 0.97pc copper.

Thor executive chairman Mick Billing said the proposed processing facility at the company's nearby flagship Moyhil project was designed to extract copper, tungsten and molybdenum, so "any primary copper at Bonya can be extracted at minimal additional cost".

"We look forward to the full laboratory assays from this drill program, along with results from the trench sampling from Marrakech and Tashkent, all expected during May," he said.

The 13 outcropping tungsten deposits at Bonya, several of which have historical mine workings, are expected to add considerably to the life, scale and economic outcomes of Molyhil.

"Despite the licence area being part of a known tungsten 'province', it has had no tungsten drilling since the 1970s and we are very excited at the commencement of this program and the potential it brings," Mr Billing said.

The assay results come after Thor reported a positive quarter "with progress on all core projects".

"Our confidence in securing off-take and finance for Molyhil remains firm, with positive interest from a number of players, whose interests vary from offtake, to joint venture arrangements, to debt instruments," Mr Billing said.

"Our cash position also remains sound with all scheduled activities fully financed through to 2020".

Bardoc spreads golden wings



The Bardoc Tectonic Zone is recognised as part of the northern extension of the Boulder Lefroy Shear Zone which hosts multiple giant gold deposits (i.e. the Kalgoorlie Golden Mile).

RAY CHAN
WA

BARDOC Gold has further strengthened its growth pipeline in the North Kalgoorlie district of WA, by acquiring a strategic package of 40 tenements covering 49sqkm in and around its 2.6moz gold project.

The purchase from Torian Resources gives Bardoc full ownership of a contiguous tenement package covering a continuous 40km strike length along the highly prospective Bardoc Tectonic Zone (BTZ) and Black Flag Fault, two key regional gold-hosting structures which underpin the company's growth strategy in WA's Eastern Goldfields.

The move will allow Bardoc Gold to expand its current +10,000m reverse circulation and diamond drill program, which is focused on extending existing deposits and discovering new ones.

The new tenure, which lies along strike

to the north of the company's 428koz Zoroastrian deposit, will allow Bardoc to identify gold-hosting dolerite with a specific mineral signature (the fractionated dolerite) that hosts the high grade mineralisation.

Exploration targeting this fractionated dolerite horizon can now be undertaken to the north, significantly expanding the prospective exploration search space at the Bardoc Gold Project.

The knowledge that all rock types within the BTZ are capable of hosting gold mineralisation, combined with the structural geological framework established by Bardoc Gold over the past 18 months, has enabled it to define new high-priority target areas on its tenure.

The newly-acquired tenement package has had very limited historical exploration in terms of drilling and the application of modern geochemical and geophysical exploration techniques.

Given the strategic location of the tenements between the Aphrodite (1.56Moz

Au) and Excelsior/Zoroastrian (combined 737koz Au) complex and the fact that they contain the right rock types and structural framework, Bardoc Gold believes they are highly prospective for potential new discoveries.

Bardoc Gold chief executive Robert Ryan said the company's corporate strategy was to build a sizeable and high-quality gold resource in the Kalgoorlie region.

"Exploration to date has focused on new techniques and technology, culminating in the impressive results released in recent months," he said.

"Bardoc will now apply our learnings to the new tenure and develop new exploration targets where historical exploration has been ineffective.

"With our current +10,000m RC and diamond program gathering momentum, we will continue to target growth in our current 2.6Moz Mineral Resource through a combination of exploration and strategic acquisition."

Alliance broadens copper footprint

RAY CHAN
QLD

MINOTAUR Exploration has formed a strategic alliance with OZ Minerals that covers the Cloncurry region of north-west Queensland.

The move follows the restructure of the joint venture between the two parties which saw OZ Minerals interest in the Jericho copper-gold discovery rise to 80pc.

OZ recently reached a 70pc stake in the Eloise joint venture by spending \$10m and has now agreed to loan-carry minority partner Minotaur to commercial production for the additional 10pc stake.

From April 1, 2019, loan amounts advanced by OZ will be non-recourse and repayable only if positive cash flow emanates from production at Jericho.

The Cloncurry Alliance will be split 70pc OZ Minerals and 30pc Minotaur, and provides for the parties to work exclusively with each other for prospect identification and acquisition around the Cloncurry district.

To initiate the Alliance, OZ Minerals will fund Minotaur's prospect research and project generation activity to \$1m over two years.

Minotaur managing director Andrew Woskett said the Cloncurry region was well recognised as a prolific source of mineral deposits.



Drillers at the Eloise mine take ground samples.

"Minotaur has operated exploration programs in the region since 2010 and has acquired valuable geoscientific insights to controls on and types of base metal mineralising systems," he said.

"The absence of any notable copper discoveries in the past two decades is due primarily to lack of surface exposure of mineralised basement host rocks.

"Minotaur's recent experience around the Eloise mine shows that exploring under cover can locate previously unknown mineralised

systems such as the Jericho copper project."

Mr Woskett said the Cloncurry Alliance recognised Minotaur's regional expertise and builds on a healthy working relationship with OZ Minerals nurtured through the Eloise joint venture.

"Minotaur is pleased to have secured OZ Minerals' financial support, which means Minotaur's Cloncurry area activity level can be scaled up without distress to shareholder equity and, potentially, for significant shareholder benefits into the future," he said.



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Swick has delivered a strong quarter, setting the platform for further earnings growth in FY20.

Profit focus proves key to strong results

RAY CHAN
INTERNATIONAL

ONE of Australia's largest drilling contractors, Swick Mining Services, has delivered strong unaudited results for the three months ended March 31, 2019.

Swick's drilling business reported earnings before interest, tax, depreciation and amortisation (EBITDA) of \$7.3m, up 58pc over the prior corresponding period (\$4.6m), and revenue of \$35.1m, up 7pc (\$32.9m).

The continuation in Swick's earnings turnaround reflects the ongoing success in its strategy of shifting drill rigs onto better performing contracts or new projects and reducing operating and non-operating costs, ensuring each contract is profitable on a standalone basis.

Swick managing director Kent Swick said the most pleasing aspect was the company's ability to secure \$210 million in contracts that were being pursued in the March quarter.

This included new work at Northern Star's Pogo gold mine in Alaska, rig expansion at BHP's Olympic Dam in South Australia, and contract extensions at Kirkland Lake Gold's Cosmo gold mine and Newmont Australia's Tanami gold mine.

"The recent award of \$210 million in work has provided a strong base for the business, with many rigs moving from low margin, long-term work to target margin, long-term work," Mr Swick said.

"Each mine site is unique, which means we sometimes look at fixed shift contract rates to ensure we do not overpromise to clients.

"What we can guarantee is mechanical uptime, crew utilisation, safe and skilled crews, and the most powerful and versatile drill rigs. We have had good feedback from many clients on this approach, although we appreciate that it is not necessarily applicable to all drilling situations."

Swick was named Mining Contractor of the Year at the 2018 Australia's Mining Monthly Awards.

The category recognises contractors that add consistent value to their clients projects or find ways to deliver real cost savings, productivity gains, and industry leading safety benefits.

Caterpillars move in at Koodaideri



A Caterpillar dozer working autonomously on a minesite.

RAY CHAN
WA

RIO Tinto has signed an agreement with Caterpillar to supply and support mining machines, automation and enterprise technology systems for the new Koodaideri iron ore mine in WA.

Under the agreement, the two companies will work together in creating an automated mine operation that makes best use of data analytics and integration to enhance safety, optimise production, boost mining machine utilisation and lower costs.

Rio Tinto Iron Ore chief executive Chris Salisbury was optimistic that partnering with Caterpillar and WesTrac, the regional Cat dealer, would help make Koodaideri the most technology-enabled and innovative

mine in the miner's Pilbara iron ore network.

"Technology is rapidly changing our mining operations as we harness innovation to make our operations safer, smarter and more productive," he said.

"This extension of our partnership with Caterpillar and WesTrac represents an exciting step for our business."

Caterpillar Resource Industries group president Denise Johnson said the Caterpillar team was looking forward to working with Rio Tinto to apply its proven mining equipment and technology.

"We plan on implementing additional MineStar autonomy solutions at Koodaideri — a new mine designed to capitalise on leading-edge technology," he said.

"We are excited to work together to advance Rio Tinto's mine automation and the company's digitalisation program."

Koodaideri will deliver a new production hub for Rio Tinto's iron ore business in the Pilbara.

Construction work has commenced, and first production is expected in late 2021.

Once complete, the mine will have an annual capacity of 43mt, underpinning production of the Pilbara Blend, Rio Tinto's flagship iron ore product.

As mine construction advances, WesTrac will manage logistics of mining, machine delivery and commissioning and will play a key role in implementing technology solutions.

WesTrac chief executive officer Jarvas Croome said he was excited to be part of the Koodaideri project and to work with Caterpillar to deliver groundbreaking equipment solutions to support Rio Tinto's Mine of the Future vision.

Mondium gets Greenbushes gig

RAY CHAN
WA

MONDIUM has been awarded a \$100m contract to design and build a new tailings retreatment plant at Talison Lithium's Greenbushes mine site in the south west of WA.

The 60:40 joint venture between listed engineering companies Monadelphous Group and Lycopodium will carry out all engineering and design, procurement and site construction.

The contract also includes design and construction of detailed earthworks, concrete works, structural, platework, electrical and instrumentation works and controls.

The contract is Mondium's largest to date and its second with Talison, following the successful delivery of a new chemical-grade plant feed system at its Greenbushes operations last year.

Mondium director Bob Osmetti said the



Mining activity at the Talison Greenbushes site.

award was a testament to Mondium's strong capability of delivering quality projects.

"We are excited to have been awarded such a significant contract and look forward

to continuing our strong relationship with Talison Lithium," he said.

Work under the contract is expected to be completed by June, 2020.

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Digital technology makes mining smarter

PAUL TUCKER, GENERAL MANAGER IN SALES FOR AUSTRALASIA, ORANGE BUSINESS SERVICES NATIONAL

IN 2018, the Australian Bureau of Statistics confirmed Australia's world-class modern mining sector set a record for exports, generating \$248 billion in revenue and supporting more high skill, high wage jobs in regional communities.

Mining is one of Australia's most significant industries and employs close to 250,000 people in a sector that has long operated on traditional mechanisms and practices.

But digital technologies are shaking up the industry, bringing new, safer, more efficient and productive ways of extracting essential resources.

Internet of Things gaining traction

The Internet of Things (IoT) has the potential to dramatically transform Australia's mining industry.

According to Inmarsat's The Future of IoT in Enterprise – 2017 report, about 40pc of mining companies around the world have plans in place to deploy IoT solutions within the next 18 months, so effectively by early 2019.

Safe Work Australia reported that from 2003-2015, the mining industry had the third highest fatality rate of any industry with an average of nine workers dying each year.

With IoT, worker health and safety at mine sites appears to be the area where mining companies are expecting to feel the most benefits: 44pc of mining companies foresee IoT solutions helping improve the health and safety of their employees.

Tailings dam failings across the world that have been highly publicised are examples of how dangerous operating environments mine sites can be.

Further drivers for IoT adoption in the mining sector include monitoring environmental changes on mine sites and improving cost effectiveness, with 47pc and 44pc respectively telling Vanson Bourne that these were their primary objectives for designing and implementing an IoT strategy.

Why is this happening?

In Australia, where mining is a major traditional industry but also one that has sites in very remote locations, IoT technologies



Paul Tucker of Orange Business Services.

can make things markedly safer and more efficient for companies and their workers.

Mines are highly specialised and hazardous environments that need to focus on employee safety as well as productivity and efficiency.

Automation is changing the way mining companies send extraction machinery and hauling vehicles into dangerous mines, taking the human worker out of harm's way.

Further, IoT-connected wearable technologies and sensors worn by workers on their site clothing can help improve the site by monitoring conditions and gathering data that is subsequently analysed and used to pre-emptively eliminate potential safety threats.

All this takes place in real time, too, meaning IoT tools can adjust to environmental conditions in real time and react to any potential hazards on the mine without the need for human intervention.

Robots on the rise

Rio Tinto, one of the world's biggest mining companies, has recently introduced us to the "world's largest robot", a fully autonomous train that, on its maiden journey, transported 28,000t of iron ore from the company's Tom Price mine site to the port at Cape Lambert.

The train was being monitored remotely by operators in Rio Tinto's Perth operations centre 1500km away.

Connecting up these advances

But all these digital tools need connectivity,

and collate detailed analytical data.

Now the world's most advanced small-sensor air monitoring system is available in Australia.

While many small sensor air quality monitoring devices have entered the market, AQMesh pods are 'tried and tested' units that have the backing of environmental agencies and university researchers.

Most recently, AQMesh has been an integral part of the city-wide air quality monitoring project, Breathe London, launched in January this year.

Breathe London has deployed more than 100 state-of-the-art AQMesh air monitoring sensors around the city of London.

The sensors use real-time data analytics and provide the people of London with a hyperlocal visual tool that maps the city's air pollution.

According to Ecotech technical manager Matthew Cook, the demand for air monitoring solutions is anticipated to grow, particularly as policies and industry



IoT technologies can make things markedly safer and more efficient for companies and their workers.

and connectivity has always been a challenge for remote, geographically disparate sites and locations like those of the mining industry.

And potentially the best connectivity option for mining companies could be LoRaWAN (Long Range Wide Area Network).

Historically, one of the chief concerns of providing connectivity to remote mining sites was cost.

This is one of the plus points of LoRaWAN, since it has a unique penetration capability and is relatively quick and easy to install: LoRaWAN can be deployed on a building or a tower and can connect to sensors more than 15 kilometres away or to mining sensors and wearables deep underground.

Environmental impact a big factor

IoT tools can also reduce mining operations' impact on the environment quite dramatically.

According to the Inmarsat report "The Future of IoT in Enterprise – 2017," 47pc of mining companies cite monitoring environmental changes as their top priority for IoT deployments, with a further 53pc saying environmental monitoring is the most exciting IoT innovation in their opinion.

Progressive companies like Rio Tinto have already established integrated remote operational centres that can monitor their mining operations via IoT technologies, so monitoring their environmental impact is the next step.

IoT solutions let them gather data more quickly and accurately, which they can then analyse and use to react more quickly to any potential issues. This gives them more

control over their operations, improved impact assessments and, ultimately, less environmental damage.

Predictive equals pre-emptive

Furthermore, the data gathered by IoT sensors on a remote mine site can be used to reduce operating expenditure, or OPEX, too.

In 2014, Mining Global estimated that maintenance costs accounted for between 30 and 50pc of a mine's total operating expenses.

IoT-enabled sensors on vehicles and machinery can help mining companies use predictive analytics to make real-time decisions that can hugely impact throughput, recovery, equipment reliability and availability.

Similarly, early warning notifications give mining companies longer lead times to plan and carry out necessary maintenance taking place in real time.

Mining major benefits from digital

Digital solutions can also enable mining companies to be more productive and more profitable, while at the same time help them reduce the danger faced by human workers.

According to a report from Transparency Market Research, the global smart mining market is predicted to grow to \$US22.59 billion by 2024, at a CAGR of around 15 percent per year.

Australia's mining companies will look to be at the forefront of that investment and leverage the big benefits that digital can bring to their operations.

Pods help monitor air quality

NATIONAL

AIR pollution is also closely linked to climate change, a growing global issue that is gaining momentum from governments and businesses who are starting to take action to reduce it.

Part of the problem is that air pollution isn't always visible and its causes are varied.

The most accurate way to measure air quality levels is by using monitoring technology to map it at a hyperlocal level

and collate detailed analytical data.

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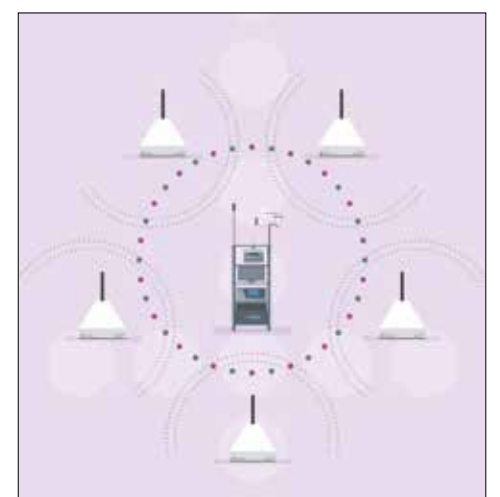
regulations tighten across the globe.

The key benefit of using AQMesh is that it not only uses the most accurate and reliable small-sensor technology available, it is also portable so it can be moved to different locations as required.

"Whether it's one or 100 units, importantly, commercial quality portable air monitoring systems like AQMesh can be used in isolation or to complement more expensive, fixed reference air quality monitoring stations (AQMS), which typically sit large distances apart," Mr Cook said.

"When used in tandem, the system creates a more comprehensive and adaptable pollution reading of a whole precinct, with AQMesh pods able to be moved around to identify localised trends, pinpoint pollution hotspots, and capture accurate data for better decision making."

Depending upon pod configuration, AQMesh can measure a wide range of particulate matter and different gases in



AQMesh pods feature wireless power options, mobile network communication, cloud-based processing and secure online access.

the air to parts per billion (ppb) levels.

The AQMesh pod also features wireless power options, mobile network communication, cloud-based processing and secure online access.



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IN BRIEF

GULF MANGANESE

INDONESIA has granted a direct shipping ore (DSO) licence to Gulf Manganese Corporation to export up to 103,162t of 49pc manganese a year from the Kupang smelter project.

The concession means Gulf can sell DSO concentrate during the construction phase of their plants to bring in early cash flows.

Gulf is currently developing a ferromanganese smelting operation in Indonesia's West Timor region.

Once in full swing with the eight furnaces, Gulf will process 524,000t of manganese ore annually, to produce 201,000t of ferromanganese alloy.

IVANHOE MINES

A C\$67 MILLION cash injection into Canada's Ivanhoe Mines will enable it to build its first copper mines in the Democratic Republic of Congo (DRC).

The funds came from Zijin Mining Group, China's leading gold producer and Ivanhoe's partner in the Kamoa-Kakula copper project in the DRC.

The move follows a C\$612m boost from China's state-owned CITIC Metal, Ivanhoe's largest shareholder.

The combined funds from the two Chinese companies will allow Ivanhoe to finance the Kakula and Kipushi mines to commercial production, and significantly advance production at the company's Platreef palladium-platinum-nickel-copper-gold project in South Africa.

Ivanhoe believes Kamoa-Kakula has the potential to become the world's second-largest copper mine.

LYNAS

LYNAS Corp plans to relocate its contentious upstream processing operations from Malaysia to WA.

This will enable low-grade radioactive waste produced in the first-stage processing of its rare earths to remain in WA, alleviating uncertainty over the company's \$1 billion Malaysian plant.

The plant's cracking and leaching operations will be transferred to either the Mt Weld mine site near Laverton, or Kalgoorlie, by 2022 as part of a \$500m capital development program backed by its Japanese financiers.

The Malaysian Government has suggested that the renewal of the Kuantan plant's operating licence in September is conditional on the radioactive residue being removed from the Mt Weld concentrate before it is shipped to Malaysia.

MYANMAR METALS

MYANMAR Metals has launched a \$30m equity raising in order to advance its 51pc-owned Bawdwin zinc-lead project.

It was split into a \$20.8m placement and a one-for-nine entitlement offer to raise another \$9.2m.

Bawdwin is slated for full scale mining in 2021.

The company includes Yandal as a 12pc shareholder, and Perilya Ltd with a 20pc stake.

BHP slammed over Samarco



Image: Agência Brasil.

The Samarco disaster unleashed 40m litres of water and sludge from the failed Fundão tailings dam.

GERARD MCARTNEY BRAZIL

BHP has been slapped with a £5 billion class action by American-backed British firm SPG Law in the wake of the Fundão tailings dam collapse in 2015.

The disaster at the BHP Vale 50:50 JV has been called the biggest environmental disaster in Brazil's history.

In 2016, it emerged that in an assessment made six months earlier, BHP had accurately predicted there would be roughly 20 deaths, serious environmental impacts for 20 years, and it would cost the company about US\$3.4 billion.

SPG will allege that BHP was aware of the escalating safety concerns surrounding the dam's integrity and that rather than acting on repeated warnings from experts, it continued to increase its iron ore

production and boost the tailings dam's water levels.

"BHP was woefully negligent in its duty of care and the damages sought are entirely commensurate with the devastation the company has wrought upon the people of Minas, Gerais, Espirito Santo and Brazil," said SPG partner Tom Goodhead.

On November 5, 2015, the village of Bento Rodrigues and other surrounding villages were all but erased when the Fundão tailings dam at Samarco failed.

Nineteen people were killed, hundreds of homes were destroyed, entire fisheries were devastated and the contamination left hundreds of thousands of people living on the Doce River without access to drinking water.

The Krenak indigenous community believed that their god, called "Uatu" (the Doce River), had been killed by the tailings collapse.

About 200 Krenak formed part of the 240,000 claimants, including 24 municipal governments, 11,000 businesses and a Catholic archdiocese that will be represented by SPG Law.

SPG partner Tom Goodhead said Brazil's court system moves incredibly slowly and that "the main purpose of filing this case in the UK is to move at greater speed and to seek a greater amount".

In certain cases, the damages sought would be 10 to 20 times the damages originally offered to individuals in Brazil.

Local fisherman would claim for the loss of 20 years' worth of catch, instead of three, and local governments would claim lost tax revenue and compensation for increased health and unemployment costs.

Separately from the civil action levied against Samarco, BHP and Vale had already spent more than \$1 billion on the massive clean-up effort.

Talga moves on graphite results

RAY CHAN SWEDEN

A PRELIMINARY Feasibility Study of Talga Resources' 100pc-owned Vittangi Graphite Project in Sweden has revealed highly promising results.

The study by the Australian advanced materials technology company confirms the project is technically and financially robust, with outstanding economic returns forecast as a market-focused, high-margin vertically integrated operation producing a high-performance fully engineered and coated lithium-ion graphite battery anode product, Talnode-C, for the global battery supply chain.

The PFS proposes a staged conventional open-pit mining operation with on-site concentrator and coastal anode refinery to produce, at final design, approximately 19,000tpa of Talnode-C.

The initial stage is designed as a low capex toll processing operation over two years to feed the Stage 1 anode refinery for output of about 2500tpa Talnode-C prior to scaling up to steady state full-scale production in Stage 2.

Key project metrics include an estimated pre-tax Net Present Value (NPV) of US\$1056m at an 8pc discount rate and a pre-tax Internal Rate of Return



Talga's Vittangi graphite being cut.

(IRR) of 55pc, with a rapid pay-back period of 1.5 years from commencement of Stage 2 commissioning.

The Project benefits further from its favourable location in the existing regional mining and processing infrastructure of north Sweden, with close access to modern roads, ample water supply, nearby container ports and low-cost, low-CO2 hydropower.

The PFS pricing of Talnode-C, proposed to be sold directly to li-ion battery manufacturers, of US\$11,250/t is

based on discounting the recommended pricing provided by independent globally recognised product and market assessors Benchmark Mineral Intelligence.

Talga will now move to initiate the Stage 1 Definitive Feasibility Study (DFS), aiming for completion by Q1 2020.

The company is continuing to progress all necessary project permitting and approvals, while working on a range of funding initiatives with customers and potential strategic partners to take the Project into production, targeting commencement of Stage 1 in 2020.



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IN BRIEF

Minnows reach for silver stars

A MELBOURNE exploration company barely two years listed on the ASX plans to step up its fledgling gold-silver hunt in one of the most southern but richest mineralised provinces in the world – Argentina's Santa Cruz.

E2 Metals' managing director Todd Williams said the company recognised only too well it was operating in the shadow of gold giants.

However, in the past two years, it had garnered and begun to progress a large and unique portfolio of walk-up drill targets across four gold-silver projects within Santa Cruz.

"These holdings now amount to an 80pc interest across 90,000 hectares of the Deseado Massif gold and silver province," Mr Williams said.

"This covers the Corona, Sierra Morena, Angostura and Conserrat projects.

"The region's world-class deposits are held by majors such as AngloGold, Goldcorp, and Yamana, so we are in well credentialed company."

Double delight for Mexican operation

THE Australian owner and developer of a new US\$52m Mexican zinc and lead mine expected to be one of the lowest cost producers in the world, says the project's upside remains open ended with every potential to double its known resource inventory.

Azure Minerals managing director Tony Rovira said the company was on track for mine development of its 100pc-owned Oposura project in 2020/2021.

Initial economic studies into Oposura have been completed and the full feasibility study is expected in the first quarter of 2020.

Azure only acquired Oposura in August 2017 but had evolved its JORC mineral resource estimate of 3.1Mt at 5pc Zn and 2.7pc Pb within 12 months and completed a scoping study last October to ensure first production by Q4 2020.

Hot prospects for red metal explorer

THE Australian company with the largest copper inventory among its ASX-listed peers says it is now positioned to emerge at the Top Table globally for the red metal.

Hot Chili managing director Christian Easterday said the game-changer had come with the staged US\$30m acquisition of the Cortadera porphyry copper discovery in Chile.

Cortadera has been privately held and its copper riches unknown, but sits just 14 kilometres southeast of Hot Chili's flagship Productora copper development.

The project is now being acquired by Hot Chili over a 30-month period from former private owner, SCM Carola – giving the Perth copper house the option to consolidate the entire Cortadera copper gold discovery into a copper super hub on the Chilean coastal range.

Guyanan gold for resurgent Troy

RAY CHAN
WA

A RESURGENT Perth miner which has slashed debt and rebooted exploration work over the past 12 months across its gold mining holdings in Guyana, says it is now ready to target growth opportunities around its existing Latin American assets.

Addressing the Paydirt 2019 Latin America Downunder mining conference in Perth, Troy Resources executive director Ken Nilsson said the company's successful push to reduce its liabilities had seen corporate debt cut to just US\$3.69m in May, compared to more than US\$16 million at the same time last year.

In the same period, Troy ramped up exploration across its Karouni gold mine tenement holdings in Guyana.

"Up until May last year, there had been no exploration carried out at Karouni in the prior 12 months but we have rebooted this," Mr Nilsson said.

"This has included extension exploration already mounted at Ohio Creek structure only acquired by Troy last September, and at other nearby regional targets, and with emerging good results," Mr Nilsson said.

"We have strengthened our exploration team, are adding further drilling capacity by mid-year and are very focused on now moving more resources to reserves," Mr Nilsson said.

"Our forward strategy is to regain strong stable and operational performance, build our resources and reserves, progressively expand our mining footprint at Karouni and then we can look to strengthen or rejuvenate the Troy Board.

"This will then allow Troy to target growth opportunities but around these existing assets."



Troy Resources executive director Ken Nilsson speaking at the conference.

The conference was attended by mining ministers from throughout Latin America, a region comparable to Australia as a mining powerhouse.

The two-day event was the eighth such forum held in Australia, with a focus on highlighting the vast, untapped potential in the LA region for Australian miners and explorers.

Last year, Oz Minerals paid \$444m

for Brazilian copper producer, Avanco Resources, while the likes of Fortescue Minerals, Newcrest Mining and BHP have picked up large exploration tracts in Ecuador.

Latin America remains the world's most important exploration destination, attracting vast amounts of exploration expenditure, especially for copper, with demand for that commodity expected to increase over the next decade.

Lithium brine boost for Perth explorer

RAY CHAN
WA

A POTENTIAL maiden resource looms next quarter for a Perth explorer making inroads into Argentina's surging lithium brine sector.

Addressing the Paydirt 2019 Latin America Downunder mining conference in Perth, Galan Lithium managing director Juan Pablo Vargas de la Vega said the move towards the key maiden resource metric had been buoyed by the granting of government permits for the Stage 2 drilling at the company's Candelas lithium brine project.

The project is located on the Hombre Muerto salar in the Catamarca Province, Argentina, with the new permit award covering six new drillholes at Candelas.

These will focus on the northern section of Candelas with the aim to define a maiden resource during Q3 2019.

Mr Vargas de la Vega said the latest approvals reflected the company's teamwork and experience in Argentina and kept Galan on track to unlock the significant lithium potential at Candelas.

"Importantly, a potential maiden resource is now in sight," he said.

Galan's 380m drillhole C-05-19 at Candelas confirmed a heavy brine horizon over 140m from 240m to 380m, with some samples exceeding the capacity of the



Galan Lithium managing director Juan Pablo Vargas de la Vega speaking at the conference.

measuring equipment.

Hombre Muerto hosts the highest grade and lowest impurity levels within Argentina and is home to Livent Corporation's El Fenix operation and Galaxy Resources and POSCO's Sal de Vida projects.

Galan's primary target is the adjoining

Candelas channel target, about 15km long by 3-5km wide valley-filled channel, with geophysics and drilling pointing to a substantial volume of brine.

Its six project areas total about 25,000ha of landholdings with potential brine areas conservatively comprising about 7800ha.



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CHINA SYNDROME

Nickel has been a volatile commodity in Australia for the past 10 years, but international interest in electric vehicles has sparked an upswing in prices that has renewed the faith of some of the biggest players in the game.

GERARD MCARTNEY

WHILE 68pc of global nickel is still used for the production of stainless steel, and only 3pc for battery metals, an announcement by the Chinese government may have changed the fortune of the metal, along with the future of the automotive industry forever.

In 2018, China sent ripples throughout the car manufacturing and mining worlds when it announced its New Energy Vehicle (NEV) deal.

The deal set a quota for the number of zero-emissions vehicles that carmakers must sell, with companies each receiving a certain number of credits, depending on certain characteristics of the vehicles.

From 2019, major Chinese manufacturers would be punished unless they met quotas for zero and low-emission cars, or bought credits from companies that did not exceed their quotas.

The decision was made in order to clean up the air, reduce reliance on imported oil products, and to develop its home-grown electric car industry.

The global reach of China's NEV deal was instantly felt, with General Motors and Ford both announcing their own major electric vehicle initiatives within 48 hours of China's.

According to the March 2019 Resources and Energy Quarterly, nickel demand is expected to rise steadily over the outlook period, growing from 2.3mt in 2018 to 2.8mt by 2024.

It also said that while stainless steel would be the most dominant use for nickel until 2022, "over the long term, demand use is likely to evolve".

"Electric vehicle production is projected to become a more significant source of demand by 2022, dominating growth in nickel demand beyond that year.

"This reflects the impact of both falling prices of electric vehicles and the growing suite of climate change-related incentives

and penalties around the world, which are likely to propel global electric vehicle uptake."

The electric vehicle

In 2018, there was a 62pc rise in electric vehicle sales, boosting the number worldwide to four million, and most of those sales have been made in China, which sold 1,255,000 EVs in 2018, according to the World Economic Forum.

Nickel is used in battery cathodes to enable greater energy storage, which then translates into a greater range for electric vehicle travel.

This has made high-quality nickel mines, especially those which produce cobalt as a by-product, to once again become an asset to the world's biggest companies.

The EV revolution is tipped to be in full swing by 2030, and the future of nickel would seem to still be reliant on the Chinese industrial mega-machine and its ability or failure to steer the global car industry away from the mass production of combustion engines.

Where over the years the electric vehicle has hit stumbling blocks and stifling funding problems, China, typically, has not been as fickle as its Western counterparts when it comes to long term economic and environmental goals, especially in the international arena.

This can be understood clearly through its interest in battery metal mining, where it has set up state-owned mining strongholds in places like the Democratic Republic of Congo and Chile, and will often run at a loss for years at a time.

Its well-articulated metals strategy has seen it secure footholds in many of the world's hardest and most complicated places to mine – places that, somewhat ironically, contain the rarest and most necessary metals for global tech and electric vehicles.

China's consistency in these areas may prove to be good news for Australian nickel miners, several of which are ramping up to

resume or increase production.

BHP has taken its Nickel West mine off the market, and Quantum Minerals has flagged the possibility of restarting its troubled Ravensthorpe nickel mine.

The Resources and Energy Quarterly predicted that Australia's total nickel export earnings would grow from \$3.2b in 2018-19 to \$4.6b by 2023-24.

Nickel West

BHP's Nickel West mine had been on the market since 2015 and the company had made two failed attempts at selling it.

On May 13, chief executive Andrew Mackenzie told a Barcelona mining conference that the company would retain the business in its portfolio because it offered "high-return potential as a future growth option, linked to the expected growth in battery markets and the relative scarcity of quality nickel sulphide supply".

Nickel West announced that a wave of developments would be carried out in order to keep it operational till 2040, and the company has commenced construction on the purpose-built upgrade to the Kwinana nickel refinery that would make it the world's biggest nickel sulphate plant.

BHP said this would help it begin the "transition to become a global supplier to the battery materials market".

Stage 1 of the plant was expected to produce 100ktpa of nickel sulphate, with first production expected by the end of FY19.

The company said that it was exploring the possibility of a Stage 2, 200kt nickel sulphate facility, and was testing a cobalt sulphate circuit plant at the refinery.

Ravensthorpe

Canadian-owned First Quantum Minerals has announced it would potentially resume mining at the Ravensthorpe mine in WA if nickel prices continued to rise.

BHP spent \$2.1b to build the mine but, due to plummeting nickel prices, closed it in 2009 just months after opening it.

Ravensthorpe was bought by First Quantum in 2009 for \$340m, and the company reached commercial production in 2011, only to place it on care and maintenance in 2017, after persistently low nickel prices forced it again out of production.

Estimated restart costs were expected to be around US\$10m, and the company said that preparation of the Shoemaker Levy deposit is underway.

"A sustained rise in the nickel price would initiate plans that have been developed for employee recruitment, contract mining arrangements, camp reinstatement as well as enhancements to identified process circuit opportunities," it said.

International outlook

Large-scale growth in the global refined output of nickel was expected to boost global production from 2.2mt in 2018 to 2.9mt in 2024.

However, this could be impacted by a number of problems associated with geological and capital constraints, one being the relative scarcity of nickel sulphide deposits.

With an increasing number of nickel miners turning from sulphide deposits to lateritic ore, which is more complex to extract and hence more expensive, nickel miners would need to develop more efficient technologies, or increase recycling capabilities — or both.

Indonesia and the Philippines continued to increase their output through 2018, and are expected to increase through 2019.

South America's production looked likely to grow, as did Russia – Nor Nickel announced plans to expand output from its Arctic deposits and to upgrade the Talnak concentrator.

SPECIAL FEATURE

SOJITZ COAL MINING

GREEN ACRES

Japanese conglomerate Sojitz has continued to reinvigorate the Emerald region of Queensland by expanding on its acquisitions of local coal mines.



The Minerva business was the first to be directly owned, operated and managed by Sojitz.

RAY CHAN

THE town is Emerald by name, and, if Japanese miner Sojitz has its way, will also be emerald by nature.

Located in Queensland's Bowen Basin, it's has been the hub of mining operations by the trading conglomerate ever since it bought an interest in the Minerva coal mine in 1994.

By 2010, ownership had increased to 96pc, enabling the company to directly own, operate and manage the business.

In 2018, it also announced plans to develop the nearby Meteor Down South coal mine in a joint venture with U&D Mining.

Now, 25 years down the track from that initial foray, Sojitz continues to expand its presence in the region by acquiring the mothballed Gregory Crinum coking coal mine from BHP Billiton Mitsubishi Alliance (BMA) for \$100 million; and with it comes plans for running its mine operations in a cleaner, greener fashion.

According to Sojitz Coal Mining managing director and chief executive officer Cameron Vorias, the company had long planned to grow its metallurgical coal portfolio.

"In an environment where there's a de-carbonisation trend around the world, Sojitz's response is to move our business more towards coal for steel-making rather than coal for power generation," he said.

"On top of that, to demonstrate our environmental credentials, we're looking at developing our own or establishing a direct relationship with solar companies in the nearby region to develop a very sizeable solar farm at the Gregory Crinum mine.

"It will commence at 20-30MW and climb to 100MW.

"We're looking to not only use that power for some of our own internal use for the washplant and dragline – but also for other mining operations in the local area plus the local community."

Mr Vorias said Sojitz was establishing a new environmental company that would be dedicated towards commencing rehabilitation of the Gregory mine, as well as taking on environmental work at other local mining operations.

Indeed, the global company takes environmental preservation activities seriously, with a policy statement that promises to "strive for a sustainable society, working to preserve the environment and prevent pollution in its business activities, while creating businesses that are both highly competitive and environmentally-friendly".

Emerald injection

Sojitz has emerged as a major source of employment for communities around Emerald, and with clear synergies between the Minerva hub and Gregory Crinum, both operations and their workforces will be centred and serviced from the region.

After first acquiring Minerva, the Sojitz board made it a priority to win over employees who had worked for the previous owners, and who were wary of a newcomer entering the field.

It recognised that the key to a successful mine operation was ensuring that the staff felt unified and supportive of the company, which was achieved by focusing on workers' interests and families, and lifting corporate pride through the use of the Sojitz logo on various merchandise and items connected to the mines, such as shirts, vehicles, stationery and business cards.

According to Atsuhiko Horibe of Sojitz' Coal Dept Project Investment and Development Sector, employees were clearly "maintaining high motivation as part of the Sojitz Group".

"We want to support them as much as possible to further increase their motivation in the field," he said.

The ongoing Minerva open-cut operation is expected to continue operations until 2024, although the company is also exploring opportunities for a small underground operation off the final high wall.

"Our expectation is that there will be opportunities for our existing workforce at Minerva and the Meteor Downs South coal mine to consider a move to Gregory Crinum," Mr Vorias said.

Workers at those mines would be given priority employment, as would Emerald locals.

"We would prefer a residential workforce to rebuild Emerald to where it was," Mr Vorias said.

"There will be some people that will come out of the rest of the industry and there's bound to be some clean skins that we will bring into the organisation as well.

"But the emphasis will be on our own people and those based out of Emerald."

All in all, Mr Vorias said the prospects were strong for the Emerald area.

"Recommendation of mining operations at Gregory Crinum will deliver significant benefits to all our stakeholders, in addition to ensuring security of supply of hard coking coal to our valued customers, as well as providing jobs and strengthening the economy for the people in the Emerald, Springsure and Cappella areas and the state of Queensland," he said.

"The discussions and negotiations we've had with local government in the area has always been centred on bringing prosperity back to Emerald, by providing additional jobs and more opportunities for local suppliers and general industry.

"We're working with local government to look at other opportunities and how we can support some expansionary developments in the Emerald area outside mining."

The company expects to employ up to 200 further workers in the region over the

next 12 months, climbing to a peak of 300.

"We are also in final negotiation on a nearby third-party coal mine that is very close to Gregory Crinum called the Wilton-Fairhill mine, owned by Futura Resources," Mr Vorias said.

"Due to our thin seam expertise, we are the logical group to contract mining that operation, wash it at the at Gregory Crinum facility and sell it into the international market on their behalf.

"The mine alone would generate an additional 50-100 jobs over the next five years."

Previous owners BMA echoed the sentiment, with asset president James Palmer saying the Gregory acquisition would provide new job opportunities and trade benefits for the people of central Queensland, as well as increased royalties and taxes to benefit the state.

Gregory Crinum

The restart of Gregory Crinum will be delivered in two stages, with the first stage focusing on the refurbishment of the processing plant, followed by the full operations and maintenance contract of the processing plant for the next three years.

Sojitz has said that the mine would have an annual capacity of up to 3Mtpa when fully operational, with a life of more than 20 years.

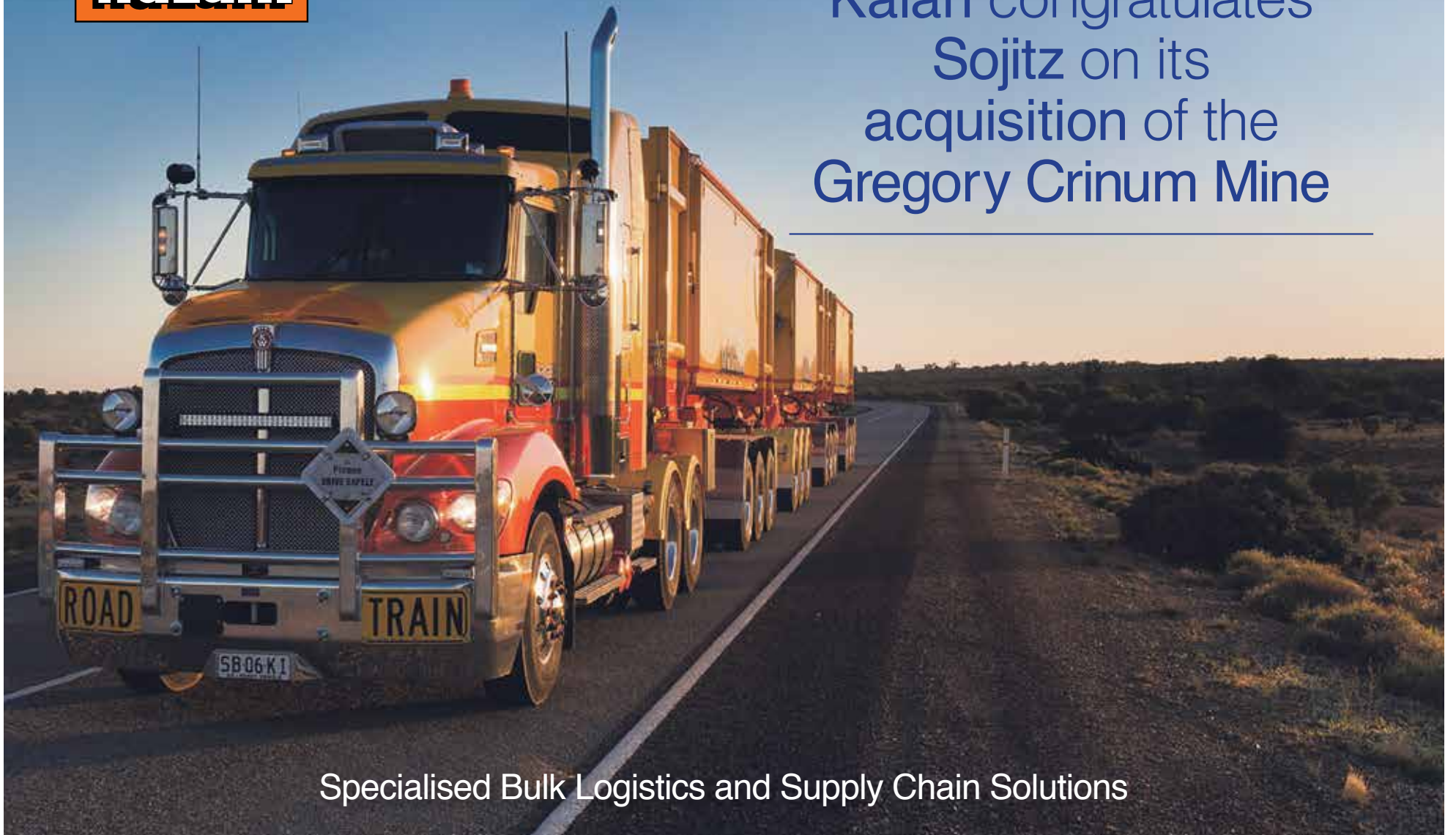
It also said restart operations would begin in the first half of its 2019 financial year, with the first shipment of coal in the second half of the year.

The site comprises the Crinum underground mine, Gregory open-pit mine, undeveloped coal resources and on-site infrastructure including a coal handling and preparation plant, maintenance workshops and administration facilities.

(CONTINUED ON PAGE 24)



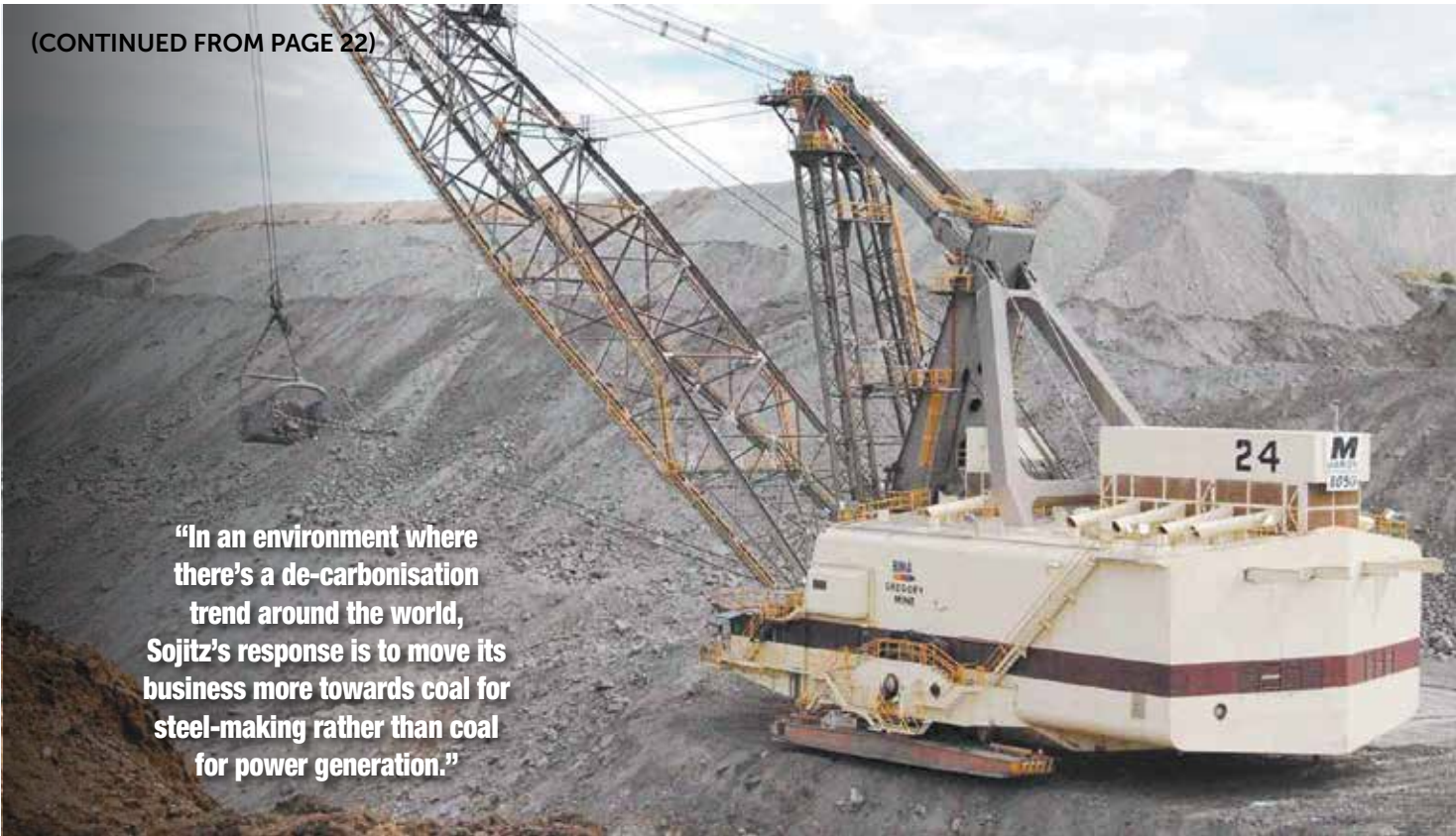
Kalari congratulates Sojitz on its acquisition of the Gregory Crinum Mine



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(CONTINUED FROM PAGE 22)

“In an environment where there’s a de-carbonisation trend around the world, Sojitz’s response is to move its business more towards coal for steel-making rather than coal for power generation.”

The Gregory Cirnum mine will have an annual capacity of up to 3Mtpa coking coal when fully operational, with a life of more than 20 years.

Gregory Cirnum Mine’s capacity was 6Mtpa of hard coking coal when production ceased, and it was placed into care and maintenance in January 2016.

BMA said it made the decision to sell after a detailed review concluded there was potential for another party to realise greater value at the mine.

Shosha redemption

The Sojitz board had initially been cautious about how it would manage the Minerva investment after its initial 30pc acquisition in 1994.

The company was a “shosha”: a diversified trading conglomerate with a business model unique to Japan.

Unlike trading companies in other countries, which are generally specialised in certain types of products, shoshas have extremely diversified business lines.

Sojitz itself runs nine separate divisions: automotive; aerospace; machinery and medical infrastructure; energy and social infrastructure; metals and minerals resources; chemicals; foods and agriculture; retail and lifestyle; and industrial infrastructure.

According to Sojitz manager Toshiharu

Chichibu, the notion of shoshas taking care of marketing, even as minority shareholders, was relatively common at the time the company moved into Minerva.

“However, the practice of shoshas participating in such investment projects as a minority was expected to gradually fade out,” he said.

“Thus, we came to see the goal of operating and managing the mine by ourselves as the same as coal suppliers, steering toward future growth.”

It’s been a worthwhile investment that Mr Chichibu is proud of.

“What I feel from being involved in this

project is a sense of fulfilment,” he said.

“I feel it in all aspects from the start of the project, to setting up the company, to its operation, so I feel challenged and rewarded for thinking about daily management from the beginning.

“The life of the Minerva coal mine is limited, but I want to utilise what I have learned at Minerva for the next project.”

King coal

Coal remains Queensland’s biggest export, making up 40pc of the State’s total exports.

According to Qld Resources Council chief executive Ian Macfarlane, Queensland coal was the commodity of choice for Asia, with the State’s economy benefiting from key trade links with growing economies.

“The State’s high quality coal is not only supporting the jobs of more than 215,000 men and women but continues to be the central commodity driving exports,” he said.

“Queensland has an advantage over other states with its close proximity to the economies of China, India and Japan.

“Every quarter we see export data repeating a common theme — the world needs our metallurgical coal to make steel needed for building modern cities, and our high quality thermal coal is delivering tomorrow’s energy needs through high efficiency, low emission coal-fired power plants.”

Coal exports contributed \$36.3b – an increase of \$5b or 16pc – over the previous 12 months.

In total, the resources sector made up \$68.2b, which helped Queensland post a record \$84.3b in exports until the end of March this year.





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Company director David Hills has more than 30 years’ experience within the industry as an operator through to mine supervisor and knows how to get the job done.

“HME Earthmoving provides reliable, well-maintained equipment that delivers

the performance you expect,” Mr Hills said.

“Our rates are competitive on short or long term equipment hire through dry and wet hire agreements.

“Operators and fitters can be provided as required and deliver equipment to your desired location for a completely hassle free service.”

HME Earthmoving can service highway and dam construction, haul road construction, mining and mine rehabilitation as well as quarrying and bulk earthworks.

“We maintain ongoing communication with our clients to foster positive working relationships which allows us to supply quality operators, machinery and service support for any project,” Mr Hill said.

More information can be found at: www.hillshme.com.au

FORGING AHEAD

BHP South Flank will be one of the world's largest iron ore operations integrating the latest advances in autonomous-ready fleets, digital connectivity and modular design, to ensure the company remains competitive and productive over the project's 25 year mine-life.

BHP's South Flank project is expected to produce 80mtpa.

EMMA DAVIES

BHP'S US\$3.6 billion South Flank project is expected to replace the Yandi mine as it reaches the end of its economic life in the early to mid-2020s.

The project would provide sufficient feed to sustain the current level of iron ore production from the company's Pilbara mines, and with an 80mtpa output by 2021, it will be the single largest annual production iron ore mine that BHP has even developed.

BHP South Flank project manager Simon Thomas said South Flank would provide an increase in BHP's West Australian Iron Ore (WAIO) operations average iron ore grade, and subsequently result in higher-quality lump and fines products.

"South Flank will allow us to increase the quality of our products, satisfying rising demand of high-grade fines and lump with the structural improvement of steel margins and more stringent environmental standards," Mr Thomas said.

"The shift towards increased demand for higher quality materials positions the South Flank product to be in high demand by our customers."

The South Flank deposit is 26km long, 2km wide and requires significant mining infrastructure and operations, including two main mining areas, each supported by a 40mtpa crusher.

"There's about 23km of overland conveyors," Mr Thomas said.

"Plus there are the usual conveyors, coarse ore stockpile, product screening buildings, a new train load-out facility and rail loop duplication.

"The Mining Area C stockyard is to be expanded and our new stockyard machines shall be among the largest in the world."



The project will create about 10,000 jobs over its 25-year life span with a focus on awarding contracts to local suppliers and businesses.

Future-proofing

The project is expected to produce ore for more than 25 years.

BHP has a future-proofing strategy in place with autonomous operations, smart modules and digital connectivity through its Remote Operations Centre.

In an address to shareholders in April, BHP chief executive officer Andrew Mackenzie said that BHP's automation

and technological advancement was the way to remain competitive.

"We will unlock the next wave of productivity through technology and transformation," he said.

"Like all global companies, BHP faces unprecedented challenges as the pace and quantum of technological change push us all towards new frontiers.

"We live in a world where technology continues to disrupt every aspect of the

way we live and work.

"To remain competitive, we must be ready to adapt and hungry to seize the opportunity before us."

Mr Mackenzie said that to stay ahead of technological disruption, BHP must reshape its workforces, streamline processes and redesign the way it works.

(CONTINUED ON PAGE 31)



WTC operates under very strict quality, safety, and environmental management systems

Transformer solutions for mining

NATIONAL

WILSON Transformer Company (WTC) has provided many transformer solutions to the mining industry across Australia with varying capacity.

One of its recent projects has been the supply of three 40/45MVA 132/33/11kV power transformers for the South Flank project, which when completed will be one of the world's largest iron ore operations.

The role of a transformer in the mining industry is at the heart of operation; therefore, it must meet many requirements, particularly in safety,

reliability and efficiency.

WTC operates under very strict quality, safety, and environmental management systems, with all its products being designed, manufactured and tested to Australian and/or international standards.

Utilising the latest engineering software with an in-house developed system, the company designs optimum standard and customised products for life-time performance and safety.

The mining industry requires robust transformers that are built to withstand the harsh operating environments with extreme temperature variations, corrosive

chemicals and heavy pollution.

WTC has extensive experience in designing transformers according to the specific requirements of its mining customers.

Its proven paint system eliminates corrosion and reduces the rapid aging of the external surfaces.

When a transformer is deployed in areas with high fire safety requirements and environmentally sensitive locations, ester fluids can be used for the transformer insulating system.

These fluids flash point and fire point are more than twice that of mineral oil, and together with a very low carbon

footprint, provide a good solution to fire and environmental risk mitigation.

A transformer is a major investment that is designed, manufactured and installed to operate for more than 40 years.

Understanding the condition of equipment is essential for strategic planning and efficient asset utilisation.

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More information can be found at: www.wtc.com.au.

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Well-positioned for growth

NATIONAL

MONADELPHOUS continues to cement its leadership position in the resources market with its construction division recently securing major contracts in the iron ore and lithium markets.

Employing more than 5000 people across its operations globally, recently secured works and the expansion of existing works will see this number increase in the coming years, bringing numerous new job opportunities to the local Australian market.

With an exceptional track record for delivering large and complex projects, a focus on customer relationships and retaining good people, and a leading end to end project delivery capability, Monadelphous is well positioned as the Australian resources market increases activity.

Monadelphous executive general manager Dino Foti said the company's customer-focused approach, coupled with superior service, has proven fundamental to the overall business success.

"It is our people though that are our true competitive advantage, and hiring and retaining good talent is crucial to the delivery of quality work," he said.

"As the resources market picks up again and new jobs are created, our key challenge becomes ensuring we have the right people to deliver safely, reliably and to a high quality for our customers."



A major Monadelphous construction project in the Pilbara.

Monadelphous continues to create new job opportunities to support its projects, and is on the look-out for people who have strong alignment to its value-led culture,

understand the complexity of the resources industry and have proven experience delivering under a customer focused agenda. Does this sound like you?

For rewarding job opportunities that provide challenge and market leading experience in the mining industry, visit www.monadelphous.com.au/careers



TOGETHER
WE DELIVER.

Monadelphous is a leading Australian engineering group providing construction, maintenance and industrial services to the resources, energy and infrastructure sectors.

For more information, visit monadelphous.com.au



A gun at dust suppression

INTERNATIONAL

SINCE 2009, EnviroMist has been successfully developing and installing its own high-energy micro-mist dust suppression systems for underground and above-ground mining operations.

The technology is based purely on water, without any chemical additives.

EnviroMist has collaborated with OEMs, Australian and overseas-based mines and BMEA of University of Wollongong in order to further develop dust suppression technologies.

These are suited to large scale applications such as iron ore or coal underground and surface operations, as well as stockpile discharge conveyors and ROMBINs.

The EnviroMist high-energy micro-mist systems have been installed in several open cut and underground operations, resulting in an immediate and significant reduction in visible dust around the material handling areas.

The solution to this dust problem was the combination of EnviroMist's technologies along with CFD modelling techniques that determined nozzle size, position and operating pressure.

The resulting systems maximise dust capture effectiveness through the control of droplet size, velocity, water consumption and spray angle to suit application specific variables.



EnviroMist uses high-energy micro-mist to maximise the dust capture effectiveness of the spray.

High-energy micro-mist is a key aspect in effective dust capture, as droplets that are similar in size to the dust particles are much more likely to result in droplet-to-particle impact.

Additionally, for the same water consumption, smaller droplet sizes will produce substantially more droplets,

thereby significantly increasing the probability of dust particle capture.

Taking this into account, EnviroMist's nozzles have been developed to produce a finely atomised mist without the need for compressed air.

EnviroMist's latest development, a

powerful misting gun, has been installed on a few new projects around stockpiles and COS discharge conveyors.

These place a high importance on minimising water usage and maximising effectiveness in high cross wind conditions, allowing EnviroMist to showcase the versatility of their systems.



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- Transfer Points & Chutes
- Construction Machinery
- Stockpiles & ROM Bins
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(CONTINUED FROM PAGE 26)



The South Flank deposit is 26km long with about 23km of overland conveyors.

“That is why we established a dedicated Transformation Office to strengthen safety, generate greater value and competitive returns well into the future,” he said.

“This work consolidates and integrates our transformation programs focused on workforce capability, job design and technology that we plan to implement over the next five years.

“We established Integrated Remote Operated Centres, as well as autonomous blast-hole drills, and the phased roll-out of autonomous trucks will also make us safer and our operations more predictable.”

The company even has an innovation mine at the Eastern Ridge iron ore operation in WA which tests new solutions and innovations in geology, extraction and processes.

“It develops workforce capability so that our people are equipped for the rapid pace of change that lies ahead,” Mr Mackenzie said.

“Successful trials are quickly replicated across other operations.”

Mr Thomas echoed this sentiment for the South Flank project.

“Technology is changing the way the mining industry operates,” he said.

“We see South Flank as an opportunity to build on our strategic investment in technology to drive further improvements across our mining value chain, and as we move to highly automated operations across the Pilbara, we have an opportunity to more fully integrate our supply chain from resource to market.”

Mr Thomas said the company aims to build on its success and drive automation further back, into its drill and blast and load and haul operations, to bring the safety and productivity benefits its seen



BHP's local Buying Program will make it easier for small local business to participate.

across its fixed plant operations.

“Our Integrated Remote Operations Centre in Perth has given us the foundation to introduce more flexibility into how we plan and schedule, enabling us to better meet the needs of our customers,” he said.

“We see South Flank as an opportunity to advance our efforts to become a fully integrated and highly automated business by 2025.”

Local contracts

South Flank is expected to create about 10,000 jobs over its 25-year life span, opening up significant employment opportunities for future generations locally and across the State.

“We expect about 85 pc of the South Flank spend will be awarded to Australian companies, of which 90 pc is likely to be

completed in WA,” he said.

“Already we have awarded contracts worth A\$2 billion for WA-based work.”

Pilbara-based businesses will have the opportunity to benefit from the project, with contractors expected to subcontract to local suppliers, and BHP pushing initiatives like its Local Buying Program to make it easier for smaller businesses to participate.

Mr Thomas said that BHP has a long history in WA and had established strong connections with, and support for, the local communities in the areas where it operates.

“We are proud of the contribution we have made and continue to make to the WA economy – the jobs we have created in regional communities and across the State, the opportunities and support we offer WA suppliers and contractors, as well as our contribution to health,

education and community services,” he said.

“We embrace our responsibility to support local job opportunities and the participation of Pilbara residential labour in the South Flank project.

“We expect this of our contractors too, requiring them to supply detailed methodology for providing maximum employment opportunities for Pilbara residents.”

“We see South Flank as an opportunity to advance our efforts to become a fully integrated and highly automated business by 2025.”

To ensure the jobs created in the Pilbara would be sustainable for decades, BHP committed to introduce more apprenticeships and traineeships, and to invest in education to employment pathways by partnering with local schools to improve the quality of education and vocational training.

“This will provide an opportunity to employ, train and support trainees, as well as simultaneously allow them to undertake practical work experience hosted by our construction contractors,” Mr Thomas said.

The iron ore market provided a platform of sustained opportunity for the company and the main challenges would be to ensure both staff and processes are prepared to cope and adapt over time.

“We need to be thinking about how we support future generations through significant investments and sustained production,” Mr Thomas said.

“South Flank is that sustaining opportunity for BHP.”

Safe scaffolding services

WA

PILBARA Access continues to evolve and be the industry leader in providing scaffolding and access solutions to the mining and resources industry.

With its innovative scaffolding and rope access business model, Pilbara Access is able to deliver a far safer, efficient and productive service to clients unlocking excellence in value, and ensuring that everyone is working to a common goal of achieving zero harm.

Pilbara Access managing director Stephen Easterbrook said that through shared knowledge further education of people and experience, team members are set with clear objectives that are deliverable and performance reviewed.

"We are committed to providing the highest standard of professionalism within access services, offering a planning, scheduling and design team that is truly unique, all underpinning the success of the way we collectively work, enabling the client to draw on value and achieve proven and traceable results," he said.

"It's our commitment to delivering a safe, efficient and innovative business model that led to the company being awarded the scaffold resources contract on BHP's South Flank iron ore project.

"As the first scaffold access company on site at South Flank, we feel a great deal of pride and are privileged to be currently working on the construction for



Pilbara Access is the provider of choice in the resources sector for access and maintenance services.

bulk earthworks at the project."

Mr Easterbrook said the scaffold teams have already been on site for six weeks and are excited to be a part of changing

the landscape in the Pilbara and the iron ore resource industry.

"We continue to strengthen our footprint and diversifying as leaders in

Access and mechanical services," he said.

More information about Pilbara Access's unique services can be found at: www.pilbaraaccess.com.au.



WE'RE GROWING, THE FUTURE IS...



Capability

Secure, reliable team.
400+ Scaffolding People
150+ Rope Access Techs
Directly employed team.
Experienced management team working within detailed framework & systems
Highly effective design, scheduling & planning team.

Scaffolding

Further educating our scaffolding teams at HiSkill Pty Ltd.
All employees are skills assessed.
Planning and pre-execution works by the coordination team are viewed as critical for project success.
Standardised work instructions to deliver greater efficiencies.

Rope Access

High performing rope access technicians/trades people are skills assessed for capabilities at HiSkill.
Assessment has been compiled by our IRATA Tech Authority.
All trades are externally assessed including Fitters, BMR coded welders and NDT tech.

Design & Improvement

Embedded access designers based remotely and in Perth.
Our scaffold and rope access design system were built specifically for Pilbara Access.
Our focus is to create clear, transparent information for the end user.
Our focus is on continuous business improvement through innovation and design.

Shutdown & Maintenance Support

Proven ability and knowledge to support major projects
Working with clients to provide key solutions.
We enable safe and reliable work practices.



All images IGO.

PEERING BENEATH THE SURFACE

IGO's Nova deposit has become a testing ground for the company's geophysical exploration. The company has been pushing the envelope with geophysical technology, successfully creating a high resolution 3D seismic cube that has been accurate beyond its expectations – an achievement chief geophysicist Andrew Fitzpatrick believes is just scratching the surface.

Airborne electromagnetic surveys are used to provide reconnaissance information before ground surveys take place.

GERARD MCARTNEY

AS Australia's greenfield outcropping and sub-cropping deposits become increasingly scarce, miners are digging deeper than ever before, exploring new options on green and brownfields tenements.

To do this, they must be able to look further underground to map the subterranean deposits before expensive exploratory drilling programs can take place.

Geophysical technology allows explorers to do just that – giving explorers high resolution 3D models of up to 3km below the surface.

According to Independence Group (IGO) chief geophysicist, Andrew Fitzpatrick, "the new frontier is exploring undercover".

Mr Fitzpatrick spoke with the *Australian Mining Review* about the way IGO has been using geophysical methods and technologies on the company's Nova deposit, and its satellite Albany Fraser copper-nickel project in WA.

The Nova deposit was discovered in 2012 and during the initial exploration, IGO identified a host of potential satellite deposits, one of them being the Albany Fraser copper-nickel project.

The geology of the tenement is magmatic nickel-copper, and is hosted within the lower granulite facies mafic rocks of the Fraser Zone of the Albany-Fraser Orogen.

To map the deposit, IGO used a variety of geophysical methods such as electromagnetic (EM), magnetics, gravity, and seismic modelling.

Mr Fitzpatrick said that for the exploration of nickel, IGO focused mostly on the use of EM and seismic techniques, as they can be used to directly detect mineralisation.



Seismic modelling can produce high resolution 3D models to depths of up to 3km.

"We use airborne EM to provide a rapid reconnaissance of the belt, and follow-up with ground EM over potential targets prior to drilling," he said.

"We just completed one of the largest high-resolution airborne EM surveys in Australia using the Spectrem system collecting over 46,000-line km.

"Additionally in 2018, we completed a large 3D seismic survey over the Nova Mining lease to assist in our brownfields exploration program."

The 3D seismic survey has been, according to Mr Fitzpatrick, the real game-changer to brownfields exploration.

"From my perspective, hard rock seismic is gaining momentum, where our other geophysical methods lack the resolution and depth of investigation to adequately define geology at depth," he said.

"At Nova, we now have a seismic cube

that is high resolution at depths over 3km."

Whereas traditionally, the electromagnetic (EM) techniques were limited to depths between 500 and 1000m, "the seismic technique is comparable to MRI technology in the medical industry, and we're only starting to realise its benefits," he said.

The self-organising map algorithms are able to interrogate a number of geophysical models and simultaneously help map geology in 3D to show any anomalous areas.

Although it is not new, the technology helped IGO to solidify its geological understanding in most areas, and to identify areas that were less understood.

IGO has also been looking at a number of new ideas to get the most out of its 3D seismic techniques, such as machine learning and more advanced model algorithms.

At Nova, the program has proved

successful and Mr Fitzpatrick said that even after the first initial holes were drilled, the geological interpretation of the seismic models were robust and gave the company confidence to test new targets at depth.

"This year we also saw our own in-house geophysics crews deploy SQUID sensors in our EM surveying," he said.

"These SQUID sensors are cryogenically cooled, and their increased sensitivity translates to seeing deeper."

The geophysical datasets, gathered by the increasingly sensitive technology, do not just support the understanding of the area's geology, they allow IGO to objectively identify and drill targets and reduce the risk involved in exploration programs.

This means that the advancement of the understanding and the increased knowledge of data-rich seismic data from Nova is not confined to one mine lease – the geological insights gained by these advanced methods can be applied and extended to greenfield programs too.

"We like to think of Nova as our laboratory where we can test and trial new ideas," Mr Fitzpatrick said.

Miners are always on the lookout for new, game changing technology, but Mr Fitzpatrick said that although there is room for improvement, geophysical technology primarily works off incremental improvements across all technology.

"Everyone is looking for the new silver bullet, and if I knew of a game changer, I'd probably keep that within IGO," he said.

"From a nickel perspective, I'd like to see the sensitivity of downhole EM systems improved.

"Increasing the search radius from 100m to 300m or so would be a game-changer, particularly when we drill beyond the depths of surface EM detection."

Total airborne and ground service

NATIONAL

BORN out of the success of its sister company, Atlas Geophysics, Pegasus Airborne Systems is making a quantum shift in the airborne geophysical industry.

After many years of research and development, Pegasus Airborne Systems now offers low noise, ultra-high resolution UAV/drone magnetic surveys to its clients in the mining exploration and environmental assessment sectors.

The company has developed a range of autonomous aircraft, including fixed wing, rotor wing and multi-copter configurations that ensure the right aircraft is tailored to the right payload.

Along with airborne magnetic data, the company can also acquire other datasets such as photogrammetry,



Pegasus Airborne Systems ensures the right aircraft is tailored to the right payload to make every project a success.

LIDAR, multispectral and hyperspectral.

As a team, the company has the know-how, expertise and logistical capabilities to deliver every time,

anywhere in Australia or overseas.

The company is fully certified by CASA to operate aircraft up to 130kg MTOW.

Paired up with Atlas Geophysics,

the team can offer a total airborne and ground geophysical solution that is second to none, with all projects professionally executed to a high and, more importantly, safe standard.

UAV MAGic

It's time to put away the toys, UAV MAG is finally here.

- Safe, low impact, low level survey
- Ground magnetics resolution and accuracy
- Caesium Vapour Magnetometers @ 20Hz
- Terrain Draping using DTM
- + 80kph flight speed
- 28kg, 40kg and 130kg MTOW aircraft
- 3 hour endurance, even in strong winds
- Rapid survey, rapid data delivery



PEGASUS
AIRBORNE SYSTEMS

Evaluate existing geophysical data

NATIONAL

RAPID Geophysics started primarily as a consulting company for mineral exploration and has experience with all disciplines of geophysics, consulting in various capacities across the mining value chain.

Over 20 years, Rapid has developed the RAMT system, an audio frequency magnetotelluric sensor which can acquire 1D AMT soundings with a two-minute record length for rapid acquisition of 2D traverses or 3D grids.

Rapid has survey equipment to conduct RAMT and resistivity tomography surveys and have recently been working in mining and groundwater exploration.

Usually a desktop study precedes the survey, given the large amounts of publically available geophysical data that needs reviewing in order to design a survey.

Rapid conducts desktop evaluations of this publically available data, reprocesses if necessary and then integrates in a GIS platform to offer integrated conclusions for mineral prospectivity.

Rapid has also developed many of its own processing, 3D visualisation and integration workflows.

It can provide results in a variety of formats for junior explorers to majors, and provides independent geophysical QC and reprocessing, inversion and modelling of data for drilling campaigns.

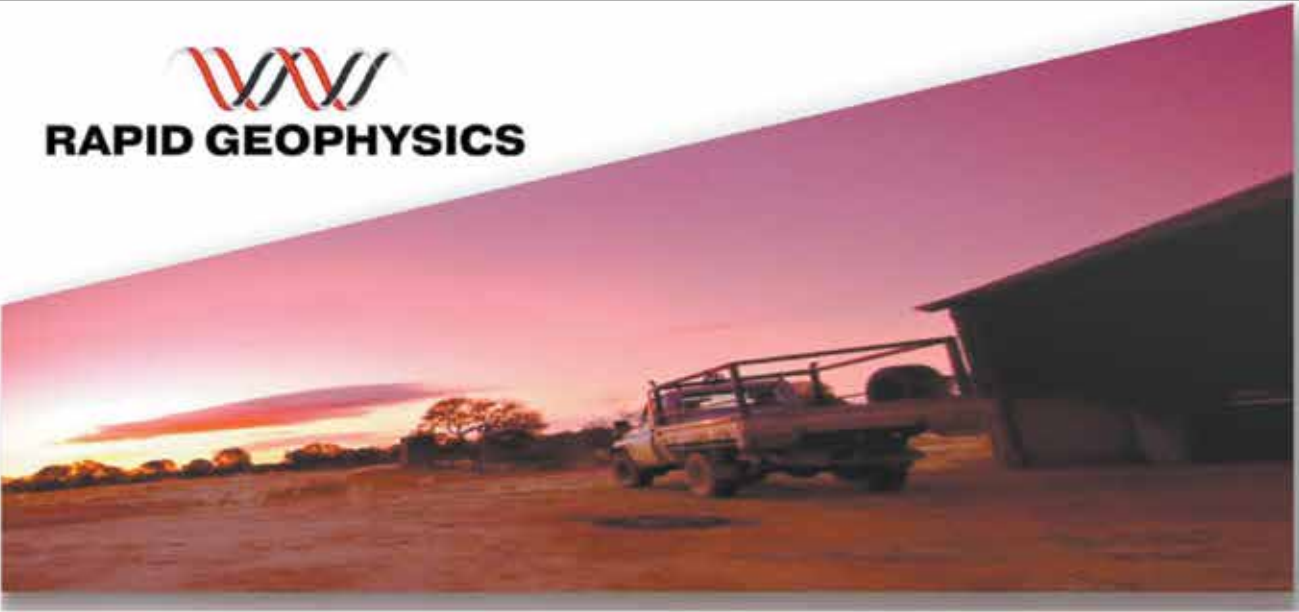

As an independent geophysical




Rapid Geophysics was featured on the Discovery channel's 'Aussie Gold Hunters' showcasing the Resistivity Tomography system, which has conducted multiple successful mineral and groundwater exploration surveys.

company without the overheads of the larger geophysical consulting companies, Rapid is able to minimise cost exposure for mining clients by maximising the value of existing information publically available, and then focus on rapidly accelerating an exploration strategy to get to drilling with confidence from integrated conclusions and discussions with the client.


More information can be found at: www.rapidgeophysics.com.au.




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SINGLE VEHICLE OPERATIONS

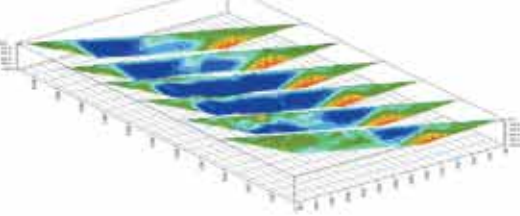
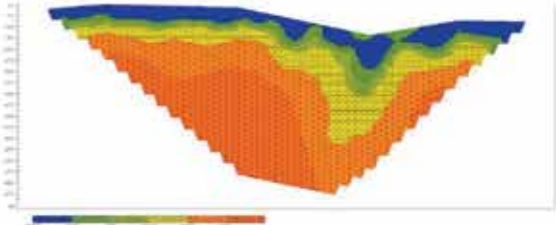




DEDICATED ACQUISITION CREW



Rapid Geophysics offers services across all disciplines of geophysics:

- Magnetics
- Gravity
- Resistivity and IP
- Electromagnetics
- Seismic
- Radiometrics
- Satellite
- GIS
- RAMT – Rapid Audio Frequency Magnetotellurics
- Res&IP – Resistivity Tomography and targeted IP





Rapid Geophysics Contact Details:
Barrett Cameron
Managing Director - Geophysicist
RAMT@rapidgeophysics.com.au

DOING THE ROUNDS

In an effort to expand on its bread-and-butter portfolio of copper operations, WHSP's mining arm CopperChem has turned to its historical roots to reimagine itself as Round Oak Minerals.

Round Oak purchased the Jaguar operation as part of its diversification strategy.

GERARD MCARTNEY

THE ambitious diversification and rebranding of CopperChem to Round Oak has been no small task.

The unlisted subsidiary of Washington H. Soul Pattinson and Company (WHSP) is in the process of establishing itself as an emerging base and precious metals producer, off the back of a series of acquisitions that have expanded its interests past its copper-producing roots to include zinc and gold.

In the past 12 months, the company's portfolio has grown to include the Jaguar copper-zinc operation in WA, Cloncurry and White Dam gold operations in Queensland and South Australia respectively, and the Stockman and Barbara projects in Victoria and Queensland.

In 2018, revenue for the company was at \$18.7m, up from \$18.4m in the previous year.

In the first half of FY19, the new incarnation of the company generated a total revenue of \$64.38m which did not cover operating costs, and cost WHSP \$22.7m in lost consolidated revenue.

WHSP said that the losses were the result of the significant start-up costs "associated with the development of various projects, including the Wallace and Barbara gold projects and the Mount Colin and Stockman copper assets," as well as the Jaguar mine reducing its production to focus on the development of the Triumph resource.

WHSP valued its subsidiary at \$198m, claiming a \$43m, 28.1pc growth in asset value over the year.

The company said that its re-branding strategy was part of a targeted move to diversify its interests, and to pay homage to its heritage.

"The new company name provides a link back to where our company started at its Great Australia Mine," the company said.

The Great Australia mine is located on the Round Oak station in northwest Queensland, and is a part of the Cloncurry operations, forecast to reach production in 2019.

Queensland

Round Oak's Queensland operations consist of 24 exploration tenements and 11 mining leases, with two projects, the Australia Operations (which includes Cloncurry), and the Mt Colin underground mine becoming operational in 2018.

The company commissioned new gold processing facilities at its Cloncurry operation in the second half of 2018.

The facility upgrade included the integration of crushing and grinding circuits, with the new gold processing facilities to process ore from Round Oak's Australia Operation portfolio of satellite open pit gold mines, which will feed the processing plant for the first two to three years.

Wallace South was the first pit to be restarted, and began operations in June 2018.

In December 2018, the company produced and processed the first gold from the pit.

Wallace South is expected to produce between 30,000 and 35,000oz in 2019.

The Mt Colin mine commenced activity in July 2018, with portal access being established from the existing open pit.

The project was impacted by the floods in northern Queensland, however, the company says it is still on track to reach production in the first half of 2019.

Once operational, Mt Colin would

employ about 70 people, and ore from the mine would be treated at Glencore's Ernest Henry operation.

The Barbara open pit development commenced in February, and has an expected mine life of two years.

First ore is expected to be produced at the beginning of FY20, with ore to be processed at Glencore's Mt Isa operations.

The operation would employ about 40-50 people, to be bussed in from Mt Isa, as with the Mt Colin operation.

Round Oak said that it is continuing exploration in north-west Queensland on a number of prospective targets in the hope of identifying additional satellite copper resources at a feasible transporting distance from the Cloncurry processing facility.

Round Oak came under scrutiny from the Department of Environment and Science (DES) over concerns about the Great Australia Operations legacy groundwater quality.

Round Oak said that it had continued de-watering the impacted groundwater system, and had successfully closed out an Environmental Protection Order for ground water quality during 2018, and that it "implemented monitoring and management actions in response to an unplanned water releaser that occurred at its Mt Colin operations".

WA

The \$73.2m acquisition of the Jaguar zinc-copper operation from IGO in May 2018 was part of the company's diversification strategy that followed on from its \$47m purchase of IGO's Stockman copper-zinc project in Victoria.

Round Oak was still CopperChem when it purchased the Jaguar operation, and at \$73.2m, the company would appear to have

purchased it at well under market value.

RBC Capital Markets analyst Paul Hissy said that the deal came in well below the estimated \$150m value.

In the latter half of 2018, ore production was reduced at the Bentley underground mine, with the company citing a shift of focus toward "completing capital development to open up additional mining fronts and enable higher production rates in FY20".

The company is also looking at the Triumph resource at Jaguar and is undertaking an evaluation to determine the project's potential to extend the Jaguar mine life beyond its current four-year expectancy.

Victoria

The Stockman copper-zinc project, acquired in 2017, has continued to progress through the approval and permissions phase.

In July 2018, the project was granted its infrastructure mining licence that covered its tailings dam, and proved a critical milestone that allowed Round Oak to progress toward the work plan, which was submitted in the second half of 2018.

The Stockman mine has a somewhat tainted legacy with the East Gippsland community.

After falling into receivership in the late 90s, Benambra Copper left taxpayers to foot the \$6.9m rehabilitation bill for the old tailings dam.

This resulted in a government exclusion zone to stop use by future miners, with the decision being reversed in 2017 by then resources minister, Tim Pallas, which facilitated the purchase.

The company said that it will continue to explore and increase the mineral resource at Stockman throughout 2019, and that as it continues to test new targets, it is yielding positive early results.

INCREVA

PROJECT MANAGERS

OWNER'S REPRESENTATIVE

- Project Conceptualisation and Scoping
 - Feasibility Management
- Brownfields Project Management
- Project Execution and Delivery
 - Operational Readiness

PROJECT MANAGEMENT SERVICES

- Schedule Creation and Management
 - Estimating & Cost Management
- Contract & Procurement Management
 - Risk Management
 - Forensic Scheduling

DUE DILIGENCE

- Feasibility Study Review
- Cost Interrogation and Optimisation
 - Financial Modelling
- Recommissioning Analysis

Proud to be associated with Round Oak Minerals

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Relocated accommodation units from Queensland now in Victoria for refurbishment.

Collaborative and strategic

NATIONAL

INCREVA is a Perth-based project management and owner's representative services company and is geared towards client-centred, collaborative project delivery.

Increva's relationship with Round Oak began with the company working on the Stockman project shortly after it was acquired, assisting with supporting the engineering interface with environmental approvals.

Increva project manager Guy Ware said the company had since assisted the study manager with the scoping, scheduling, cost management and estimating services at Stockman.

"We sourced a quality second-hand camp and managed relocation of the accommodation facility from Queensland to Victoria, he said.

"This included refurbishment works."

Increva tendered for, was awarded and is now managing design of the Stockman Camp layout to balance costs and liveability with the available buildings and remote location.

"We have complemented the strategic and detailed planning of the Stockman project by driving project initiatives to reduce execution risk while maintaining project viability," Mr Ware said.

Increva has since assisted with the new camp at Mount Colin (Qld), providing estimating, design management, construction management, schedule and cost control services.

The company has also recently continued its relationship with Round Oak, assisting with option assessment at the Jaguar site in WA.

More information about Increva can be found at: www.increva.com.au.



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**WE EXIST TO CREATE ENDURING
VALUE AND CERTAINTY FOR
MINE OWNERS.**

We are proud to be working alongside
Round Oak Minerals.

Consistently delivering exceptional
results at the Mt Colin Operations.



Optimised ore recovery

NATIONAL

ROUND Oak Minerals' Jaguar operation approached Minova to assist with a solution that could maximise the recovery of stopes at its Bentley underground mine.

One of the principal mining methods used historically is the Avoca method, which requires all development in a given area to be completed before stoping commences in a bottom-up sequence – both the conventional and modified variants are used at Bentley, which rely on end-on and central access respectively.

Stope voids are sequentially back-filled with loose ROM waste rockfill.

The 3900 AOS level is positioned below a previously extracted Avoca zone; as such, loose rockfill is situated in the 3920 AON immediately above.

Stopes in the 3900 were originally earmarked to have rib and sill pillars to maintain control of the existing backfill, however due to several factors including a shift in mining economics over time, options to achieve full extraction were reviewed.

Scope

To optimise extraction of this level, a 150m long section of consolidated rockfill was required in the 3920 AON to provide a stable exposure to mine underneath and ensure minimal dilution of the ore body during extraction.

Solution

Minova supplied technical advice, product, specialised equipment and operations capability to support Round Oak Jaguar during the consolidation program.

FB200 grout was selected for its unique rapid gel times, quick strength, low viscosity and high water content, allowing for controlled placement through carefully designed borehole patterns and maximum penetration of the rockfill.

Tekseal, another high yield grout, was used to create grout curtains to control the placement of the FB200 within the rockfill.

The result

With the help of Minova's 18 years of product ingenuity and experience in recovering sterilised ore, Round Oak Jaguar was able to adapt its mining method to a primary/secondary sequence, utilising the stabilised rockfill sill in conjunction with CAF backfilled primary stopes, which enabled the extraction of the previously planned rib and sill pillars.

Minova provided 360 tonnes of FB200 to Round Oak Jaguar and consolidated the rockfill in the 3920 ore drive in three weeks, working round the clock.

To date, all the primary stopes have been extracted with minimal dilution observed, with extraction of the secondary stopes still to occur.



Minova supplied technical advice, product-specialised equipment and operations capability to support Round Oak Jaguar.

Minova is currently undertaking further work at Jaguar to unlock and extract value within the mine.

Achievements

Minova was able to extract primary stopes to full height, including the

originally designed ore sill pillars.

This represents an average 20pc increase in ore tonnes on the initial design for these stopes, and dilution within the consolidated rockfill sill has averaged less than 3pc.

Grout samples were taken during application to ensure the correct ratio of product would achieve the correct

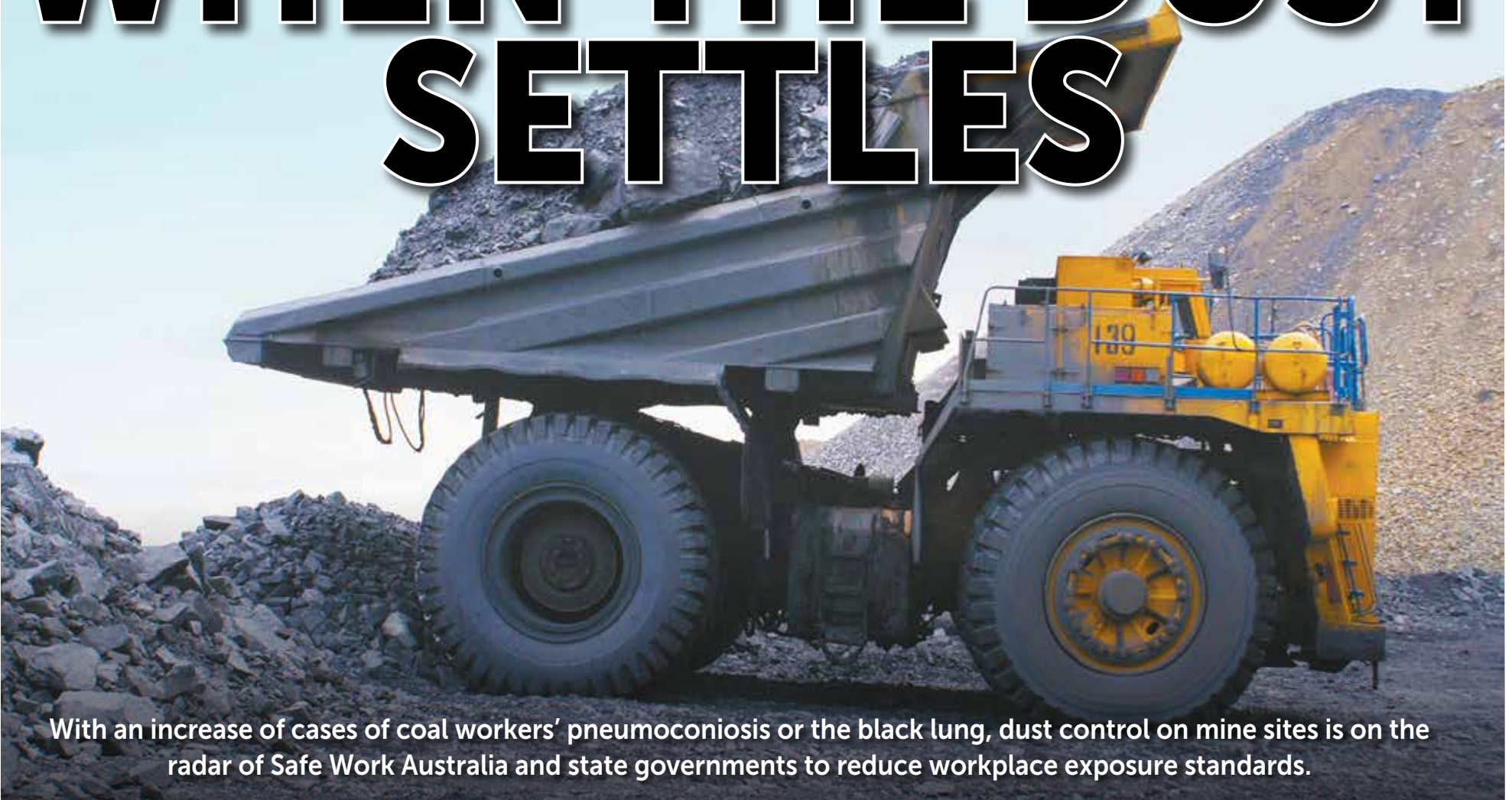
strength.

These samples were tested by Minova and a third party to ensure compliance.

Minova has helped customers recover sterilised ore reserves and improve extraction outcomes in unmined areas for more than 18 years, delivering substantial financial benefits safely and efficiently.

All Images: Pixabay.

WHEN THE DUST SETTLES



With an increase of cases of coal workers' pneumoconiosis or the black lung, dust control on mine sites is on the radar of Safe Work Australia and state governments to reduce workplace exposure standards.

Workers in enclosed cabins can be protected from excessive dust by pressurised air supply, filtration methods and preventative maintenance reminders displayed digitally.

EMMA DAVIES

IN 2017, Scott Morrison famously entered parliament with a lump of coal stating “don’t be scared, it won’t hurt you, it’s coal”. But as it turns out, he was wrong.

The incurable black lung or coal workers’ pneumoconiosis has hit Queensland coal mines with a vengeance, leading to new dust control standards on mine sites.

Exposure to dust can cause irritation to the eyes, skin and respiratory tract, and prolonged exposure, breathing in coal dust, silica dust and other finely powdered materials, can lead to a range of serious lung diseases.

Workers who are exposed to respirable dust at levels that exceed the occupational exposure limit (OEL) are at risk of developing diseases including silicosis, coal workers’ pneumoconiosis (CWP), chronic obstructive pulmonary disease (COPD) and lung cancer.

Late last year the Queensland State Government committed to a respirable dust exposure level review, pending a review of workplace exposure standards for airborne contaminants including coal dust by Safe Work Australia (SWA).

As an interim measure, the Coal Mining Safety and Health Regulation 2017 (CMSHR) has been amended, building on the recommendation of the Monash review and the Parliamentary Select Committee report.

The regulated limit or maximum average concentration a worker breathes in a mine atmosphere containing respirable dust has been reduced from 3mg/m³ to 2.5mg/m³, effective from November 1, 2018.

While this is a step in the right direction for Queensland, it remains to be seen if other states follow suit.

A spokesperson from SWA said that the agency is not a workplace health and safety (WHS) nor natural resources safety regulator, and that each of the states and territories hold responsibility for compliance and enforcement of laws in their jurisdictions.

“WHS in the natural resources and mining sector is regulated by states and territories,” they said

Jurisdictions regulate WHS in the sector slightly differently.”

“For example, New South Wales, South Australia and the Northern Territory have implemented the model WHS laws and enacted supplementary provisions to deal with mining safety; and in Queensland and Western Australia there are separate mining laws in addition to their primary WHS laws.”

However, occupational lung diseases are a priority condition in the Australian Work Health and Safety Strategy 2012-2022.

SWA is working on an occupational lung diseases work plan that will be implemented over 2019 and 2020, including a literature review into dust control technologies to better provide advice about the most effective control measures to protect workers from workplace dusts.

“We are also evaluating the workplace exposure standards for airborne contaminants,” the spokesperson said.

“The workplace exposure standards represent the airborne concentrations of a chemical that is not expected to cause adverse effects on the health (illness or disease) in an exposed worker who is not wearing respiratory protective equipment.

“Under the model WHS laws, a person conducting a business or undertaking at a workplace must ensure that no person at the workplace is exposed to an airborne concentration of a chemical that exceeds the exposure standard.”

The draft evaluation report for coal dust (respirable, containing less than 5pc quartz) suggested that Time Weighted Average (TWA) exposure limits of 0.9mg/m³ for respirable dust of bituminous and lignite coal and 0.4mg/m³ for respirable dust of anthracite coal is recommended to prevent CWP, COPD and progressive massive fibrosis (PMF).

While Queensland recently revised

exposure limits, the current standard coal dust concentration in the 2018 version of *Workplace Exposure Standards for Airborne Contaminants* is still 3mg/m³.

“The recommendations in the draft evaluation report are not mandatory values under state and territory WHS laws until they are agreed by SWA members and adopted into those laws,” the SWA spokesperson said.

“The expertise of industry and worker stakeholders and the Australian public is crucial for SWA members to make informed decisions about what values should be adopted.

“We will continue to seek feedback for each of the workplace exposure standards as they are reviewed to ensure practical considerations are taken into account.”

Controlling dust

Mining companies can reduce workers exposure by reviewing the methods and products used for dust suppression purposes — because if the impacts of dust on mining processes are controlled — so too will the exposure levels.

Australian Institute of Occupational Hygienists president Dr Julia Norris said there are some basic principles that can be applied to control dust and in fact, all workplace hazards.

“We call these principles the “hierarchy of control,” Dr Norris said.

“We like to start at the top of the hierarchy of control, because these strategies actually remove the hazard rather than just containing it.”

The first principle is elimination; this means not using materials or processes that generate dusts in the first place.

The second is substitution, which involves using alternative materials that are less hazardous than the material currently being used.

Thirdly is engineering control, involving changing the process so that less dust is not formed in the first place, or modifying

equipment to prevent dust coming in to contact with workers; for instance, wet process to reduce dust or installing ventilation to capture and remove dust before it becomes a hazard.

Fourthly is administrative control such as work instructions, procedures and training, while fifth is the use of personal protective equipment (PPE), which Dr Norris said is the last line of defence if other controls are not feasible.

“While PPE does work, it relies on the correct selection, use and maintenance of each piece of equipment to give adequate protection; and in the real world environment, this is often not the case,” she said.

Dr Norris said she commended SWA on their current review of the WES.

“However, I need to reiterate that WES’s are only a tool to assess the need for controls in the workplace, they are not controls in themselves,” she said.

“It is vitally important that we educate workplaces about the correct use and interpretation of Workplace Exposure Standards.

“While the WES does define a legal upper limit, it is not a target, but rather a tool to be used to guide controls.”

Workplace exposure monitoring is just one small part of a comprehensive occupational health program.

It is important for mining operations to understand that in order to truly prevent occupational diseases, they must prevent exposure in the first place.

The AIOH and the British Occupational Hygiene Society (BOHS) have developed the Breathe Freely Australia program aimed at employers, health and safety managers and anyone responsible for occupational health programs in the workplace.

“It is about raising awareness, both of the hazards encountered and how to control them,” Dr Norris said.

For more information visit www.breathefreelyaustralia.org.au.

Protecting your business

NATIONAL

WITH its slogan of “protect your business”, PR Power puts its focus on your business and project needs, while offering expert advice, products and solutions.

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The company has thoroughly researched their internationally recognised brands and extensively tested equipment to ensure reliable products are available for use Australia wide.



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PR Power is the exclusive Australasian distributor for Siltbuster equipment (including settlement units, oil water separators, chemical dosing and pH correction units).

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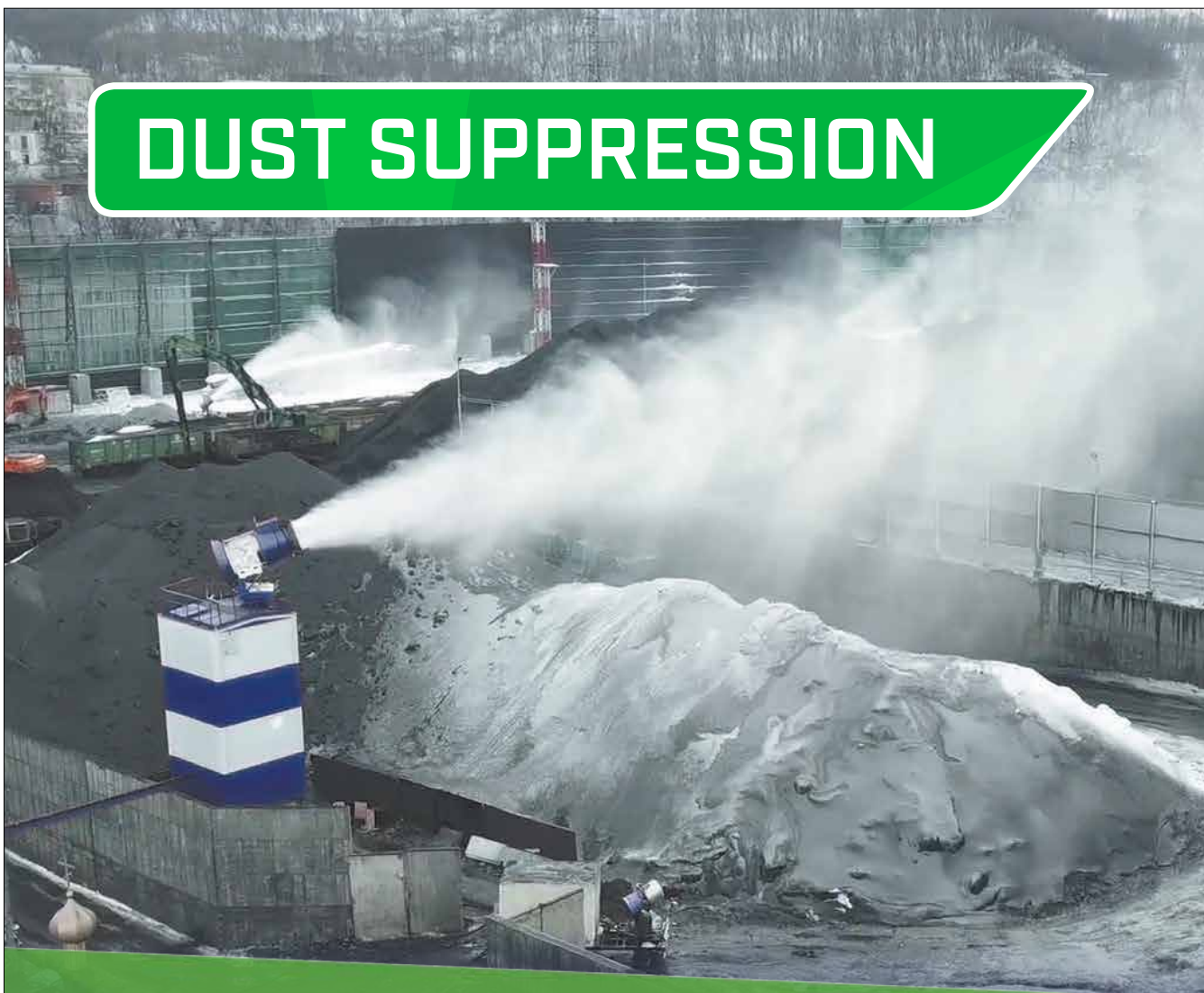
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Dust control from pit to port

NATIONAL

ACHIEVING effective dust control in mines and across the supply chain is an ongoing challenge for mining operators.

Relying on conventional methods alone, such as water carts and low-pressure watering systems, is rarely enough.

Instead, a combination of customised measures tailored to specific dust issues is now required to meet increasingly strict dust emission, environmental and workplace regulations.

Since 2005, Dust-A-Side has become Australia's leading specialist in total dust control management to the mining sector.

The business has grown from its initial core capabilities around dust control for mine roads to adopting an all-encompassing "pit to port" approach.

This holistic strategy incorporates delivering efficient and cost-effective



Before and after results from a customised Dust-A-Side dust control solution.

dust control solutions for mine pits, roads, stockpiles, rail freight veneering, and for tipping and material transfer points at mines, processing plants and ports. Customised services offered by

Dust-A-Side include the design and commission of mechanical dust suppression systems which minimise water usage, as well as full establishment and maintenance services for light and heavy mine roads.

Additionally, Dust-A-Side supplies and integrates a range of biodegradable dust suppressant products, binders and surfactants.

Dust-A-Side is currently positioning the business to respond to competing challenges being faced across the mining industry.

Tightening dust emission regulations, water scarcity, environmental management and delivering a healthier workplace all feature heavily in current mine operational plans.

Dust-A-Side Australia general manager Neil Hoskin believes that in Australia's post-mining boom, delivering shareholder value now lies in achieving production gains and smarter management of existing assets.

"Our full-service dust control and management capabilities not only address and significantly reduce fugitive dust issues for mines, we also contribute to reduced water consumption and improved production gains, from pit to port," Mr Hoskin said.

Dust-A-Side Australia is currently operating in locations in Brisbane, Perth and Newcastle and is investing heavily in sales and operational capability to meet market demand.

More information can be found at: www.dustaside.com.au.

Dust Problems? Dust-A-Side has the total solution

Dust-A-Side is Australia's only provider of holistic, pit to port dust control services. We offer tailored products and solutions to reduce dust and improve productivity, covering all dust generation points, including:

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- Tipping and transfer points
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DUST-A-SIDE
AUSTRALIA

Another one fights the dust

NATIONAL

GOOD dust management is essential to the wellbeing of your employees, mine equipment and the environment.

Dust has a significant health and environmental impact associated within many areas of the mining industry.

Any dust, no matter how small, poses a threat to workers health – it is the most common health and safety issue facing management and workers.

And any amount of dust will have a significant impact on the running costs of mine machinery.

CoolMist Systems Australia can design, supply and install high-pressure misting systems that are tailored to suit the specific needs of different mine sites.

Committed to assisting businesses, CoolMist finds the best solution for operational issues and EPA compliance requirements.

The company's services include system design, supply, installation, commissioning, in-house and on-site service and maintenance.

CoolMist will partner up with clients to customise an effective dust suppression system unique to clients' facilities.

It can design a fog system that is concentrated when needed and captures and suppresses dust without wetting the process material, the equipment or the facilities.



Mist cannons can suppress dust and reduce its significant associated health and environmental impacts.

The company is a leading provider of high-quality, fixed line fog systems and mist cannons for mining and industrial applications, and it specialises in proven and innovative technologies for large scale areas.

Its product range includes high pressure

fog pump modules, fittings and large area A-JET fog cannons.

High-pressure misting systems, also referred to as fog systems, are the most efficient, effective and economically viable means for mine site dust control.

Mist systems are far more economical, safer and more effective than dust extraction systems, and CoolMist's industrial mist systems avoid the moisture problems that are common in water spray type systems.

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www.coolmist.com.au

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Call 1300 266 564 or **email sales@coolmist.com.au** our expert team can work with you to find the best solution for dust suppression with their professional advice, system design and installation service.



Bring out the big guns

NATIONAL

NELSON Big Guns are used in mining applications all over the world for dust suppression and leaching minerals with toxic solutions.

The Nelson Big Gun stands on its own because of the product's longevity, and when the Big Gun is used in conjunction with Nelson control valves and the TWIG wireless control system, there is a unique synergy that improves efficiency and reliability.

The life of the product is typically between 10,000 to 15,000 hours – consistently longer than other brands in all applications and, when it comes to dust control, the Nelson Big Gun's sealed ball bearings have proved an unmatched feature, giving the machine life a distinct advantage over other brands.

And it's ready to go, right out of the box. The Nelson Big Gun requires no adjustments, as the patented drive vane automatically compensates over a wide range of pressure and flows.



The Nelson Big Gun relies on flexibility, simplicity and reliability.

All of the Nelson Big Gun models are field-tested and proven, and the accompanying control valve and systems provide the ultimate in flexibility, simplicity, trouble-shooting and maintenance.

The Big Guns are preferred around the world for their ability to move large amounts of water in short periods of time. The large nozzles of the Big Guns are less likely to plug, and the filtration

requirements are minimal. The high-trajectory Big Gun sprinkler can achieve necessary stream heights to reduce tower height and clear the top of the piles.

INDUSTRIAL GRADE IRRIGATION PRODUCTS



ORIGINAL BIG GUN

- Dust suppression
- Quarries and Construction Sites
- Land Applications for highly corrosive water
- Fire suppression

Nelson's complete industrial-grade control package consists of Big Gun® sprinklers, control valves and the TWIG® wireless control system.

Intelligent cabin air filtration

NATIONAL

ON mine sites where operators are exposed to hazardous airborne substances, protecting workers from harm is vital.

Breathe-Safe has developed high-efficiency filtration and pressurisation systems which can be fitted to mobile equipment to protect workers from respirable asbestos fibres, crystalline silica dust, pesticides, mineral fibres and diesel particulate matter (DPM).

The priority is to ensure that the air in the operator's breathing zone has been purified with High-Efficiency Particulate Air (HEPA) filtration to provide workers with the best quality air possible.

Fitting a system that exceeds European standard EN15695 Cat 3 for Airborne Hazardous Substances will ensure the air quality at the breathing zone inside the

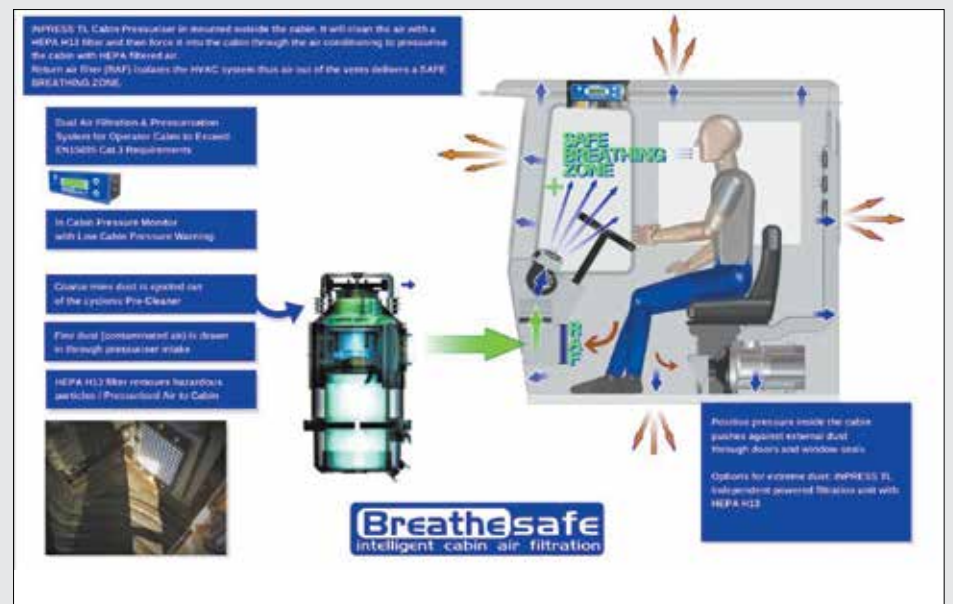
cabin is as close to a clean room standard as possible, which would then exceed all international mobile equipment exposure standards.

It would also reduce maintenance on the air conditioning system, as all the air going through the air conditioning system will be HEPA-filtered so the evaporator coil will stay clean.

This means that the evaporator coil itself will never need to be cleaned, dramatically improving the reliability of the air conditioning system.

With the highest capacity unit on the market in both volume and pressure, Breath-Safe units have auto pressure control capabilities, which dramatically extends the service life of the HEPA filter by up to six times.

Breath-Safe systems are designed to be as maintenance free as possible with our 1000-hour filter service life guaranteed.



The diagram shows that all the air going through the air conditioning system has been purified by dual HEPA filters.

To ensure workers at fully protected and will have zero exposure to harm, Breathe-Safe recommends mine sites follow the ABC's.

- A) Able to maintain positive pressure (above 20Pa) inside the cabin at all times and to ensure the cabin is effectively sealed
- B) The pressuriser should have a HEPA Filter with a minimum filtration efficiency of H13 or above, (meaning it is able to remove 99.97pc of all particles above the size of 0.3 of a micron)
- C) Have a cabin pressure monitor inside the cabin to warn the operator if the cabin is safe or there is low positive pressure and requires maintenance

- D) Have an internal filtration unit with a HEPA grade filter – this is to clean the air inside the cabin and this dramatically improves the air quality in the breathing zone

- E) Train your operators so they understand what has been installed and what they need to do to get the very best from the system.

More information can be found at: www.breathe-safe.com.au

Breathe safe
intelligent cabin air filtration

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12 & 24V HEPA AIR SCRUBBER

24V HEPA VACUUM

Stem gel helps to lessen dust

NATIONAL

OVER the Past 28 years, Rainstorm has become one of Australia’s leading dust control specialist companies.

It operates at the forefront of dust-solving technology in the mining, civil construction, materials handling and land rehabilitation industries, among many others.

Rainstorm technical manager Mason Trouchet said he was pleased to announce the company had added Dustex to its range of specialty dust control products.

“Combining Rainstorm with Borreguaad Ligotech, Dustex product will open up the market to high quality lignins and very competitive pricing,” he said.

“We have been blending lignins with other products in our range to add binding power, now we have the history and experience of Dustex – a market leader in lignin technology.”

Product development has always been a big part of Rainstorm’s development, and by teaming up with PWS, the company was able to take the natural step toward tackling the difficult problem of dust and noise generated by blasting.

The solution was to apply a stem gel to contain blasts over conventional rock stem.



Rainstorm provides fully customisable dust storm solutions for all its clients.

The PWS technology replaces rock stem with a patented Stem Gel LR2 that has produced major containment impacts on blasting efficiency.

The pressure waves contained in the rock brought about greater fragmentation, lower powder factors, small holes, less oversize and easier loading of stem.

And the liquid gel could be pumped into horizontal stems in underground and in open pits.

Stem Gel LR2 is a novel approach and field trials through WA mines and quarries have generated significant data sets to open this technology up to the wider market.

Rainstorm has always opted for the

open approach to dust control chemistry and data collection in order to validate the business case for better dust control.

Proof in data has shown that when using dust control products for roads, open areas and materials handling, returns for the business case can save miners significant costs.

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Rainstorm signs a deal with Borregaard to supply Dustex “Top of the Tree” Lignin based dust and soil stabilisation products.

Dustex a brand of quality Lignin for roads.
Price saving deals, if you use a lignin talk to us.



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3 reasons to choose the professionals
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*Water savings equate to total annual averages from 2010 to 2018



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OPEN FOR BUSINESS



All images: Southern Ports.

Southern Ports is the custodian of South Western WA's three gateway ports.

GERARD MCARTNEY

WA'S South West holds three gateway ports that connect it to the rest of the world – the Ports of Albany, Esperance and Bunbury – and Southern Ports is their custodian.

Unlike role-specific organisations such as the Hunter Valley Coal Collective which focuses its energies on getting one commodity (coal) to one port (Newcastle), Southern Ports manages multiple ports, customers, industries and multiple products.

This gives it a unique and multi-faceted role in the supply chain.

Its principle role is to facilitate trade through the commercial management of the ports, and to return a dividend to the government of WA.

As FY19 comes to a close, Southern Ports will celebrate another successful year.

From the beginning of FY19 to April 30, the company's total exports were 25.5mt, with a total guidance for the financial year of 26.466mt.

Southern Ports chief executive Steve Lewis said it is tracking well against the forecasts.

"Southern Ports is focused upon creating value for customers, commencing additional land planning around its three ports, and implementing better systems and processes to support trade and efficiency," he said.

The company said it was focussed on growing its intergenerational assets, a key strategy in positioning the ports for resilience and growth.

"Strong regional ports means strong regions, which of course has economic and social benefits for residents in Albany, Bunbury and Esperance," Mr Lewis said.

"We believe that each of the ports has a unique role to play in the State's economic prosperity.

"Albany has a focus on sustainability, Bunbury has the capacity to achieve significant organic growth over time and Esperance aspires to be a smart port in order to optimise trade from a smaller land holding."

Upgrades and developments

A number of key technological updates have

"Strong regional ports means strong regions, which of course has economic and social benefits for residents in Albany, Bunbury and Esperance."



The Port of Bunbury is a large part of the WA government's Westport study to determine the future of maritime exports in WA.

been taking place in the first half of 2019, with Esperance progressing towards the upgraded and enhanced functionality of key process control systems.

Mr Lewis said that the changes would give greater visibility and access to real time data from the systems that track the loading of iron ore.

"Being able to see the operation in real time will speed up the identification and resolution of any maintenance issues with clear benefits of reduced downtime for our customers," Mr Lewis said.

The 'smart port' at Esperance has also received additional funding for upgrades to Shed 4, which includes the installation of a concrete floor that will enable it to accommodate many different export products from Berth 3.

"This change will provide a number of mines in the goldfields and surrounding regions a cost effective way to reach their customers with reduced product contamination," Mr Lewis said.

"The upgrade works have and will continue to deliver benefits in terms of increased revenue from the storage of product in the shed itself, as well as providing employment opportunities for local residents."

At the port of Bunbury, Berth 8 is undergoing a \$8.6m improvement works program designed to improve the berth's operational efficiency.

Southern Ports has also been heavily involved in the Westport study as the state government looks to the future of ports in WA, with the Bunbury port a key area of focus.

On the back of a good trading year, the port of Albany required no major developments, which Mr Lewis said demonstrated its ample capacity for growth within the bounds of the present infrastructure.

Across the three ports, Southern Ports is working toward a more harmonious approach toward safety inductions.

Mr Lewis said that processes were already in place to ensure safety and security of all personnel on-site and for the broader community by ensuring that all facilities met the highest standards, but that there was still work to be done.

"The changes will create a mechanism for regular induction content updates and the cardholder renewal process to be streamlined," he said.

"We are in the detailed planning phase of the project and we will work closely with all affected port users to explain the changes which will take effect from August 2019."

Open for business

Southern Ports' 'open for business' mentality has seen it take on some exciting new customers, with many more in the pipeline.

From the thriving whaling industry out of Albany in the early 20th century to the modern farming and mining industries that dominate the regional south of the state today, WA's south western coastline has a rich maritime history defined by a diverse array of industries, imports and exports.

Mr Lewis said that the potential reopening of the Ravensthorpe nickel mine was an exciting prospect for the Port of Esperance.

"If confirmed, the re-opening would provide additional import and export opportunities for the port," he said.

Southern Ports has begun working with Mineral Resources, which began operations in Q1 2019 on the back of Cleveland-Cliffs' departure.

Mr Lewis said that it was a key development for the port and would create employment opportunities for the local community.

"We are currently in discussion with a number of businesses that range from mature operators to newer businesses that are very much in the conceptual stage of development," he said.

"While we are not currently in a position to disclose details of these potential customers, we look forward to being able to do so into the future."

Mr Lewis said the company was excited about the opportunities associated with the Koolyanobbing operation, and while it was still too early for him to comment on the potential impact of Jupiter Mines' Central Yilgarn project, he said Southern Ports was working closely with all parties to "better understand the potential of this project and its fit with our existing operations".

The link in the supply chain

NATIONAL

SUPPLY chain and logistics solutions provider LINX Cargo Care Group (LINX CCG) looks set to enhance trade and employment opportunities for its customers, becoming the link in the South Western Australian supply chain.

Executive customer and business development general manager Carlo Cutinelli is confident that LINX CCG can facilitate trade, not just for the Southern Ports of Esperance, Albany and Bunbury, but for the industries in the surrounding region.

“We’re working really hard with a lot of other industries in those regions and catchment areas to facilitate trade for their companies and ensuring their systems come to fruition,” Mr Cutinelli said.

“A lot of the junior miners and junior developers are looking for ways to get to market and we see ourselves as very much the facilitator in that respect.

“At LINX CCG, we’ve got a vision for the South Western Australian region.

“We’re working to deliver a connected supply chain, one move at a time.”

Mr Cutinelli said that the backing of parent Brookfield allows LINX CCG the flexibility to work with customers to provide them the best gateway to export their products.

“We are nimble, and less rigid than our competitors which means we are able



Esperance Port where LINX delivers port services.

to genuinely partner with our customers and customise solutions designed to their needs,” Mr Cutinelli said.

“We also bring employment opportunities, which is something I think

everyone in the industry should be focused on.

“In creating more jobs and assisting our customers to get volumes out of the ground, and to give them that gateway

to export their products throughout the world, the ports play a significant role in that.”

More information about LINX CCG can be found at: www.linxcc.com.au.



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five market-leading operations

End-to-end supply chain and logistics solutions

Committed to your business success

Where our customers go, we go

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linx cargo care group





MINING SHOWCASE

The national AIMEX conference 2019 will host more than 6000 mining industry professionals.

AIMEX 2019 will host more than 6000 mining industry professionals at the Sydney Showgrounds.

RAY CHAN

REGISTRATIONS are now open for Australia's largest and longest running mining exhibition and conference.

The Asia-Pacific International Mining Exhibition (AIMEX) 2019 will host more than 6000 mining industry professionals and an additional 2000 exhibitor personnel when it takes place at Sydney's Showgrounds.

It will be held from August 27-29.

More than 500 exhibitors are expected, with the likes of Contitech, ESS Engineering Services, Alfagomma, Cummins, Hitachi and Volkswagen signing up for the event, which attracts decision-makers and mining leaders from across the world.

For the second year, a free-to-attend multi-stream mining conference will form part of the exhibition, providing visitors with a unique opportunity to hear from mining innovators and disruptors at the

same venue where the technology is on show.

The conference will focus on key themes surrounding the changing of mindsets and how to survive the impact of future technological, social and environmental changes.

It will also look at the rise of automation and robotics, and the use of AR and VR to enhance safety training for staff.

And in a first for AIMEX, five of Australia's biggest mining companies will

also come together at the mining pavilion.

Centennial Coal, Glencore, Mach Energy and Whitehaven Coal will join Yancoal Australia to outline their own enterprises, connect with suppliers and drive their own recruitment strategies.

Full details of topics and speakers for the conference will be announced once they are confirmed.

To register and keep up to date with conference news, visit aimex.com.

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INDUSTRY FOCUS

COMPANIES GEARING UP

Customers race to Euro Auctions sale

NATIONAL

EURO Auctions, the record-breaking international auctioneers of industrial plant, construction and agricultural machinery, is already receiving consignments for the next sale, to be held in Brisbane.

On June 20, a one-day onsite auction will be held at its popular Brisbane site and Euro Auctions predicts massive turnouts and that everything will be sold on the day.

Euro Auctions' territory manager for NSW, Paul Haynes, said the demand for quality used equipment in Australia is definitely on the increase, so the fact that Euro Auction sales are unreserved is very popular with the Australian buyer.

"At all Euro Auction sales, everything is sold on the day to the highest bidder," Mr Haynes said.

"Our buyers know they can get the equipment they want without having to worry about if the item will sell or not – if they are the highest bidder, it's theirs."

Mr Haynes said he predicts massive turnouts for the sale.

"The one-day physical onsite sale provides buyers with the perfect opportunity to personally inspect the various lots being offered, before bidding, plus it's the perfect chance to meet up with likeminded people and discuss activities face-to-face," he said.

If customers are unable to physically



All Euro Auctions sales are unreserved. The June 20 auction will see an impressive array of quality equipment, much unused, being sold on the day to the highest bidder.

make it to site, online bidding is also available.

"We are seeing significant growth in bidder participation in all our auctions, and the increased demand for new equipment is helping drive auction

activity in the used equipment sector," Mr Haynes said.

"We expect to see many consignors allocate quality used equipment to both these auctions over coming weeks, releasing quality used equipment back

into the market to meet the strong demand for it."

For specific details on all upcoming sales and to obtain relevant bidder catalogues, visit Euro Auctions at www.euroauctions.com.

Pioneered stockpile solution

NATIONAL

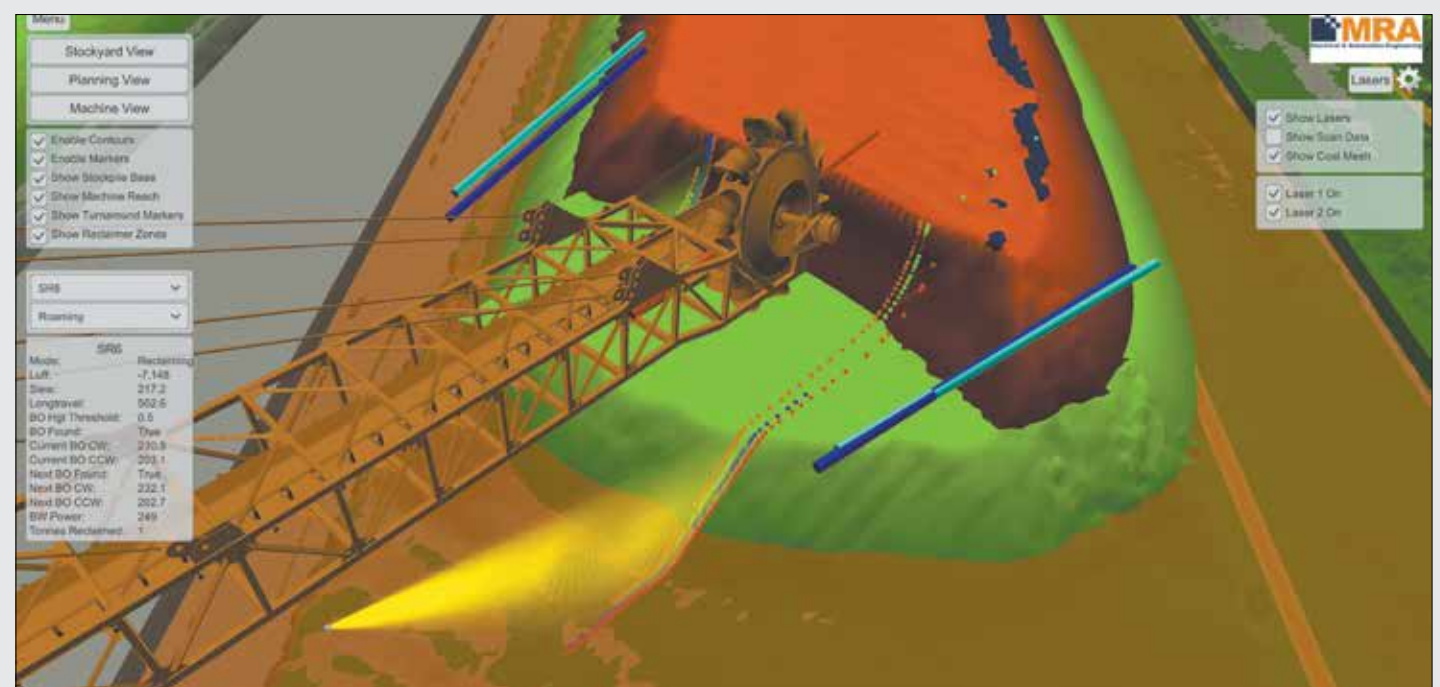
MRA first introduced an automated Stockpile Management System more than 15 years ago, which has now been refined to use a combination of technologies for accuracy and robustness.

According to MRA engineering manager Peter McPherson, the company uses real-time machine data to build a volumetric model of the stockpile.

"This model is refined by the use of two lasers for machine-level optimisation and takes into account how the stockpile settles and any slumping events post stacking," he said.

MRA's optimisation goals are twofold: to maximise the time-in-material to increase throughput and to reduce machine stress by decreasing the variance of material flow.

The extent of the optimisation gains by using the combination of lasers and advanced modelling was a surprise at Abbot Point, where the Smart Products Group head of research Matt Bastain said throughput was increased by an average of 13.7 per cent across the stockpile.



Abbot Point Reclaim optimisation showing laser scanner data points and calculated turnaround slew position for the current and next slew swings.

"We had more than 20 pc gains in handling the top bench, around 12 pc on the middle bench and 9pc on the lower bench," he said.

"Our model is very accurate.

"We never expected the gains to be this large, particularly on an automated machine that was manually optimised through the PLC code."

To show the power of the stockpile modelling and potential gain through optimisation, MRA is introducing a Reclaimer Performance Check which Mr McPherson said is like a health check-up for a reclaimer.

"We can analyse a recording of your machines' data and by using our stockpile modelling, see what efficiency gains can be achieved in throughput per hour, turnaround time, quantity control, step size and bench change," he said.

"There is no risk.

"If we cannot show an improvement in reclaiming performance of more than 5pc, there will be no charge."

The system is also robust, and MRA general manager Rod Devetak was confident it would save projects millions lost through downtime.

"We have seen technical problems bring a stockyard to a standstill for more than 24 hours, which can cost millions of dollars in opportunity loss and penalties," he said.

"This would not happen with our system. If there is a problem with the lasers, the volumetric model can keep the reclaimers working.

"Likewise, if there is an IT problem, the machine defaults to the existing PLC automation allowing continued operations."

More information about MRA's stockpile management systems can be found at: www.mra.com.au.

New high-head submersible

NATIONAL

AUSTRALIAN Pump Industries has launched a new high-head Tsurumi submersible sub pump, the KTZ415, designed for tough dewatering and batch plants jobs.

Tsurumi, the world's biggest manufacturer of submersible pumps, has developed the unit in recognition of the need for tough pumps that have head capabilities of up to 55m.

Unlike dewatering boreholes, submersibles installed underground have to handle dirty, abrasive water.

The groundwater is collected into sumps and the pumps are arranged in series, with booster pumps located partway, to bring it to the surface.

Aussie Pumps product manager Neil Bennett said dirty water-submersible pumps were traditionally not designed for high head applications in mines.

"The new Tsurumi development is innovative in that it used the same philosophies and technologies from the existing KTZ range, but adds extra power and a bigger impeller to drive water even higher," he said.

A big 4-inch pump, Tsurumi's model

KTZ415 uses a 15 kW motor to achieve its excellent performance.

The pump's maximum flow is 2000 lpm, while its maximum head is 55m.

The high head is achieved with a single piece impeller, made from high-chrome cast-iron.

This means less pumps are needed to bring water to the surface.

The pump has all of Tsurumi's normal features of heavy-duty dewatering pumps that have made the company a byword for reliability, including the unique double dual mechanical seals with integrated oil lifter.

The seals run in oil to provide greater longevity and performance reliability.

The unique patented oil lifter keeps oil circulating even if the pump is not running in a strictly vertical position.

There is also a pressure relief port to protect the mechanical seal faces from extreme pressure, whilst simultaneously diverting abrasive particles away from the seal face; ideal for tough construction applications.

The cable at the top of the motor is another unique feature of Tsurumi's, with a special sealed gland that won't let water into the motor even if the cable is damaged or cut.

"Other pump brands allow the water to wick down inside a damaged cable, causing catastrophic motor failure," Mr Bennett said.

"Tsurumi's unique cable block is a major leap forward in technology, it can virtually eliminate water ingress from the top end of the motor."

The new KTZ is made from high-chrome cast-iron and comes with a strainer that is able to handle solids of 12mm.

The KTZ series is widely used in mining, tunnelling, quarries or concrete batch plant applications and piling duties.

The product has been adopted in the US, South East Asia and Europe in tough applications where lighter weight pumps simply don't last.

"Tsurumi cut their teeth developing dewatering pumps in the 1950s during the rebuilding of Japan," Mr Bennett said.

"Duties included land reclamation, piling and dewatering.

"They soon found their way into concrete batch plants as the ready-mix industry took off in Japan."

Further information on the new KTZ415, boasting increased flows and higher heads than traditional Tsurumi KTZ dewatering pumps, is available from the Aussie Pumps website.



A tough pump for tough applications, Tsurumi's KTZ415 has the ability to handle dirty water whilst still maintaining high head.

Fire pump works like a boss

NATIONAL

THE Aussie 'Fire Boss' high performance pump can be used for fire duties, dust suppression as well as a high pressure water transfer.

Aussie Pumps, major manufacturers of high pressure firefighting pumps, took its top commercial diesel-powered fire pump and enhanced it with a range of additional safety features to make it suitable for the mining industry.

Called the Aussie Fire Boss, it can handle heads of up to 60m (85psi) and flows up to 400lpm, and self-primers from 7.6m (vertical lift).

Powered by a Yanmar L48 4.8hp, electric start air-cooled diesel engine, the pump is built into a 32mm hot-dipped galvanised frame with a perfectly balanced, integrated, centre mounted lifting bar.

Aussie Pumps product manager Brad Farrugia said lightweight pumps and other equipment on construction and mining sites were prone to damage when they're picked up by an excavator and trundled over to the new location and dropped.

"Conventional commercial frames get bent out of shape fast," he said.

"Our Mine Boss frames are built like a CAT D10."

The pumps are fitted with e-stop and battery isolation as standard, and banded trays and trolley mounts are available as an option.



The Aussie Fire Chief fire pump in Mine Boss configuration rolls off the Castle Hill production line.

"We even supply fire extinguishers as part of the kit," Mr Farrugia said.

The fire pumps can be mounted on a fast attack vehicle, or coupled to a larger tanker, depending on site and application.

Aussie Pumps said that every mine should have a portable mine spec fire pump on hand for fast response in an emergency.

The Aussie Pumps are compact, relatively lightweight and highly efficient.

The Aussie Mine Boss range of pumps is a purely Australian initiative.

The pumps are built at Australian Pump's two-and-a-half acre site at Castle Hill in Sydney.

They are now operating not just in Australia but on mine sites in Africa, SE

Asia and through the South Pacific.

"We've had a lot of enquiries from overseas looking for a portable fire pump suitable for the mining industry," Mr Farrugia said.

Further information on Aussie's Mine Boss fire pumps are available from Australian Pump Industries or authorised distributors throughout Australia.

Continuous improvements lift productivity

NATIONAL

LIEBHERR has been designing, developing, and servicing high-quality mining trucks for more than 20 years and strives for continuous improvement to its product line of mining trucks, excavators and dozers.

Transformative upgrades

The latest product upgrade for the T 264 mining truck results in a higher payload capacity of 240 tonnes/265 tons and offers multiple engine options with power ratings up to 2013 kW/2700 HP.

This allows customers to move more material in less time, while supporting the additional weight of the increased payload.

The new front wheel design and upgraded braking system offers quicker reaction times to increase safety for operators, particularly when traveling downhill.

The upgraded wheel motors and rear gear ratio boosts torque and acceleration to provide similar cycle times with 10 per cent increased payload.

Evolutionary options

Existing mining trucks can be retrofitted for increased payload and production capacity.

Now capable of hauling additional payload to reach a total capacity of 375 tonnes/413 tons, this improvement will



Safety, productivity, and performance are at the core of the new Liebherr mining equipment features.

allow for maximisation of productivity, with the added benefit of enhanced compatibility with Liebherr's R 9800 mining excavators in a five-pass match.

Sustainability and compliance in mining

Liebherr provides customers with a choice of engine options with tier 4 solutions designed to reduce emissions and satisfy global requirements (established by the

EPA for all new mining and construction equipment).

Machine health and performance tracking


The new Liebherr Mining Data (LMD) online portal offers real-time insights and data regarding performance and availability of mining trucks.


This OEM solution software offers

a single dashboard for improved fleet management of Liebherr mining trucks, so that customers can track KPIs and generate custom reports.

LMD now comes standard with all new Liebherr ultra-class mining trucks, and the hardware kit is available as a retrofit for the T 282C generation mining trucks.

For more information on Liebherr mining equipment visit: www.liebherr.com.au.





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Electrical and civil operations experts

WA

DCI Electrical Services (WA) Pty Ltd was founded by J.J. Greene and Pauric McGearty with a vision to become a leading provider in specialised electrical and civil operations.

With more than 20 years of combined experience in the electrical and mechanical sectors, Greene and McGearty built DCI Electrical Services as an industry leader with a reputation for providing extensive and valuable services to the industry.

Specialising in complete rail signal installation, civil construction, electrical and instrumentation and renewable energy, DCI Electrical Services prides itself on being fully trained and qualified to industry standards, offering a wealth of experience to deliver projects safely, on time and within budget across Western Australia.

Attention to safety is one of DCI Electrical Services' core values.

Safe working is the company's number one priority and will never be compromised in the high-risk environment in which it operates.



DCI Electrical Services provides on-going support for the installation and maintenance of communication infrastructure within the mining, rail, NBN and general industrial sectors.

DCI Electricals' operations span a diverse range of sectors, enabling the company to combine the experience and skills acquired in each division to create innovative, flexible, scalable and cost-effective solutions for its clients throughout WA.

Providing immediate on-the-ground support and quality-endorsed back-up

service and leadership to any project undertaken is one of the key components of the business.

DCI Electrical Services has the ability to deliver qualified support across concept, design, project management, supply, installation and commissioning with additional capabilities, including its

ever-expanding plant hire division.

DCI Electrical is on track and committed to its core mission — to be a leading provider of specialised electrical and civil installations where it is chosen by clients for its integrity, quality and innovation whilst delivering projects on time, within budget and safely.

GETTING YOU ON THE CIRCUIT TO SUCCESS

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- TURN KEY PROJECT DELIVERY
- INSTALLATION MAINTENANCE AND COMMISSIONING STRATEGIES
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- PLANT HIRE

DCI has the ability to deliver qualified support across concept, design, project management, supply installation and commissioning.

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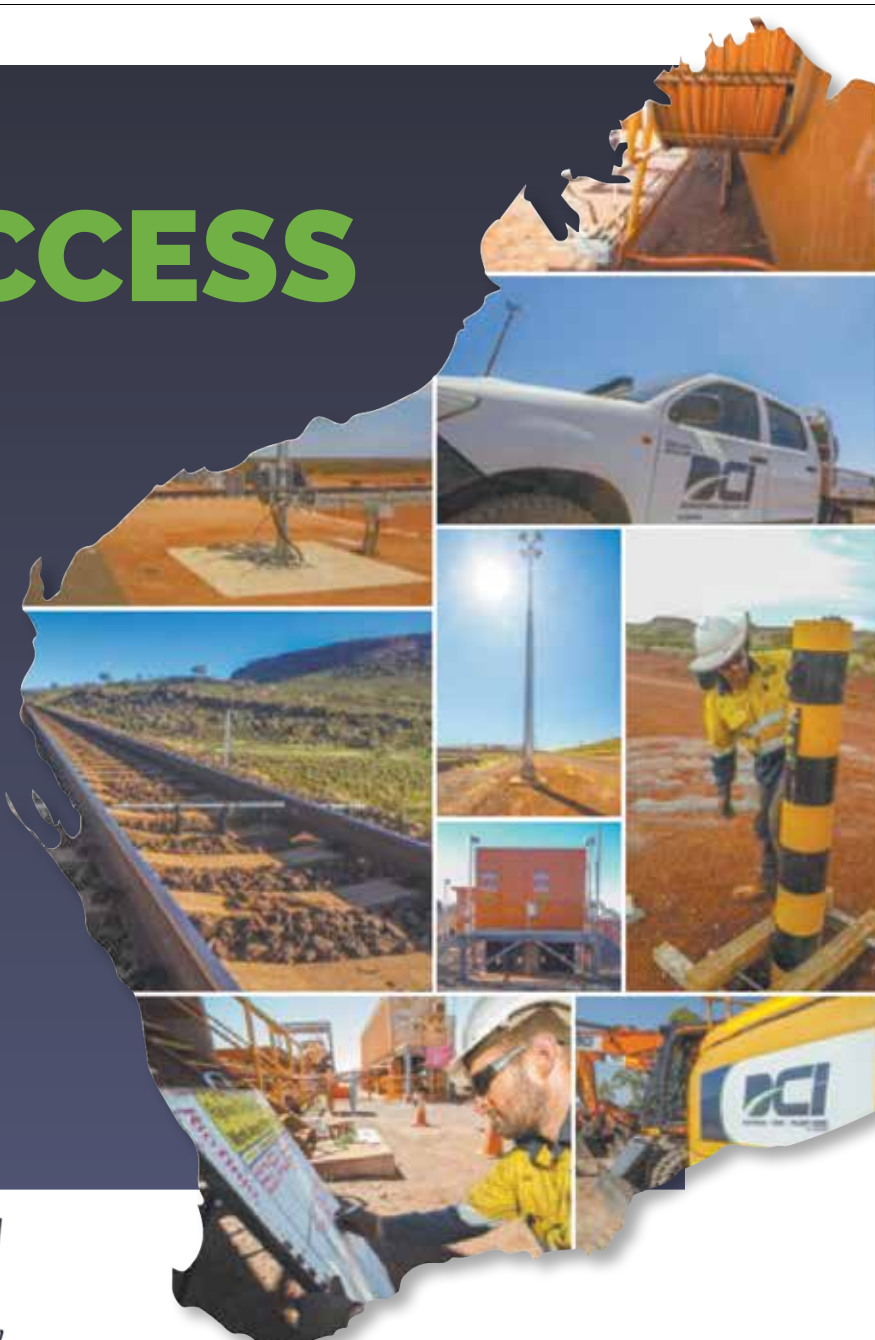
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Impact beds with rubber spring suspension

NATIONAL

AN idea by Richard Sharp early in 1991 led to the production of the first “dynamic” impact bed (DIB) for troughed conveyor belts in Australia, forming the foundation for Leverlink’s current leading-edge technology.

It was conceived from an idea to develop a better and more reliable product – one that would dissipate kinetic energy and provide the benefits of long service life, as well as assisting in reducing maintenance costs in terms of consumables and labour.

The design for the DIB, using rubber torsion springs as suspension, was radically different from the static impact beds that were dominating the Australian marketplace at the time.

Most belt damage occurs at conveyor load zones (e.g. under crushers) and transfer points, and the reasons for this are many and varied.

Many so-called impact beds are nothing more than belt support cradles with limited design capacity to dissipate impact energy and provide belt damage protection.

Leverlink’s experience, engineering skills, and continuous improvement program through research and development and infield monitoring, have made it a leader in the design and application of dynamic impact beds in Australia.

All Leverlink DIBs are custom built to suit each application.

In areas where installation space and access are restricted, the design can be such that the individual parts can be



When used with rubber torsion springs, Leverlink’s dynamic impact beds have solved some of the complex problems in facing heavy machinery in the mining industry.

broken down and reassembled on the conveyor frame in manageable parts, with minimum effort.

Leverlink has also developed its own line of rubber torsion springs which provide a unique method of absorbing impact with the added benefit of vibration attenuation.

Rubber torsion springs are used extensively in Leverlink’s designs for

various applications, and Leverlink is the largest manufacturer of rubber torsion springs in Australia, manufacturing some of the largest rubber torsion springs in the world.

The design of an effective conveyor load zone can often be a complex issue.

Leverlink has used DIBs and rubber torsion springs to solve some of these

complex problems.

Functional specifications such as belt speed, width, type of belt, product size, free fall heights, and product moisture content are all major design considerations.

Spillage can be controlled by effective skirting and inner wear plate design and the added use of belt support systems.

Specialised engineering for coal



Morgan Engineering prides itself on retaining a team of highly skilled machinists, fitters, welders, draftsmen, mechanical engineers and line borers.

NSW

MORGAN Engineering is a second generation, family-owned and operated company underpinned by strong values, and has been operating since 1975.

The company specialises in general engineering, CNC machining, weld reclamation, fabrication, mobile line boring and machining, liquid nitrogen services and supply, CAT rear dump truck steering taper reclamation, and service exchange components.

Morgan Engineering director Chelsea Morgan-Whitaker said the company’s capability include steering taper reclamation services Australia-wide, with a fully enclosed stainless transportable container.

“We are currently reclaiming a fleet of trucks for Newmont at Boddington,” Ms Morgan-Whitaker said.

“We have also reclaimed the tapers of fleets of trucks (785 thru to 797) in the Hunter Valley several times over.”

Ms Morgan-Whitaker said that offering a quick turnaround for repairable items and an extensive range of service exchange components made Morgan Engineering a one-stop shop for mining clients.

“We are expanding our machining capabilities in the coming months with the installation of a Soralue FP6000 floor borer to enable us to offer track frame reclamation, in addition to our already advanced CNC machining capabilities in our workshop,” she said.

“And we have just added to our fleet of line boring trucks another fully equipped, state-of-the-art service vehicle.

“All service vehicles offer dual boring systems capable of machining two bores and welding two bores simultaneously.”

Morgan Engineering prides itself on retaining a team of highly skilled machinists, fitters, welders, draftsmen, mechanical engineers and line borers who can deliver a fast and reliable service using state-of-the-art equipment and their combined years of knowledge in the industry.

“We welcome all enquiries for our services,” Ms Morgan-Whitaker said.

More information about Morgan Engineering can be found at: www.morganengineering.com.au.



Terrigena is a small environmental consultancy combining specialist knowledge with spatial analysis to undertake environmental impact assessment and associated services.

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Owner-maintained and operated

NATIONAL

AERO Hire, unlike many other companies, owns and maintains its aircraft at its dedicated CASA-approved maintenance facility in Jandakot.

Its best-in-class aircraft have the speed and range to reach remote locations, and can comfortably handle different types of landing strips, including gravel.

The company knows that flexibility, reliability and efficiency are priorities.

From hot-shot cargo deliveries and FIFO deadlines to business travel and exploration, Aero Hire can structure a charter solution that is reliable, flexible and can prevent costly downtime.

The size of its fleet and its flexible configuration means Aero Hire can quickly adapt to the changing needs of clients, with the added security of back-up aircraft when required.

Its dedicated flight lounge at Perth's Jandakot airport is well-equipped for all business needs, including a private facility for drug and alcohol testing.

This ensures optimum safety, reliability and availability of the fleet, giving clients complete confidence in their travel schedules.

The eight turboprop and turbo-piston aircraft are the best in their class, and their superior speed and energy efficiency take the convenience and affordability of charter aircraft to new levels.

The aircraft are versatile and can



Aero Hire owns, maintains and pilots all of its aircraft.

be configured for any combination of passengers and freight.

These aircraft can comfortably handle a variety of runways including remote gravel airstrips – which maximises convenience and accessibility.

Aero Hire's professional pilots are all highly experienced and well-regarded in the aviation industry.

They are committed to the highest safety standards and operating procedures at all times.

The company's safety record is immaculate and it is fully compliant with the latest CASA operating manual.

The team at its custom-built CASA-approved maintenance facility at Jandakot Airport has a collective 120 years' experience, with one of its engineers recently receiving international recognition for his services to aviation.

Aero Hire's own dedicated maintenance facility helps to keep costs down – and clients benefit.

The company can access remote sites, move freight urgently, charter exploration flights across Australia's extraordinary wildernesses, and manages clients' time productively, flexibly and efficiently.

Choose Aero Hire as your air charter partner and be confident that you are getting the best air charter deal where safety, economy, flexibility, reliability, performance and convenience are paramount.



FLEXIBILITY RELIABILITY EFFICIENCY

Strongly positioned to meet the challenging transport logistics of mining and resource operations throughout Western Australia.

Our aircraft have the speed and range to reach the most remote locations in the country and the versatility to comfortably handle different types of runways.

- Dedicated flight lounge at Perth's Jandakot airport
- Cargo deliveries
- FIFO deadlines
- Business travel
- Exploration

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A CHARTER
SOLUTION THAT
WORKS FOR
YOU.**

Charter with Chartair

NATIONAL

WITH more than 40 years' experience in remote locations, Chartair is the first choice for just about every charter, whether it is site inspections, testing, geotech surveys, drilling, freight movement or FIFO work.

Chartair holds a Low Capacity RPT and operates out of four key bases — Darwin, Katherine, Alice Springs and Cairns.

With a fleet of 42 fixed-wing aircraft, Chartair services some of the most remote locations in outback Australia.

It is responsible for servicing the mining and resources sector with crew changeovers, VIP transport, support of key customers and essential services flights, and the movement of time critical spare parts.

Chartair specialises in chartering services to miners at the drilling and other start-up phases.

The versatile aircraft and skilled pilots can land on sealed and unsealed strips, and the company operates to the highest standards of safety and professionalism.



Chartair's pilots are skilled enough to land on sealed and unsealed strips.

One of the company's greatest strengths is its flexibility; it is client-focused, goal-orientated and

ever-mindful of providing exceptional value to those who fly Chartair.

Chartair is regularly audited by

the resources companies it services to ensure the highest safety standards and compliance are always adhered to.

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Workplace drug, alcohol test leaders

NATIONAL

INTEGRITY Sampling is Australia's leading workplace drug and alcohol testing provider, with geographical coverage across all Australian states and territories, including the North and South Islands of New Zealand.

The company has provided total drug and alcohol management solutions for clients since 2001, which includes drug and alcohol testing, the development of policies and procedures and education for management and employees.

Because many of its clients operate around the clock, so does Integrity Sampling, providing a 24-hour-a-day, seven-day-a-week on-call response service.

This is invaluable following an accident or incident when drug and alcohol testing is required, or if an employee is suspected of being under the influence after hours.

Raising the standards

Integrity Sampling welcomes the recent release of the Australian/New Zealand Standard AS/NZS 4760:2019, which sets out procedures for specimen collection and the detection and quantification of drugs in oral drug testing.

The objective of the new standard is to ensure that the detection of drugs using oral or saliva samples meets the expectations when used in workplaces and for other purposes.



Integrity Sampling conducts workplace drug and alcohol testing across all states and territories of Australia.

It also provides up-to-date procedures for the collection of oral fluid, on-site drug screening, handling and dispatch of specimens to the laboratory for confirmatory testing.

Integrity Sampling is also delighted to announce that the exclusive equipment used for all its saliva drug testing,

the Draeger DrugTest 5000, has been independently verified to comply with the new standards.

The equipment, the Draeger DrugTest 5000, was independently tested and verified by the NATA-accredited Victorian Institute of Forensic Medicine, and was the first and is still the only

device to be verified to be compliant with the new standard.

Integrity Sampling's clients can now have even more confidence in the equipment and processes that Integrity Sampling uses.

More information can be found at: www.integritysamplingaust.com.au.



RAISING WORKPLACE DRUG AND ALCOHOL TESTING STANDARDS

Integrity Sampling is Australia's leading workplace drug and alcohol testing provider, with geographical coverage across all states and territories. Since our inception in 2001, we've been pioneers of the industry and our people are relentless in continually raising standards.

More recently, we welcomed the release of the Australian/New Zealand Standard AS/NZS 4760:2019, which sets out procedures for the collection, handling and testing of oral or saliva samples for drug testing.

We're delighted to also announce that the equipment we use for all our saliva drug testing - the Draeger DrugTest 5000 - has

been independently found to comply with the new standards. In fact, it was the first and is still the only drug testing equipment to be verified to be compliant with the new standard.

So, when you use Integrity Sampling for your workplace drug and alcohol testing needs, you can be even more confident you're in good hands.



- Drug and alcohol management and testing has been our sole business since 2001.
- We provide a total drug and alcohol management solution, including testing, policy and procedure development and education.
- We provide a 24 hour, 7 day a week emergency response service.
- Our all-inclusive, transparent pricing and no hidden extra costs are extremely competitive.
- We're the only provider to use the fully-compliant Draeger DrugTest 5000.

Manitowoc a match for mining

NATIONAL

FOR more than 50 years, US company Manitowoc Ice has developed and manufactured quality ice machines for use around the world.

The brand of choice for many well-respected Australian companies, Manitowoc is renowned for its technology that enables its ice machines to work in harsh and exposed environments.

The manufacturer has won the Best in Class Award from the US Foodservice Equipment and Supplies magazine for the past 17 years.

AJ Baker and Sons Pty Ltd is the exclusive Australian distributor of Manitowoc ice machines, and has sold them since 1976.

The company is family-owned, based in Perth, with branches and stock in Brisbane, Sydney, Melbourne, Adelaide and Bunbury.

As a market leader, it has been involved in the commercial refrigeration industry in Australia since 1931.

The reliable and durable Manitowoc ice machines feature a strong aesthetic and cutting edge ice-making technology.

The Manitowoc range is uniquely suited to the mining industry, as its

designs take into account stringent on-site health and safety requirements.

Stainless steel and galvanised panels make the machines easy to use and clean, with excellent corrosion resistance.

Manitowoc has a suitable model for every area of Australia's mining industry, with machines capable of producing up to 1300kg of ice per day.

Coupled with the award-winning ice machine, AJ Baker also offers the Kloppenburg automatic ice dispenser range.

The DISP range includes a combined storage bin and ice dispenser that accurately distributes ice into any size drink container or insulated bin.

One model also comes with water dispensing taps, so that drinking containers can be filled with ice and water at the same time, all captured safely within a drip tray to reduce spills and slipping hazards.

The AJ Baker team is committed to providing products that not only satisfy customer needs but also add value to the equipment investment, working to effectively reduce costs and increase energy efficiency.



Manitowoc has a suitable model for every area of Australia's mining industry.

Mining & Manitowoc ice machines. A great match.

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REFRIGERATION



Plasson makes perfect for pipes

WA

Benjamin Zis from Salt Lake Mining sat down for a chat with the *Australian Mining Review* to discuss the advantages and benefits of using the Plasson 2:1 fixed ration valve.

THE Beta Hunt Mine, located in Kambalda, WA, is a deposit which hosts both nickel and gold resources in adjacent discrete mineralised zones.

The Kambalda mining district is a long-established major mining centre with excellent existing infrastructure, a skilled local workforce, and nickel and gold processing mills nearby.

Salt Lake Mining used Plasson's 2:1 fixed ratio valve to process the underground water and the Alpha decline at its Beta Hunt mine.

Plasson's new lightweight fixed ratio pressure reducing valve is designed to reduce static "head" pressure, especially in underground mining water supply systems.

The valve also protects pipework by reducing surge and water hammer.



The 2:1 fixed ration valve works in the most testing underground conditions.

Q. How would you describe the site and water conditions of the Plasson 2:1 fixed ratio valve in use?

The valve was placed in a small cutty of the primary decline in moderately high traffic and wet environment; the water was super saline and at high head pressure.

Q. How did the installation process of the valve go? Did you notice any leaks?

The valve performed well and was as simple to install as a standard Plasson coupling.

There have been no instances of the Plasson 2:1 fixed ratio valve leaking as yet.

Q. What makes the Plasson valve advantageous compared to other products (life span, etc.)?

The easier installation and the ability to fit the valve directly to the poly water line meant no metal was left exposed to the environment and there was no need to space the line of the walls to prevent contact rust with ground support or wall hooks.

The lack of corrosion and zero impact from the sun makes it an ideal option for underground operations.

Q. Do you have confidence in the valve and would you recommend it to others?

I would recommend the valve as an absolute must-have addition to any Plasson installation; it is a simple and effective alternative to the industry standard valves that eliminates many of the common problems encountered.

Q. In general with all Plasson fittings you have used on site, would you recommend them?

With 10+ years in the mining industries, I have personally come to depend on the Plasson range for dewatering and poly fixtures.

Their superior design, interchangeable parts and readily available supply network mean I can always rely on the brand.

Purchasing and Supply expert Benjamin Zis highly recommends Plasson's new valve based on his experience during his work at Salt Lake Mining Pty Ltd, Beta Hunt Mine until earlier this year.

RNC has a 10pc interest in Salt Lake Mining Pty Ltd.

NEW PRODUCT

FIXED RATIO PRESSURE REDUCING VALVE



Designed to reduce static "head" pressure in underground mining water supply systems

- ✓ Protects pipework by reducing surge and water hammer
- ✓ Stable pressure control over the full flow and pressure range
- ✓ Lightweight
- ✓ Corrosion resistant
- ✓ Fixed ratio of 3:1 or 2:1
- ✓ Available in DN50

"The Plasson valve is an absolute must-have and a simple and effective alternative to the industry standard valves that eliminates many of the common problems encountered."

Benjamin Zis, Salt Lake Mining Pty Ltd - Beta Hunt Mine, January 2019

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OSD can tailor its services from concept to abandonment and every stage in between.

The backbone of a mine

NATIONAL

OSD Pipelines has been providing pipeline services to the mining industry since the start-up of the Telfer gas pipeline in 2004.

Since that time, OSD has worked on the concept, feasibility, design, EPCM, EPC, commissioning or operations and maintenance of 120 proposed, new or

operating pipelines for more than 100 clients in WA alone.

Most of these projects have been for mining clients, typically for lateral pipelines to remote mine sites as part of a gas-fired power solution, tailings pipelines, assessing hydro-transport solutions for moving product to port, water supply and diesel distribution systems.

The OSD hydro-transport group has undertaken more than 100 assignments on projects in Australia, South America, Europe, Asia and North America.

OSD can provide a complete tailored service from concept to abandonment and every stage in between.

As well as traditional design, EPCM and EPC contracts, OSD also provides

specialist services in due diligence and advisory services, concept development, route selection, approvals and licencing, regulatory approvals planning and GIS based design.

OSD is currently working on gas and water pipeline projects for Rio Tinto, MRL Energy, European Bank for Reconstruction and Development, Pilbara Minerals, Covalent Lithium and Saracen Gold.



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THE AUSTRALIAN
MINING REVIEW

FEATURES FOR JULY 2019

- AIMEX
Amrun Mine (Rio Tinto)
Aus Tin Mining
CSA Copper Mine – 20 years of Glencore
Operation
Dargues Gold Project
Dugald River Mine (MMG)
Lithium Valley
Mining in New Guinea
Mt Carlton Mine (Evolution)
Mt Gibson Mine
Olympic Dam (BHP)
Panoramic Resources
QCoal
Silverlake Resources
Tropicana Mine (Independence/AngloGold)
Western Areas



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MEETS OR EXCEEDS PRESSURE RATINGS OF HDPE PIPE
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- Designed to provide a single transition from plain end HDPE pipe (SDR 7 – SDR 21) to grooved steel sized piping system components
- Sizes from 2 – 8" IPS HDPE to 2 – 8" DN50 – DN200 grooved steel
- Sizes from 63 – 225 mm ISO HDPE to 2 – 8" DN50 – DN200 grooved steel

Refuse-to-Fuse™ Fittings for HDPE Pipe

- Available in SDR 7, SDR 11, and SDR 17
- Sizes from 2 – 8" IPS and 63 – 225 mm ISO
- Full flow fittings
- Compatible for use with Style 905 and 907 HDPE couplings

More than just shotcrete

NATIONAL

JETCRETE is a mining services contractor with more than 30 years of experience in the mining industry.

More than just shotcrete services, the company also provides remote area concrete supply, shaft lining, civil construction, cable bolting, and resin injection services.

With mobile and modular plant Jetcrete is readily available and has the capacity to rapidly mobilise and deploy operation sites for remote location concrete supply and campaign shotcrete works.

Jetcrete can deliver remote application of shotcrete of up to 400m depths and up to 6m diameter shafts such as vent shafts, escape ways, and ore passes in both hard rock and coal mines.

The company has recently updated the current shaft lining equipment to be the first Ex d Group I coal mine compliant shaft liner in Australia.

This shaft lining system was designed and built with the view to have a fit-for-purpose shaft lining system that meets and exceeds the Qld coal mining safety and health regulations for operational plant in coal mines.

Innovations such as a modified 42m

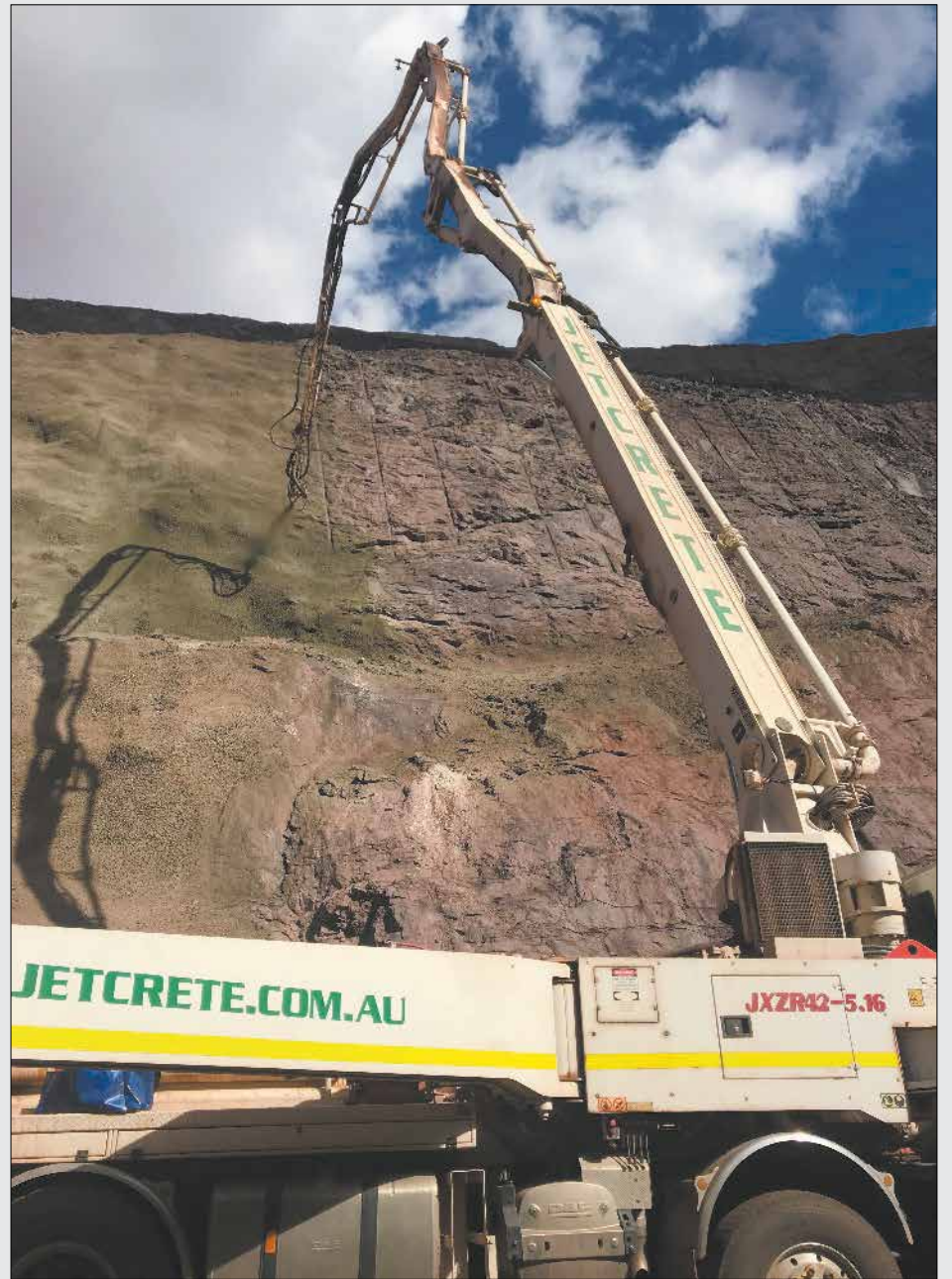
long boom shotcrete machine allow for increased operational safety, efficiency, mobility and versatility for high wall spraying, reducing the operational risk and need for specialised labour such as rope access technicians for high wall spraying whilst still increasing the daily output for spraying, as opposed to traditional hand held application that was used in the past.

Jetcrete can also deliver construction and civil services to both surface and underground operations and is the construction partner for heavy duty workshops, mine site officers, machine foundations and slabs, drainage and culverts, earthworks and high wall stabilisation.

For an alternative rock support system for underground mining, Jetcrete offers a cable bolting service and strata consolidation via resin injection, which stabilises convergence, rock, sand, gravel, concrete and caved material.

Both hard rock and coal mines can rest assured that Jetcrete employs the latest techniques and specially adapted placement materials to maintain best industry practice and ensure a totally safe environment, without disrupting ongoing mining operations.

More information can be found at: www.jetcrete.com.au.



Jetcrete can deliver a range of high standard and cost-effective services to both hard rock and coal mines.



With a background of over 30 years in the industry, **Jetcrete Oz Pty Ltd** has extensive experience in all aspects of concrete spraying and specialist ground support services. Operating in over 19 sites across Australia, the company is capable of providing a wide array of services from remote site concrete supply, underground/surface shotcreting, underground/surface civil construction, shaft lining, cable bolting, and strata consolidation.

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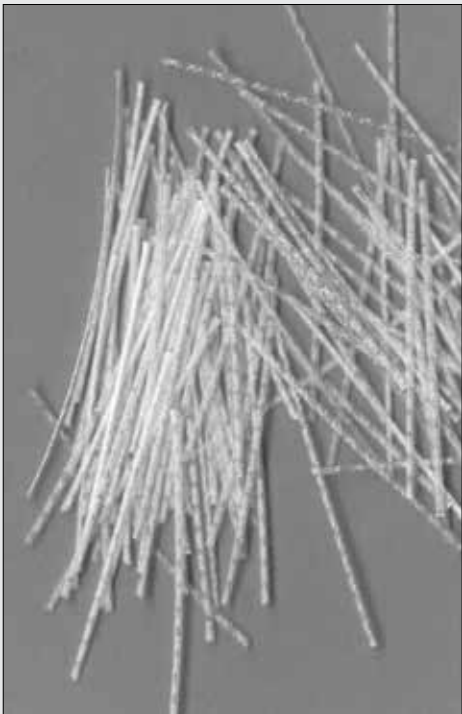
EASTERN AUSTRALIA operation

20 Enterprise Road
Mount Isa QLD 4825

Ph | 07 4744 7400 Fax | 07 4744 7401

tendering@jetcrete.com.au

jetcrete.com.au



BarChip 60 is a high performance structural synthetic fibre concrete reinforcement, optimised for sprayed concrete (shotcrete) with large displacements. The Concrete Fibre Reinforcement 60s packaged in mulchable paper bags and big bags for automated dosing, and safely stacked three pallets high.

New name, same great service

NATIONAL

IN 2018, Elasto Plastic Concrete (EPC), a pioneer of fibre reinforced concrete, was acquired by its long-time partner Hagihara Industries.

EPC was the first synthetic fibre company to break into the Australian mining industry and was a driving force behind the proliferation of synthetic fibre shotcrete reinforcement.

A little over 12 months on and the same team is in place with the same passion for fibre.

Rebranded BarChip, the team behind EPC has transitioned seamlessly into their new home.

BarChip director Tony Cooper said the company’s greatest asset has always been its people.

“It’s a testament to our long history with Hagihara that the entire group is

still with us,” Mr Cooper said.

“Our shared focus with Hagihara has always been on continuous improvement in fibre design and performance.

“That focus remains the same as does our commitment to providing our clients the highest levels of efficacy possible with the support of our technical and practical application expertise.”

Training and development of their staff has always been a priority for Barchip.

With the support of BarChip, Des Vlietstra has recently graduated with an MSc (Eng) in Advanced Concrete Technology from the University of Leeds.

Such development of their staff further increases Barchip’s ability to deliver high performance solutions to the market.

More information about BarChip can be found at www.barchip.com.

BarChip Inc.

The Synthetic Fibre Experts

BarChip is still the first choice for tough mining conditions.

We may have changed our name, but the BarChip team is still the same and still delivering results for our clients. BarChip is a solutions provider, not just a fibre supplier. We deliver;

- Fibre Manufacturing
- Design Support
- Mix Design Support
- Application Support
- Quality Control

Work with BarChip and together we’ll get the most out of your shotcrete mix.



www.barchip.com

“

Make The Change To A Better Reinforcement System

”

25%
Increase in
Application
Speed

70%
Reduction in
Carbon

80%
Reduction in
Handling

100%
Reduction in
Corrosion



An Australian standard compliant ladder and platform.

Custom mine water tanks

NATIONAL

HERITAGE Water Tanks has gone to the next level of innovation in water tank construction and can now offer profiled Galvabond steel tank walls of up to 2.95mm thickness.

This profiled product is exclusive to Heritage Water Tanks and not available through any other company in Australia.

Heritage Water Tanks is a trusted

leader in the water tank Industry, having many years of experience constructing and maintaining lined steel water tanks.

The company understands the importance of tank wall rigidity, liner integrity and quality roof engineering.

Getting these key elements right significantly reduces maintenance issues from arising due to de-lamination, leaking liners, wind buckling and corrosion.

More information can be found at www.heritagetanks.com.au.



Industrial Fabric Solutions installed a liner into a desalination plant in Dubai.

No job too big or small for tank liner specialists

NATIONAL

WITH more than 30 years in the business, Industrial Fabric Solutions has taken on a range of projects from across Australia and overseas, from the Australian outback and remote mining sites to the tranquil Heron Island and the extravagance of the United Arab Emirates.

While happy to do simple inspections and on-site repairs on tanks of all sizes and types, the company doesn't shy away from large installation projects either, recently taking on the supply and install of six 1.8 million litre liners for a tank farm in Fiji.

These were all pre-made in Queensland, then shipped to site for a fast installation, minimising any downtime for the tank farm.

Another recent job involved the retrofitting of a potable liner into a 2mlt drinking water reserve, which was fully fabricated on site.

Managing director Warren Hamer said one of the biggest projects to date was the project management and installation of a liner into a desalination plant in Dubai, which took over 18,800 square metres of 2mm re-enforced PVC.

For more information, contact Warren Hamer, Industrial Fabric Solutions on (07) 3209 6195 or 0422 494 722.

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APMS Services international storage tank experts

INTERNATIONAL

APMS Storage Tank Services delivers global expert end-to-end services for industrial and commercial storage tanks predominantly for the mining, petrochemical and oil and gas industries.

APMS STS collaborates with partner companies, APMS Engineering and Acid Plant Management Services, to provide effective and sustainable solutions for its clients.

Operating in accordance with strict Australian and International quality, environmental and health and safety codes and standards, APMS STS delivers design, fabrication, maintenance, repairs and cleaning services.

Providing innovative solutions for tank remediation projects, it has developed safe and cost-effective tank alterations and repairs procedures, and can also provide advice on tank floor or sidewall breaches, oxidation or corrosion damage, buckling, and dangerous settlement levels.

APMS STS is also certified to inspect and report against relevant industry codes such as API 653 to safely evaluate tanks prior to cleaning, degassing, and maintenance and repair shutdown projects.

The company also has extensive experience with tank design and fabrication.

APMS STS employs a team of



APMS is a leader in tank maintenance and repairs.

industry experts and, along with its long-standing partnerships with various industry specialists, is able to assist in the design, engineering and fabrication

of storage tanks and associated pipe spooling for use in various applications and industries.

APMS Storage Tank Services uses

more than has in excess of 150 existing weld procedures and provides coded welding to Australian and international standards.



**SPECIALISTS IN THE INDUSTRIAL AND COMMERCIAL STORAGE TANK INDUSTRY
FOR OVER 15 YEARS**

APMS Storage Tank Services deliver global professional and expert end to end services for industrial and commercial storage tanks, and associated piping, predominantly for the Mining, Chemical, Petroleum and Oil & Gas industries.



Maintenance, Repairs and Cleaning



Inspections (API653 Certified)



Design and Engineering



Fabrication and Welding



Cut the downtime

NATIONAL

WITH the ever-growing pressures on mining operations, companies are extending the life of their equipment by leveraging Eriez' service capabilities.

Its technicians can inspect equipment on-site, or customers can deliver their equipment in-factory for a strip and inspect.

Eriez provides a detailed report outlining the best courses of action.

This may mean preventative maintenance or replacing minor components, updating electronics, or carrying out a complete rebuild to original OEM specifications.

All repairs and refurbishments are covered by an Eriez warranty.

Most importantly, Eriez understands the dangers associated with handling permanent magnets.

Its personnel are specially trained and follow specific job safety procedures to properly handle high-strength magnetic elements.

Eriez inspections and performance audits improve equipment availability by avoiding unscheduled downtime.

Its technicians have an unparalleled level of skill and knowledge understanding the application



Before

After

As good as new – suspended electromagnetic repair.

and limits of magnetic equipment.

Advancements in technologies and innovations are often implemented as upgrades during rebuild processes.

One of Eriez' early innovations was the external oil expansion tank developed for its suspended electromagnets (SE).

This ensures that the magnet coils always stay completely submerged, thus preventing moisture infiltration and coil burn-outs.

Subsequently, Eriez SE magnets run cooler,

are stronger, and last longer than the competition.

The company has also retrofitted expansion tanks to competitor SE's to boost performance.

Eriez can improve the magnetic power of wet drum magnetic separators with enhanced circuit design and better-quality magnets.

The performance of vibratory feeders is improved with new energy saving components; metal detectors are improved with software updates; and smart phone technology can feedback real time data to enhance maintenance and operating processes.

Process equipment represents a significant capital investment, and annual inspections are mandatory to maintain them in peak working order, to identify any looming issues and for the possibility of process improvements.

Regular equipment checks, process audits and in-plant certifications by Eriez will help maximise life.

Eriez has the complete in-house capability necessary to service, repair and refurbish damaged equipment quickly, accurately, and safely.

MORE INFORMATION: Eriez | 03 8401 7400 | www.eriez.com

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Magnet Rebuilds



Before



After

Wet Drum Separator Rebuilds



Before



After

Pivotal moments

TREVOR PICKETT
WA

THE world of natural resource processing is filled with movement.

From the first extraction of raw materials out of the ground, to the transport of that material to, and through, a processing plant and ultimately its distribution between waste and resource stockpiles, complex machinery is in motion and dealing with a multitude of static and dynamic loads.

Historically, the simulation of these dynamic loads was an expensive and time-consuming process, but as technology and software have advanced, the complex process of in-putting and analysing this data has become more affordable and accessible.

This is certainly the case in the mining industry where being forewarned is being forearmed.

Utilising simulations of load lifts, ROM materials handling, conveyor function and a myriad of other situations allows risk to be assessed prior to moving into operation.

A simulation can also pin-point areas of concern and allow a full scenario to be run and tested before a worker is dispatched or a machine fired into life.

Lessons learned in a simulated environment make projects safer, more efficient and more cost-effective.

One company that is bringing a new level of engineering design, analysis and simulation to the mining industry is Ettol.

Based in WA, Ettol has been involved in civil and structural engineering, greenfield and brownfield mining projects and bulk materials handling for more than 20 years.

This experience and the use of Algoryx simulation software, coupled with ANSYS Spacedclaim, allows Ettol to simulate engineering problems much closer to reality, for more accurate data extraction and more detailed analysis.

Thanks to advancements in 3D software capabilities, it is also possible to conduct real time simulations and visualise exactly what is happening when a load is lifted, a structure is loaded or material begins to travel down a chute.

The direct modelling capabilities of Spacedclaim allow a 3D model of the project to be built and then tested in a real time simulation for dynamic loads, with the light and fast rigid dynamics solvers of the Algoryx package.

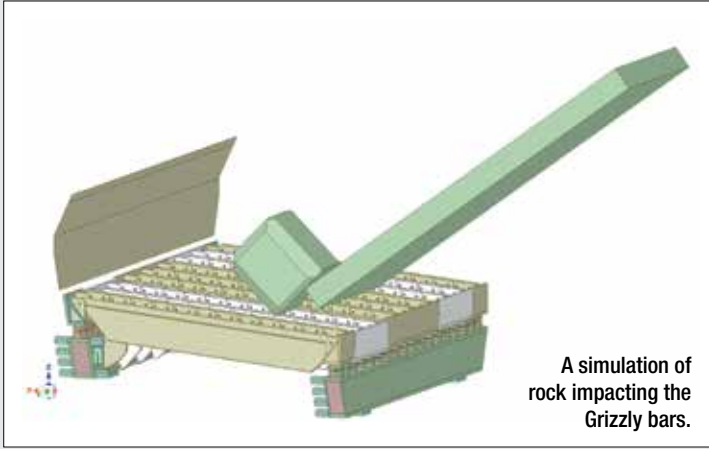
Prime examples of the application of this simulation software are lifting and rigging, material impact loads and the functionality of chute and bin doors.

When it comes to lifting a load with slings or rigging, Ettol's simulation models can not only determine the centre of gravity (COG) but also reveal exactly which lifted load is leaning and which individual slings are working more than others.

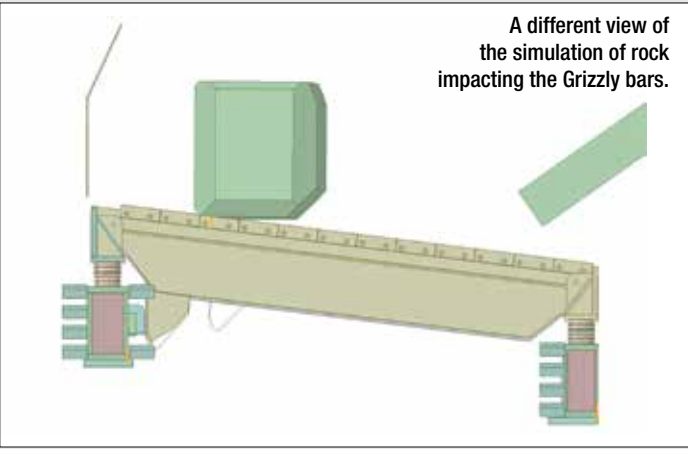
The modularisation and combination of the various software packages now allow a far more accurate model to be built, that not only provides dynamic shifts in the COG but can also be used to calculate exact sling and shackle loads.

In other software, such as Solidworks, the models are created in CAD and must be moved manually – essentially the engineer must take snapshots throughout a range of movement and interpolate the data points in between.

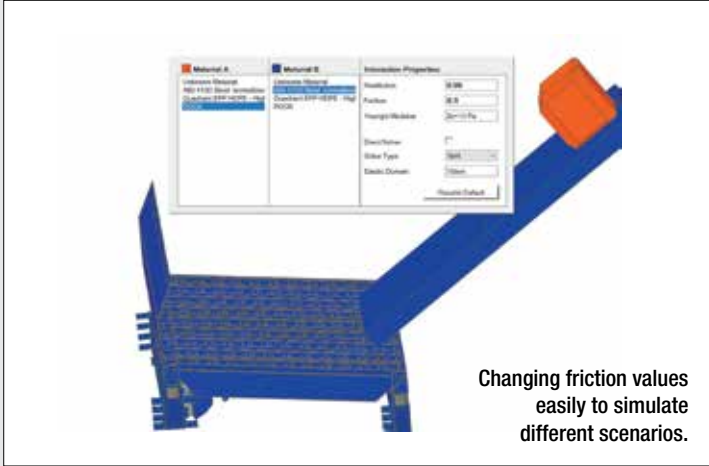
However, running the same simulation in real time not only permits a smooth flow of data throughout the lift, but also allows the velocity of the lift to be varied and the corresponding



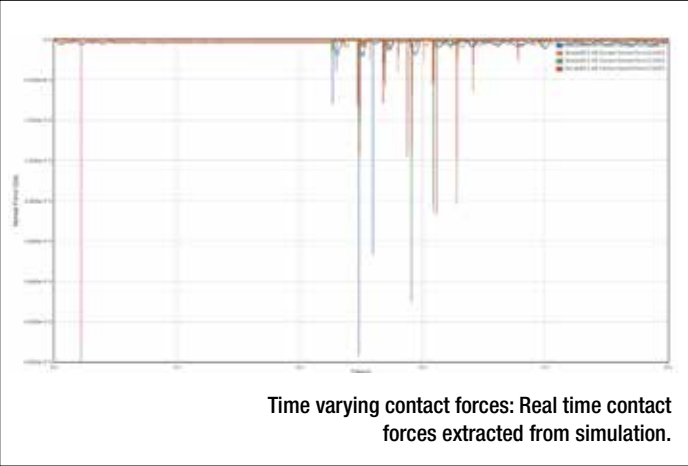
A simulation of rock impacting the Grizzly bars.



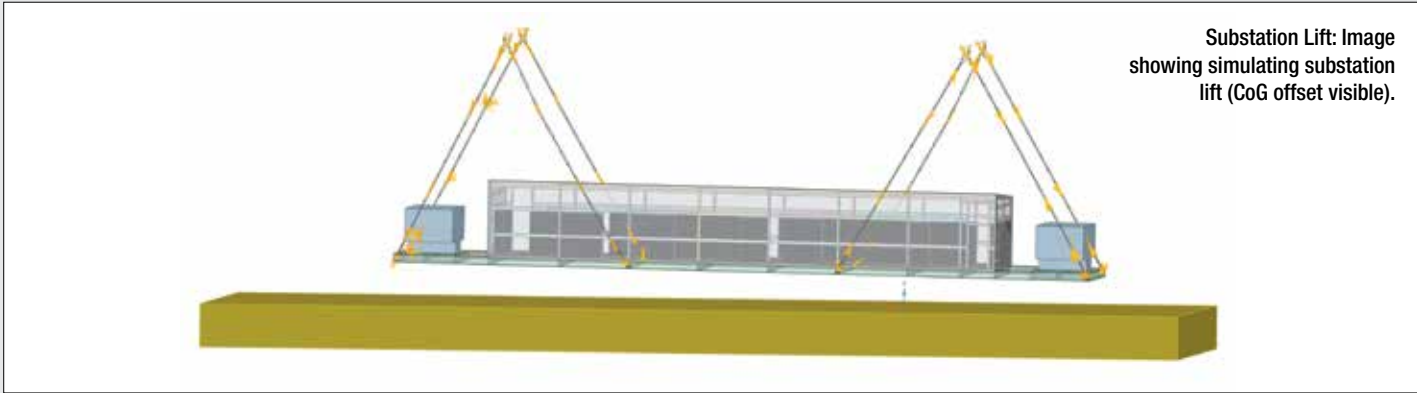
A different view of the simulation of rock impacting the Grizzly bars.



Changing friction values easily to simulate different scenarios.



Time varying contact forces: Real time contact forces extracted from simulation.



Substation Lift: Image showing simulating substation lift (CoG offset visible).

dynamic loads to be calculated.

Important data such as actual contact loads on shackles is critical when modelling lifts.

Using load factors of between 1.2 and 1.5 (variations according to lift velocity) the entire model can be subjected to a range of loads to check for safety and efficiency before the crane operator is even on site.

Ettol recently carried out simulations to test the impact of ROM on Grizzly separators.

This detailed analysis allowed the angle and friction coefficient of the feed ramp to be varied, thus changing the impact of a given load on the screen of the Grizzly.

The test can be run an infinite number of times if necessary and each time the load can be made to rotate and strike the screen in a different place at a different angle.

The spring loaded Grizzly then responds to the varying angles and degrees of impact.

The whole project can be rotated 360 degrees while the test is running.

The loads and reactions extracted from these Algoryx simulations can be coupled into ANSYS Mechanical software for further analysis and design verification.

Ettol has also used this collaboration of simulation software to analyse gear and pinion backlash, the contact forces between gears and chain pins and for operating the joints and rotating robotic arms.

It seems that pivotal moments have just become more readily available, more cost-effective and more accurate.

MORE INFORMATION:
Ettol | 08 6165 8807
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Flexible mine modelling

NATIONAL

MICROMINE is a comprehensive and easy to use exploration and mine design solution and can bring benefits to almost every stage of the mining value chain.

From prospecting and exploration through to geological modelling using implicit, stratigraphic and/or explicit methods), to resource modelling for geologists and for engineers, Micromine covers life-of-mine design and planning through to daily operations in open pit or underground mines.

Product strategy manager Mark Gabbitus spoke to the *Australian Mining Review* about how the software can improve functionality and productivity on site.

"Having data in a single system throughout the process will definitely improve the ability of geologists, engineers and surveyors to collaborate and work together — increasing productivity just by making their lives easy," Mr Gabbitus said.

"On top of this Micromine is very easy to learn, allowing new staff to get up to speed rapidly, whilst having the depth of capability that means Micromine will grow with you as your skills and needs increase."

Mr Gabbitus stressed that each key module of the software (Exploration, Mining, Stratigraphic Modelling, Scheduler, Resource Estimation, Implicit Modelling, Wireframing, Surveying and Pit Optimisation) is scalable and flexible to suit different needs and projects.

"Micromine is a modular solution that allows a resources company to buy what they need, when they need it," he said.

"The scalable pricing and licensing options

means that they can dial up or down functionality as needed but in practice a company might start with a basic Explorer bundle, upgrade it to a Geology Modeller bundle as drilling data becomes available and then finish off the Geology story with the Resource Modeller bundle."

When a company is thinking about feasibility studies and mine planning they can get the Mine Scheduler bundle which gives them the ability to optimise, design and plan the mine.

Micromine is commodity agnostic and has been used in almost all kinds of deposit from narrow vein gold to massive porphyry to stratigraphic coal and all points in between," Mr Gabbitus said.

"We also have design and planning tools for most mining situations in both the surface and underground environment."

Improving exploration

Micromine has a range of benefits in the resource estimation and exploration process, particularly around data management.

Historical datasets (digital and paper) as well as new mapping and drilling, combined with public data such as Government geophysical surveys and maps, all need to be imported and transformed so that an exploration geologist can start planning future exploration activities.

"Being able to plan sampling and drilling projects then take all of this information into the field, execute them and review the results, whilst in the field, can make a massive difference to an explorer's bottom line," Mr Gabbitus said.

"Changing your plans on the fly can save significant dollars.

"Once you've found something interesting you

can start the modelling process right there and then."

Geologists can also use the software to build implicit models of surfaces and grade to test geological models, and even drill extra holes to see if the model is robust.

Mr Gabbitus said that as more data becomes available, the model (or even better, models) can develop and grow until the client reaches the points where they are ready to start building a resource model.

"Because it's all in one system there is no break in the flow of modelling," he said.

"Micromine has all the tools you need to analyse and estimate grades and information into a resource model quickly and robustly.

"The speed of development means that should new information become available, updating the models is easy."

Micromine 2020

There are hundreds of new features and fixes for all aspects of the mining value chain expected with the release of Micromine 2020 (MM2020) update in November.

Mr Gabbitus said a few updates included the implicit modelling tools and the new vein and surface modelling tools which would allow the ability to model most geological situations.

"We have also invested a lot of time in our geostatistical analysis and charting tool — this was something our clients had asked us to do and the new charts we have available are going to really help people understand their data," he said.

"We are releasing a new Stope Optimiser to the market in November which is going to be very

different to what the industry has been using to date as it is a true optimiser.

"Our Scheduler has had a lot of development over the last 18 months as has our Ring Design tool."

Most of the changes and new features are client driven but Micromine has made significant architectural changes to both tools as well for speed and ease of use.

"Finally we have been working on new tools to manage huge point cloud datasets, both from an import standpoint and then how we deal with this data," Mr Gabbitus said.

"Traditionally it has been hard to turn complex point clouds (tunnels, stopes etc.) into wireframes without significant manual interaction.

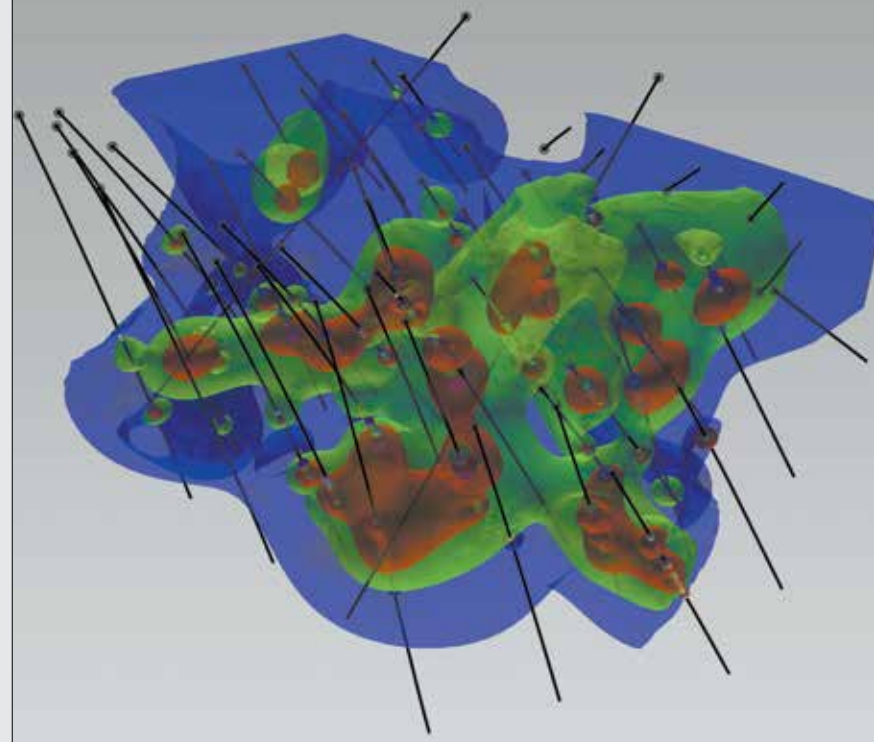
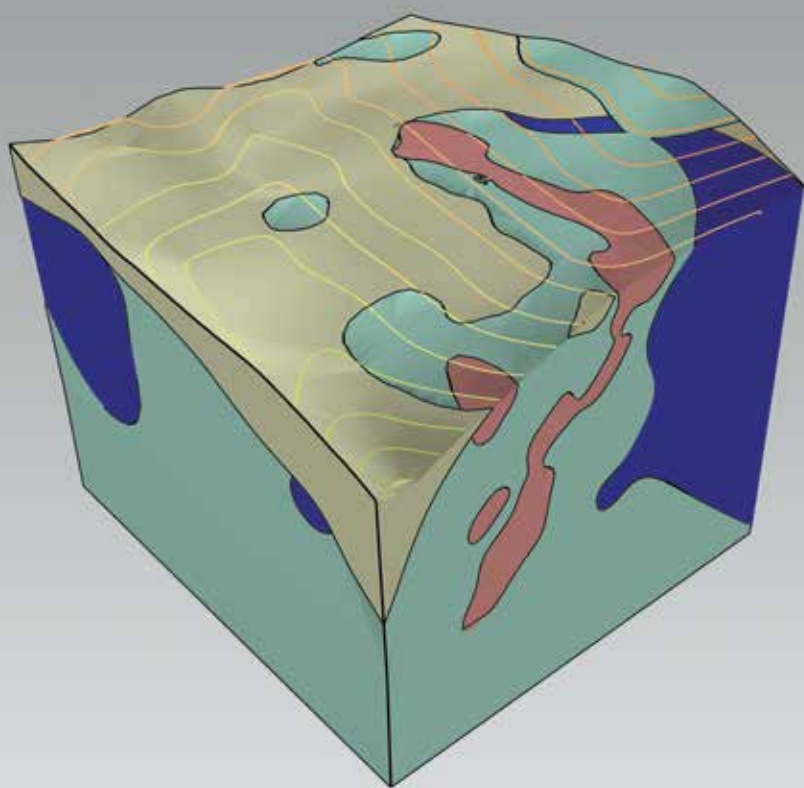
"We are going to deliver new tools to significantly simplify and speed up this process in MM2020."

Micromine is committed to delivering new and updated solutions to the resources industry, beyond software.

"We are also committed to working with the broader community and are engaged in industry projects such as GMG's Open Mining Format, a project to develop and deliver a standard file format for the mining industry with other software providers such as Seequent, Deswik and Dassault," Mr Gabbitus said.

"Additionally we are a key participant in the \$218M MinEx-CRC working with miners, academics and geological surveys to discover how we can gather and manage data from drilling below cover.

"As a proudly West Australian founded company we are also proud to have a global reach and reputation that is spreading."



Implicit modelling uses data inputs and complex algorithms to produce 3D geological models, which can be readily analysed and iterated to finalise geological or grade interpretations.

MORE INFORMATION: Micromine | 08 9423 9000 | www.micromine.com



MICROMINE

Intuitive Mining Solutions



MICROMINE is a leading provider of innovative software solutions that span the breadth of the mining cycle from geological exploration and data management, to resource estimation, mine design, planning and production control.

Customers use MICROMINE software to maximise their asset value, increase productivity and for decisions on which they know they can rely.

Our software is renowned for its ease of use yet powerful capabilities. All products are available in numerous languages and supported by local experts. Founded over 30 years ago, MICROMINE solutions are used at more than 2,000 sites in over 90 countries.

micromine.com
marketing@micromine.com
T: +61 (0)8 9423 9000



Simplify asset management

NATIONAL

REAL time asset management is vital on site when the downtime that comes with unplanned and unexpected maintenance can cost millions.

Accurate asset management and condition reporting can mean the difference between unplanned downtime impacting productivity and profitability – so why wouldn't you want to simply the process?

PDS Asset Management Software can be used for web, android and iOS and eliminates the need for complicated spreadsheets and inefficient hand-written reports.

PDS connects multiple work groups, captures valuable inspection data and reports all the relevant information you need in a simple, easy to read format and can easily expand as your business.

Idler

One of the most consistent causes of conveyor downtime and lost productivity in mine sites around the world is idler (roller) failure.

PDS Idler helps reduce conveyor downtime through accurate digital recording of inspections, Idler captures precise, real time failure data — reducing conveyor downtime and lost productivity.

PDS training and implementation officer Ricki Southgate said the traditional, more inefficient and inaccurate method of tagging during routine manual inspections meant extensive time was spent tagging equipment but also the data would have to be



Created by mine maintenance managers for mine maintenance managers, PDS software captures data regarding asset management and condition monitoring.

hand delivered to the site office where another staff member would collate the information into a spreadsheet or SAP.

During an inspection you detect an idler failure by visual inspection or by the sound it makes, while the use of thermal scanning can

also used to pick up heat differences.

With Idler you then record that failure on the tablet (iOS or android); all the Idlers are mapped in the system so it's easy to accurately identify unresolved failures.

Photos and thermal scans can also be attached

to the record for easy reference.

"Once you've captured all of the failures in the field you generate the report from the data and send it directly to the maintenance crews who can go out and replace the idlers once a maintenance window is available," Mr Southgate said.



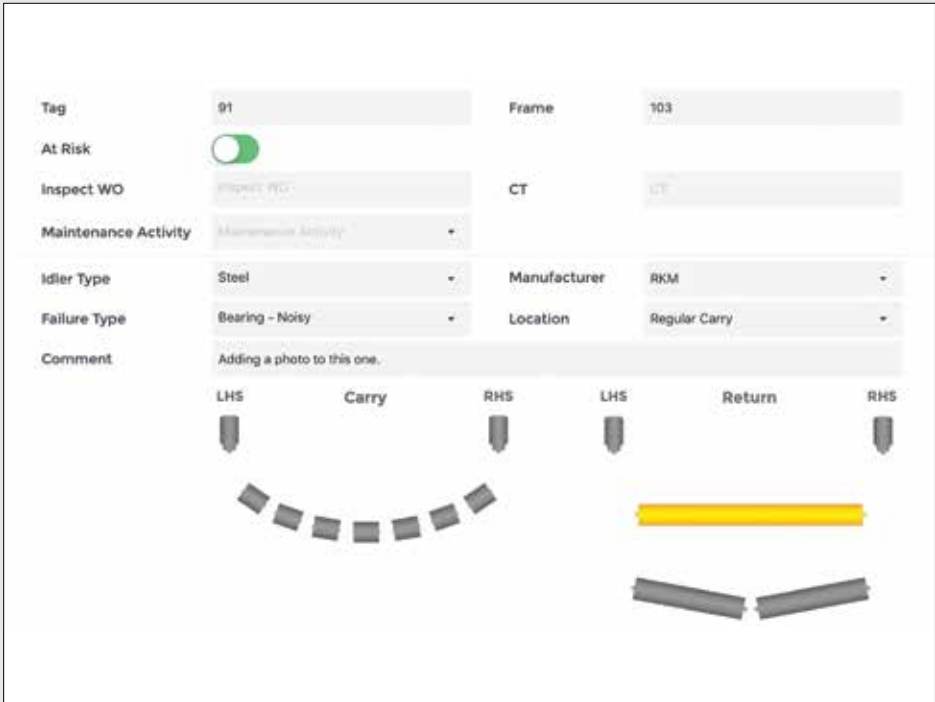
www.pdsglobal.com

PDS ASSET MANAGEMENT SOFTWARE

- Reduce unplanned downtime
- Maximise productivity
- Increase profitability

PDS Software is designed to meet the specific needs of our partners in the resources sector. Our cloud based asset management and condition monitoring applications eliminate paper based reporting and complicated spreadsheets. PDS Idler, PDS Wear, PDS Inspect & PDS Complex are a multiplatform* subscription-based solution for your reliability engineering needs. For more information or a product demonstration contact sales@pdsglobal.com

*Web, iOS, Android, phone, tablet



PDS Idler provides a powerful management tool for detailed planning, execution and failure analysis.

Maintenance managers are able to run reports from the PDS database to see trends on failures, failure types, and make decisions around potentially looking to different suppliers or manufacturers.

Mr Southgate said it's the simplicity and ease-of-use that dramatically cuts down inspection and reporting time.

"Before you might have had three different crews walking around doing inspections on 40 conveyors on one mine site, and they would all walk back and hand a piece of paper to a planner who then has to sit there and add 40 lots of conveyor failures into a spreadsheet to create notifications," he said.

"Whereas now anyone could walk onto the field with an iPad and once they synchronise their location it goes into the database so the person sitting back in the office can generate the report there and then."

Wear

PDS Wear gives users the critical information needed to dramatically reduce unpredicted failures due to wear, predict belt life, plan scheduled belt replacements and assist in better belt grade selection and accurate capital planning.

Mr Southgate said that PDS Wear means that maintenance managers can look at the budget and know when they're going to have all the resources on site.

They can also know whether or not that

component will make it to the next shutdown or not.

"Someone sitting in a head office in a capital city with access to PDS could simply login and generate reports for every site – they will have all the information in one report across all sites which would show every possibility forecast for replacement," he said.

"This increases bargaining power through procurement when approaching suppliers on a group level."

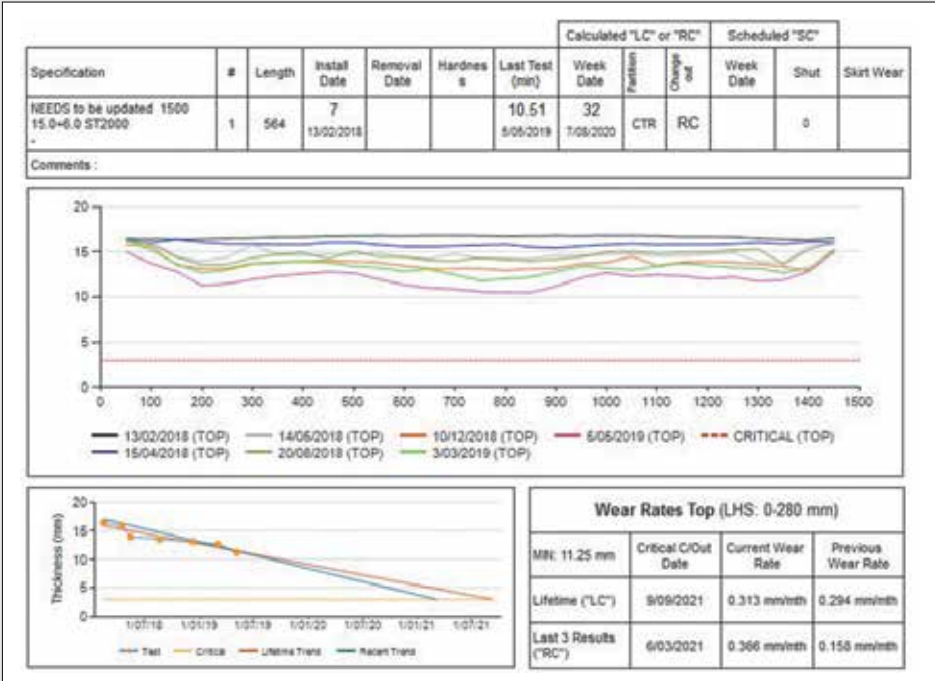
PDS Wear has also been adopted for the management of wear data on both fixed and mobile plant assets from pipe spools, apron feeder pans, screen panels, transfer chute liners and haul truck trays.

"We started off with conveyors but now we've moved on to pretty much anything that requires a forecast like pipe wear, apron feeders, chains and rollers, rail wheels, even the rail line that the train runs on," Mr Southgate said.

"We'll measure the wheels of the rail to see how much it's worn, maybe it's at 60mm and once it gets to 50mm you know you need to look at replacing it."

Sites can also configure their own parameters to take lead time into consideration when ordering stock in advance – saving valuable downtime – and can even record wear based on tonnage.

"Historically you might have a cycle of six years and suddenly within three years you need a replacement component and that's because of improvements on site over the last two years



Once a site knows they have to replace two belts in 2020, they can get the supplier to quote the job well in advance of the belts wearing out.

which have increased production by 50 per cent," Mr Southgate said.

"So now rather than use a time based prediction, you would use a tonne-based prediction – so you have the option there to change as the business (and production) evolves."

Inspect

PDS Inspect provides a robust digital platform for capturing fault history against assets over time, enabling detailed reporting on plant condition and outstanding maintenance requirements.

"Now we can actually configure inspection plans digitally so someone can go in-field with an iPad and open up to the inspection for that day, add the work order number in, and complete all the inspections in the software" Mr Southgate said.

"PDS Inspect provides a quick snapshot of critical problems requiring attention and you can add measurements or photographs for more description if needed."

Interactive reporting and dashboard views enable users to quickly see the condition of their assets as well as the current inspection status according to priority.

"We've got an At Fault dashboard which highlights everything that has been inspected and requires some sort of corrective action," Mr Southgate said.

"If something arises when a ship hasn't turned up or a train is delayed then the manager will know exactly what the priorities are and where to allocate their resources, just by generating a report."

Complex

PDS Complex makes accurate monitoring and maintenance planning simple by allowing the client to visualise the wear profiles of various equipment.

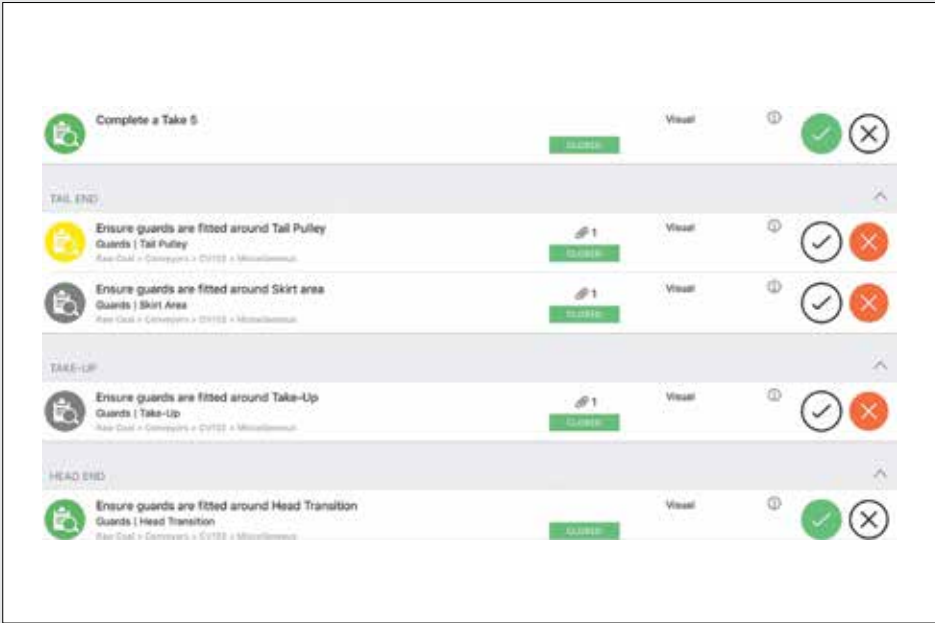
Originally Complex was designed as an alternative documentation tool to 3D scan data and for trending wear data as 3D scanning alone provided no asset history or predictive analysis.

Due to the cost associated with 3D scanning, Complex has increased in popularity, becoming an invaluable management tool for recording historical replacements, associated part number information and visualising wear profiles.

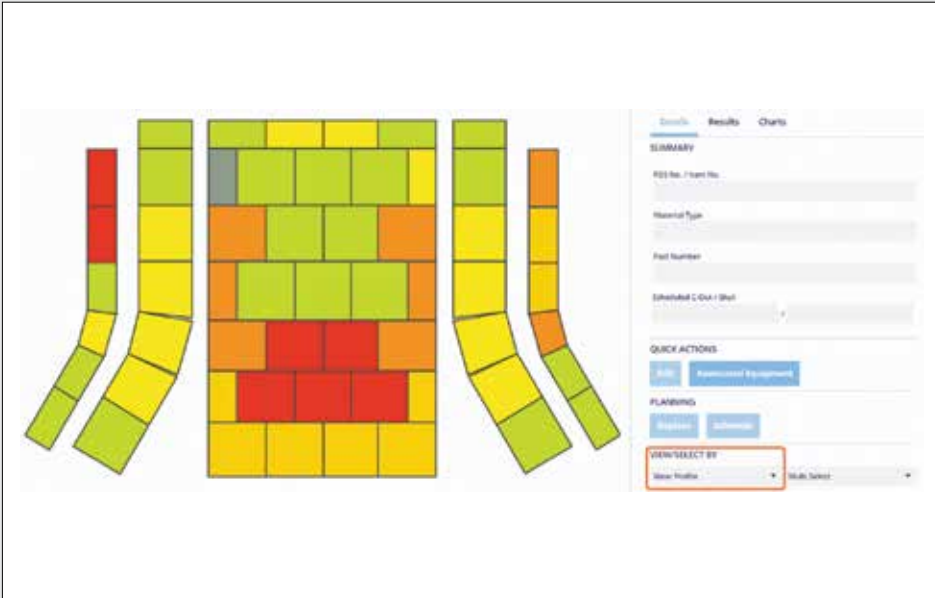
Mr Southgate said that PDS was one of the first companies to create the 2D drawings of 3D objects such as chutes in a layout so that a field technician could view on a tablet during inspection and accurately mark off multiple liners and schedule them for replacement.

"They can also use it during shutdowns, for example you can select 15 liners across that chute mark them all for replacement and once those are replaced their data will be moved into the background history," he said.

"Now you've got the new install date for those replacement liners as well."



PDS Inspect is the practical digital solution to managing inspection records.



PDS Complex provides a market leading visualisation tool for tracking and predicting wear in assets with multiple wear surfaces such as chute liners, screen panels, haul truck trays, feeders and crushers.

Time-saving solutions

NATIONAL

WITH hundreds of employees and contractors on the books, mining operations can often fall behind when it comes to keeping track of their workforce and assets, often spending valuable time trying to locate misplaced equipment, keep track of time sheets and the dreaded task of payroll.

Luckily, Perth-based software company Roshtek (the brand name of Existco) has a solution: a suite of attendance, asset and inventory management software that allow companies to regain control of their operations with ease.

Roshtek Software Solutions specialises in vertical markets such as asset management, inventory control, time and attendance, and office productivity solutions (messaging and quotation systems), and with a broad range of automatic data capture products, electronic and software engineering services for the local and interstate industry.

Roshtek director and senior design engineer Eli Abitbol said the firm dynamically utilises the latest proven technologies, bringing them to everyday businesses and allowing a more effective and efficient result.

"We maintain and strengthen alliances with technology partners, such as Honeywell and Zebra, and continue constant education and training to



Roshtek has a suite of attendance, asset and inventory management software that allow companies to regain control of their operations with ease.

further develop our knowledge and skills," he said.

Roshtek's Asset Manager is an industry-leading asset tracking solution for small to medium-sized businesses.

The product keeps the location of companies' valuable assets at their fingertips, preventing them from having to search for misplaced, unreturned, or lost assets.

In addition, detailed information on each asset,

including what site, location and even department it is currently in, who checked it in or out, the cost of the asset, when the warranty period expires, and even when maintenance is due on the asset, is all captured by the system.

Roshtek Asset Manager also stores the transaction history of an asset, so companies know where it has been, how many times it has been broken or serviced, and who was the last person

to check it out, and for how long.

Roshtek Inventory Manager is capable of meeting the high demands of a business, preventing staff from having to search for inventory levels, ordering information, or performing stocktakes too often.

The system captures detailed information on each inventory including cost, multiple sell value, location, serialisation, and even the department it is currently in, order on suppliers based on reorder information, update inventory levels when goods arrive, issue inventory to jobs, and perform stocktakes is all part of the system.

Attendance Manager is an industry-leading time and attendance solution that saves businesses time to reconcile timesheets and calculate entitlements.

Detailed information on each employees' job times are recorded via a touchscreen-based time system, which gives businesses the best user interface.

All of Roshtek's solutions use the latest technologies including Barcoding, Passive RFID, Active RFID, Satellite tracking, 'Internet of Things' and incorporate mobility (rugged mobile computers), and labelling using thermal transfer technology.

They can also be easily integrated to customers' existing ERP, accounting system, and in house line of business solutions.

MORE INFORMATION: Existco | 08 9227 0088 | www.existco.com.au

Optimal mining

TREVOR PICKETT
NATIONAL

MODERN mining is a complex business but its core principles are deceptively simple: dig a commodity out of the ground, process that commodity to the point where it is saleable, and then transport it to the customer.

In most cases the total resource in the ground has a finite value (subject to variations in commodity prices) and every cost associated with extracting that resource over the life of mine, by definition, diminishes net profitability.

The goal then is to focus on cost reduction and production efficiency to increase production, profits and share price.

Assets are a significant cost in every mining operation and their effective management should be a core focus for any mining operation.

Savvy management monitors the return on every asset and realises that plant and equipment should not only be available to contribute to production, but must also be operationally excellent so that each contribution is as efficient as possible.

The market will often judge a company more harshly if production and profitability fails to meet expectations and predictions, than if they fall short due to fluctuations in commodity prices.

With this in mind, it makes sense to view asset management from a production standpoint, rather than a financial standpoint.



Putting the right personnel and maintenance processes in place to ensure that assets are maintained at the right time – with the right priority and that maintenance schedules are synchronised with production schedules – will have far greater and more far-reaching positive effects on production, profitability and market cap than micro-management of isolated cost centres.

Information is power

Designing and implementing optimised

maintenance schedules involves the collection of fine data from all assets, the meaningful collation and interpretation of that data, and then modelling that information under a number of price and event-based scenarios.

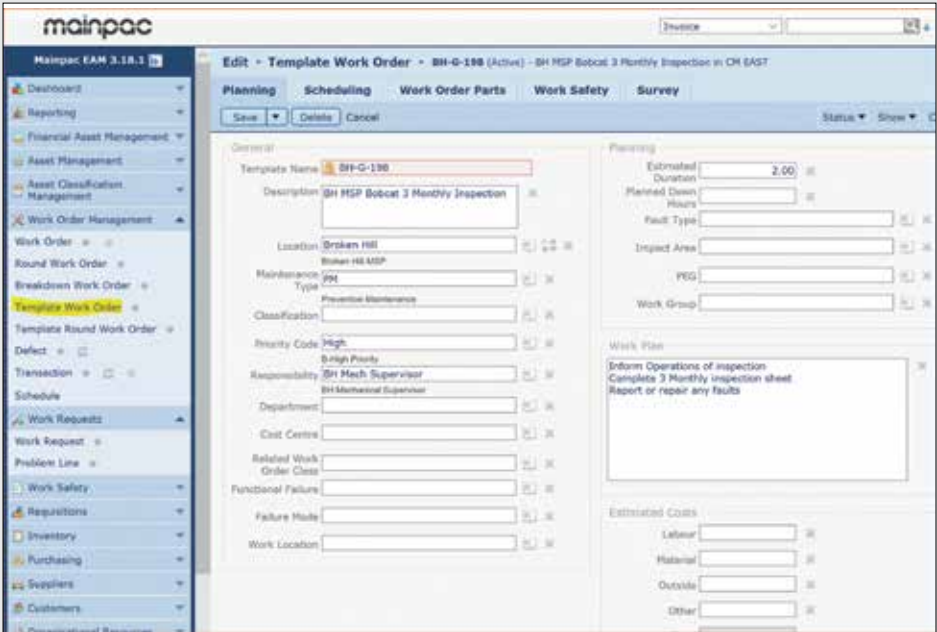
This combination of real-world measurement and simulated modelling requires a comprehensive and adaptable Enterprise Asset Management (EAM) platform, like Mainpac.

Designed, produced and implemented in Australia, Mainpac's four main modules were

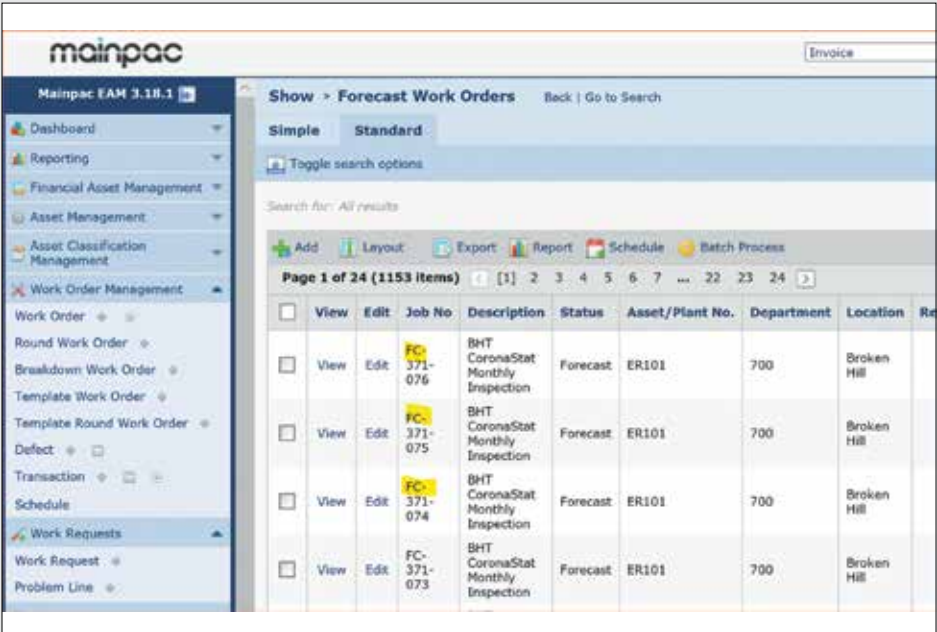
created to provide more than drill-down cost analysis: they deliver unique insights into the daily operation, efficiency and maintenance requirements of mining assets – and more.

Many CFOs are still forced to work with spreadsheets when it comes to asset and maintenance reports.

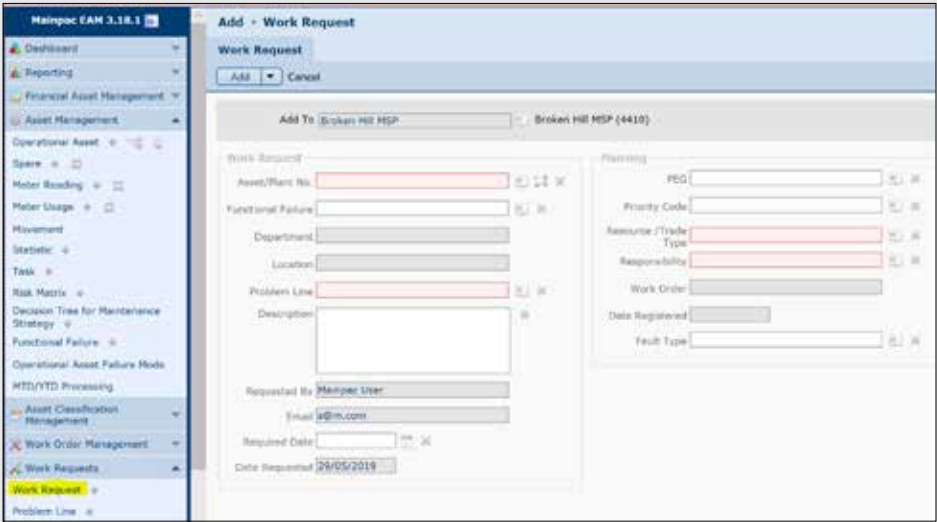
Apart from the time lag issues of this method, they are forced to drive their operations from a single financial viewpoint, rather than a multi-view operational perspective.



Movement records provide a history of operational asset movements in the operational asset structure. The first movement record is created when the operational asset is first added to the operational asset structure.



Template work orders describe the usual way that an organisation performs maintenance work and are primarily used to describe preventative maintenance.



With the Work Order Forecast, once tasks are set up, they can be used to generate forecast work orders.

Mainpac's integrated approach allows real time decisions to be made to compensate for variances in production lines, the implementation of Reliability Centred Maintenance (RCM), the analysis of lease versus buy, the ability to electronically automate inventory, a means to carry out accurate capital budgeting, and a structured and synchronised maintenance schedule for every asset that can lead to working capital savings, by arranging for vendors to hold stock of scheduled maintenance parts rather than buying them into the company's stock bin.

Asset management

Long term asset viability and life cycles require accurate capital planning and budgeting.

Is it better to lease or own a particular asset? Will that decision change if the market climate changes? Which assets should be parked if commodity prices fall – based on production capabilities, depreciation and other variables?

Mainpac refers to this analysis as asset intelligence (AI), which enables modelling under different scenarios to arrive at preferred options for action in each case.

The software has an asset register that logs both parent and child assets, as well as classification of all assets.

Data logged against each asset and asset class can be used to improve reliability, develop better maintenance and operational practises and reduce operating costs.

Analysis of this data will deliver insights that may have previously not been visible.

An efficient operator will log lower fuel usage; there will be less brake and tyre wear; and there will be higher total payloads.

Mainpac's AI will analyse relevant maintenance and operational data, reporting on inconsistencies and variations so that appropriate corrective action can be taken, delivering asset operational efficiencies and lowered overall costs.

Similarly, if a company operates two fleets of trucks — each of a different brand — the logged data will enable the CFO to compare the service intervals and maintenance costs of one fleet against the other.

When these operating costs are compared to the initial capital costs of the assets, it is possible to make more informed decisions about which trucks to buy when it comes time to replenish a fleet.

Notable rotables

Rotables are a class of asset that typically comprise gearboxes, engines and other parts that are removed from one asset, repaired or serviced and then returned to service in another asset.

Mainpac allows for each of these items to be stored in the asset register and data relating to that part's initial cost, repair costs and service life is on hand for maintenance staff.

These items can be expensive and are difficult to track from a costing perspective, but significant efficiencies and savings can be made by knowing which parts can be repaired or serviced rather than replaced, and when each part should be retired.

This record-keeping works hand-in-hand with a warranty and inventory.

Parts that fail under warranty can, by definition, be replaced or repaired without cost to the company.

Therefore, a vital part of cost minimisation for all assets, not just rotables, is an accurate management of warranty conditions attached to each item.

Mainpac delivers this function also.

Scheduled servicing

Acquiring data from assets and then analysing and modelling that data in detail – in parallel with production schedule data – enables the development of accurate and timely maintenance schedules.

With Mainpac, maintenance managers are able to configure a work order template for each asset that automatically generates a bill of materials required from stores and opens a work order.

This can also include multiple part storage and automated part counts and be integrated with purchasing to keep regular items in stock at the required time.

Once the work is completed, the work order is closed and the asset is returned to service, with all work carried out logged in the register.

This information can be easily integrated into all major ERPs.

Getting mobile

In most cases it is more efficient for maintenance staff to work on an asset in the field, in order to reduce downtime wherever possible.

By necessity, this means that mobile 'warehouses' must be created as service vehicles need to carry parts and tools to carry out that work.

Mainpac's mobility module allows parts, tools, consumables and other assets to be allocated to an individual service vehicle.

At the end of a shift, the software can determine which parts need to be replenished and also guarantee accountability on all tools taken to the field.

This allows all work done on a particular asset to be justified according to the requirements of a given work order.

Maintenance managers take a great deal of solace from the ability to accurately log and track field work because it provides a record of all maintenance work carried out on each asset and ensures that it is compliant and operationally capable.

The mobility module also has the capability to record condition-based readings for asset monitoring and store photos from inspections for corrosion, fatigue or wear, for example.

As this data is stored against each asset, it can also be used as supporting documentation to create a work order.

Once opened, each work order is flagged and can be inspected by a scheduler who can ensure that no asset is returned to service before all scheduled work has been completed and the work order is closed.

Workshop optimisation

Bottlenecks can occur in busy workshops when every available bay is full with scheduled repairs and a corrective maintenance job suddenly appears at the door.

A breakdown means that an asset is out of production and that means down-time costs are mounting.

At this point the maintenance manager must decide what is the least expensive and most efficient course of action is to return to full production.

Using Mainpac's asset information, that manager could determine if, for example, the machines undergoing scheduled maintenance actually has 10pc operation time remaining before it is critical.

It is then possible to make the decision to return that asset to service to maintain full production, while the breakdown is repaired.

The software also prevents over-allocation of maintenance resources, as Mainpac's maintenance planner will not allow this to happen – thus streamlining the workshop's workload.

Defend and optimise

Through data acquisition directly from PLC sensors or input from maintenance personnel, Mainpac's EAM software constantly records the real-world functionality of a mine's assets.

That data can then be utilised to model future scenarios, compare the Capex and Opex of assets, develop scheduled maintenance programmes and stock fixed and mobile warehouses with essential parts.

Mainpac was developed to deliver complete functional capability for its clients.

It is a single-source stream that is always maintained and always upgradable.

It offers complete management of all fixed and mobile assets with intuitive reporting based on operational and financial considerations.

Mainpac typically delivers cost returns in only 12 to 18 months.

This incredibly powerful system enables mining companies to optimise production efficiency, minimise costs from an operational-sensitive perspective and ultimately defend their bottom line for greater profits, higher share prices and increased shareholder satisfaction.

Controlled explosion

TREVOR PICKETT
NATIONAL

THE storage and inventory management of explosives is a significant responsibility for mining companies.

Ultimately, the company and its senior management are accountable for the responsible use and inventory control of all explosives.

However, conventional explosives inventory control processes are often lacking in terms of accuracy, auditability and timelines.

The problem primarily arises from the timeliness and inaccuracies introduced through manual and paper-based reporting of explosives movements in and out of the company's magazine.

Typically, these paper-based systems require operators to populate complex and often dishevelled tabulated stock sheets with the inventory movements in and out of the magazine.

Operators are often inattentive and not inclined to accurately complete paper based stock sheets due to their complexity.

By the time the mining engineer completes a magazine stocktake, transfers the paper-based stock reports into a spreadsheet and identifies any discrepancies in the explosives inventory, it can be days or even weeks later.

Any delays in identifying discrepancies in explosives inventory make investigating and identifying the source of the error exceptionally difficult, particularly if



Magman specialise in Getac rugged tablets and laptops.

the discrepancy is a result of operator inattentiveness and complacency associated with completing stock report sheets.

Any unaccounted-for explosives by law need to be reported to the regulatory authorities, which can result in prosecution of the company and the statutory mine manager.

In 2009, the WA Police undertook a massive operation in search of drugs and explosives, searching the luggage of 2300 passengers which had arrived into the Perth and regional airports from mine sites.

A spokeswoman said a significant quantity of explosives was found to have been removed from mine sites.

Although the regulatory requirements have become increasingly stringent since this time, the way in which mines manage explosives inventory remains unchanged – until now.

Rodney Bedgood has spent many years as a mine manager, and possesses firsthand experience in the deficiencies of paper-based explosives inventory control processes and the inordinate amount of engineering time and resources which are dedicated to maintaining such systems.

This prompted him to develop a technology solution, called Magman (Magazine Management).

The Magman system requires very minimal training for operators due to its simplistic interface.

Once a transaction or stock take is complete, the data is sent to the cloud based server, where a reconciliation statement can be output instantly by the engineer or mine manager.

This allows any discrepancies to be identified in a timely manner, while they are still easily traceable.

The end result is timely reporting and peace of mind for mine managers who are legally responsible for the control and responsible use of the company's explosives.

With more than 70 Magman systems being used throughout the industry by some of the larger mining houses, the Magman system has broad acceptance throughout the industry.

This innovative product, born from necessity and developed after many years of practical mining and explosives management experience, has now become part of the KPMG METS scale-up program.

With the benefit of experienced mentors, a comprehensive business and legal structure and an analysis of the market, Magman has grown significantly in recent years.

Apart from its rapid uptake in the mining industry, the Magman software is also suited to rail companies that transport explosives, pyrotechnic companies which must also account for all their pyrotechnics devices and even hospitals which are required to log the inventory levels of their radioactive products.

In addition to the cutting-edge explosives inventory solution, Magman has a Short Interval Control/Supervisor Production tracking system and also supplies rugged notebooks and tablets through its e-commerce website, 1300MAGMAN.com.au.

After many years managing mines throughout Australia and Internationally, Rodney also offers a range of mine consulting services including mine management, project management, statutory ticketed positions; mine design and planning; mine feasibility and mine operational reviews.

PRACTICAL MINING SOLUTIONS. REAL RESULTS.

- **Magman Electronic Explosives Management Systems**
- **Magman Short Interval Control & Data Management Software**
- **Ruggedised Notebook & Tablet sales**
(www.1300magman.com.au)

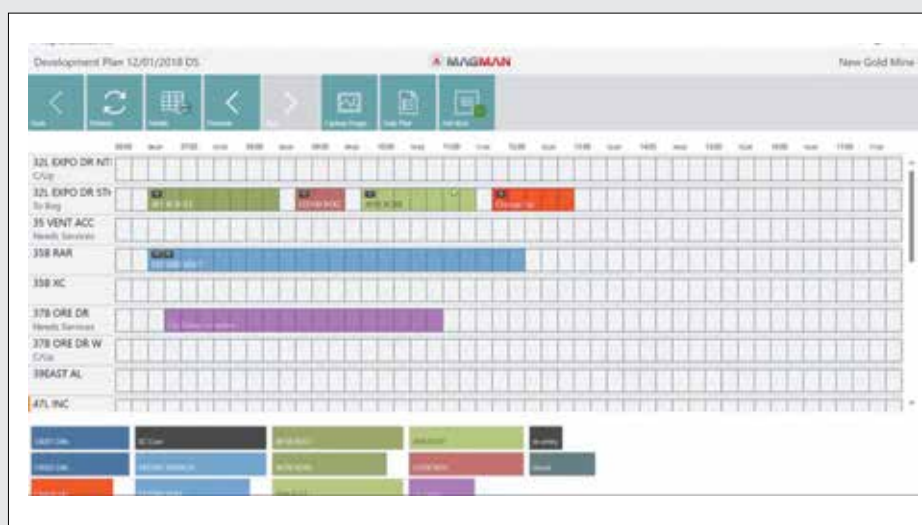


MAGMAN

☎ **1300 MAGMAN (624 626)**

✉ **Enquiry@magman.net.au**

🌐 **www.magman.net.au**



Magman software interface is intuitive and easy to use.

MORE INFORMATION: Magman | 1300 MAGMAN (624 626)
www.magman.net.au | www.1300MAGMAN.com.au

Conference addresses corrosion control

NATIONAL

THE Australasian Corrosion Association (ACA) will host the Corrosion and Prevention 2019 conference on November, 24-27, at the Crown Promenade in Melbourne.

This annual conference and trade exhibition will bring together leading researchers and industry practitioners who combat corrosion on a daily basis.

C&P 2019 will showcase the latest techniques and technologies to help mitigate corrosion.

It has been estimated that industries and governments spend billions of dollars every year on corrosion mitigation and repair, making it vital that the latest technologies and practices are applied to managing this threat.

Diverse technical streams will showcase the latest developments in corrosion, ranging from fundamental corrosion science to hands-on application.

Topics covered will include concrete corrosion and repair, steel corrosion, water infrastructure, cathodic protection of pipelines, asset management, high-temperature corrosion, non-ferrous metal corrosion and microbiologically influenced corrosion.

This year's P F Thompson lecture will be delivered by Willie Mandeno, Principal Engineer Materials, WSP Opus.

Willie is an ACA life member and has specialised in the specification of engineering materials and protective coatings for more than 35 years.

The ACA's premier dedicated lecture marks Percival Faraday Thompson's contribution by



Melbourne will host this year's Corrosion and Prevention 2019 conference.

emulating the academic and technical qualities for which he was known.

In addition to the technical program, the conference exhibition will be an integral part of the activities.

It provides an opportunity for delegates to experience the latest products and services relating to corrosion mitigation.

C&P 2019 will appeal to a wide range of industries, including building and construction; cultural and historical materials preservation; defence; education and research; food processing; government; marine transportation and

infrastructure; mining and resources; oil and gas; power generation and energy systems; and water and wastewater treatment.

As always, C&P 2019 will provide the premier venue for networking opportunities for delegates to network with colleagues and peers.

Building on their well-established reputation, the social functions – including the Welcome Function and Exhibition, ACA Awards Dinner and Farewell Function – will not disappoint.

For further information, please visit: <https://conference.corrosion.com.au/>

About the Australasian Corrosion Association

The Australasian Corrosion Association is a not-for-profit, membership association that disseminates information on corrosion and its prevention through the provision of training courses, seminars, conferences, publications and other activities.

The vision of the ACA is that corrosion is managed sustainably and cost effectively to ensure the health and safety of the community and protection of the environment.

For further information, please visit the web site: www.corrosion.com.au.

CONTROL CORROSION

Lubricate and revive your rusty equipment with CorrosionX



Unlike other lubricants, CorrosionX and CorrosionX HD prevents and restores equipment with rust and water damage.

- Non flammable
- Stops rust, electrolysis and oxidization on impact
- Lubrication for switches and solenoids
- Superfast penetration into corroded bolts and fittings
- Can be applied over already wet electronics and
- Already corroded PCB's, contacts, switches and terminals

CORROSIONX®

Revive rusty equipment

WA

CORROSION usually occurs when the degradation of metal occurs due to an electrochemical process and rust is a prime example of this.

It occurs when iron is exposed to oxygen and water and unlike the greenish patina on copper, rust does not create a protective layer.

The corrosion of iron continues as rust flakes off and exposes fresh iron to the atmosphere – which then also corrodes.

Think of the impacts of rust on mining equipment, where the extra harsh atmosphere on a mine site, the abrasion, heat, chemicals, and salt would quickly erode equipment, causing it to rust and reducing its lifespan.

But what if there was a cost-effective way to increase the lifespan of CAT diggers, Volvo loaders and trucks by 10 per cent or to make Toyota Land Cruisers last another six months?

What if you could take millions off material bills and ensure crews spent 10 pc less time dealing with frozen bolts, pins and shackles?

What if rusted ventilation systems, air conditioners, heaters, communication radios and electronics could be resurrected?

Luckily they can with the right lubrication.

A thin layer of lubrication on the surface forms a protective coating - preventing oxygen, water and salt from getting into direct contact and protecting equipment from corrosion, wear and tear.

Polar bonding

The key to effective lubrication is polar bonding, which is an electrostatic attraction to metal surfaces by some of the components found in lubricants like CorrosionX.

It does far more than just to keep the air away from the metal, the product spreads in a capillary-like action until it reaches minimum thickness of .0002 and also frees seized parts as oxides are softened up in the process.

If you were to look at mating surfaces under the microscope you would see 'asperities' or surface roughness that appears to be similar to microscopic mountains.

These microscopic voids aid in allowing the product to travel and to coat the entire surface area, no matter how tightly joined.

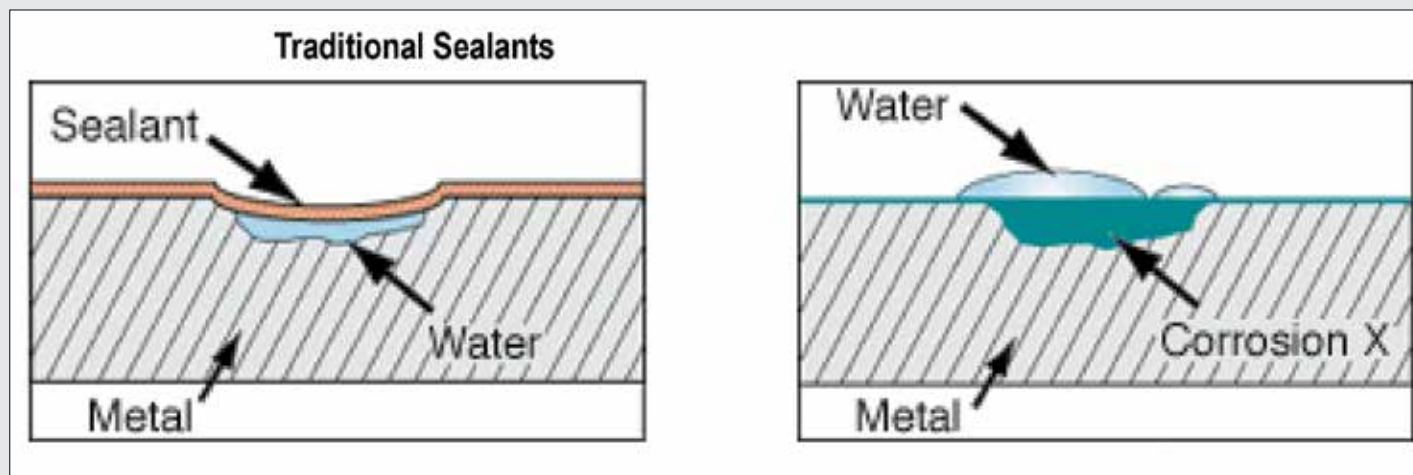
Corrosion Technologies coined the term "Fluid Thin Film Coating" (or FTFC for short) to describe the basic technology found in all its anti-corrosion products and to distinguish them from barrier coatings or wax-based sealants commonly used as corrosion inhibitors.

They are not sealants in the traditional sense, contain no wax, tar, silicone or solids and leave no sticky, gummy mess behind.

Wax CPC'S are designed to prevent rust by attempting to stop (salt) water contact with the metal.

They do not interrupt the corrosion, and actually often enclose the problem, allowing rust to continue to spread underneath.

While CorrosionX is not a rust remover, it will facilitate its removal by penetrating deeply



Traditional sealants lie over any water on the surface of the metal whereas CorrosionX forms a barrier underneath the water.



CorrosionX is safe to use on electronics and can even improve performance.



CorrosionX HD (green cable tie) offers superior long-term protection for mining equipment.

to all assembled parts, coating all surfaces and softening rust by crawling underneath flakes — which then fall off and can be easily removed with a scouring pad.

Essentially, the FTFC sticks to metal like a magnet, so it cannot be displaced by pressure, friction or moisture and literally defies gravity to loosen the most hopelessly seized or corroded parts.

Rust, friction and wear are all dramatically reduced by lubrication that stays bonded in place and wear surfaces are separated by a super slick, protective coating.

Insulating electronics

When electronic gear on site is subject to harsh outdoor environments and saltwater spray, CorrosionX can be used to protect and even improve performance of switches and circuit breakers bothered by moisture.

First it displaces the electrolyte, then leaves an

ultra-thin, dielectric barrier that blocks the path of current and is safe to up to 36,000 Volt.

CorrosionX FTFC is just one molecule thick (0.0004"); when you place two such treated conductors in contact with each other, the resistance between them is only about 0.1 Ohm.

So why doesn't it short out adjacent conductors? A separation of even just a fraction of a millimetre is so many molecules wide that it exhibits a resistance beyond the billions of Ohms that instrumentation can measure.

In practical terms, CorrosionX is an insulator and does not interfere with circuitry, cleaning contact points and improving connectivity in electronics that have been damaged by environmental exposure like com radios, VHF's, deck switches and trailer equipment.

Heavy duty

CorrosionX Heavy Duty (HD) is a thicker version of CorrosionX, and while it's a slower penetrant, it offers extreme longevity in rust protection and

long term protection for equipment exposed to the elements.

It can be used to water proof electronics and electrics, especially those which get exposed to salt water, sulphur or methane.

CorrosionX HD can be used on a wide range of equipment such as winches, leaf springs, gears, steel cables, sheaves and pulleys and on scaffolding, trailer springs, HIAB controls and cranes.

Not only is CorrosionX HD a long term anti-seize, but it's a high performing lubricant when fitting bolts, especially those which are prone to galling/freezing.

Don't waste millions of dollars on new machines, non-productive labour hours, unreliable equipment and down-time just because of rust.

If you could prevent and actively fight corrosion why wouldn't you?

Make your machines last longer and increase productivity with CorrosionX.

Thermoshield has you covered

NATIONAL

MOST people, when they think about the longevity of their building, the efficiency of their air conditioning and solar PV performance, overlook roofs and roof coatings, but they shouldn't.

Forged from the desert furnaces of the Aussie outback, Australia's coating industry is world class by necessity, because few places in the world need to cope with such extreme conditions.

Thermoshield has the capabilities to repair, seal, improve the insulating resistance values (R-values) and future-proof solar PV and other expensive investments.

In fact, Thermoshield is an effective solution for any commercial or private application where there is a need to reduce radiant heat, or where there is a need to preserve structures susceptible to thermal shock and corrosion.

Breaking it down

What is radiant heat, thermal shock and corrosion, and why are they important?

Thermoshield offers three distinct advantages.

Firstly, it minimises power usage and the need for air-conditioning in the home, factory or donga because of its incredible insulating properties.

Secondly, it can completely stop thermal shock.

The insulating properties and the physical barrier created by the product keeps the temperature down and stops the thermal expansion and contraction of steel.



Thermoshield improves the look, longevity and value of buildings.

Thirdly, it prevents rust and corrosion.

Thermoshield has been used to stop rust in steel roofs.

Radiant heat

Radiant heat is the heat emanating from the substrate on your roof.

It is the reason the company uses anticon insulation and bats in the ceilings of housing, dongas, mess halls and factories.

The insulation principle is simple enough: by creating dead air space you limit the heat's ability to transfer and pass through an object or a structure.

Typically, this would be achieved with fibreglass wool and a high-gloss reflective coating on the roof.

The difference between the high-gloss resin applied to tin roofs and a Thermoshield protective coating is stark.

A high-gloss coating reflects the heat away from the surface which works to a certain extent but, over time, the reflective surface will fade, tarnish and become ineffective.

(CONTINUED OVER)



thermoshield.com.au

- **ASSET PROTECTION** addressing corrosion, water proofing, roof strengthening.
- **THERMAL INSULATION** applied to substrates resulting in lower cooling costs and nullifying thermal shock.
- **FUTURE PROOFING** prior to the installation of Photovoltaic panels.



PV panels



Rust treatment



Thermal protection



Protection against ammonium nitrate

All works carried out are compliant with OH&S and accompanied by a 10 year Warranty.

Thermoshield Australia commenced trading in August 1997. We are the manufactures and applicators of our highly accredited and successful product Thermoshield.

We are ISO accredited in Quality Systems (ISO 9001:2015), Environmental (ISO 14001:2015) and Environmental Product Declaration (ISO 14025).

Thermoshield is fire rated by the CSIRO and has dedicated R-ratings and is CM3 Registered.

(CONTINUED FROM PAGE 77)



When Thermoshield is applied to a roof it adds an extra layer of insulation and a physical barrier between the roof and the sun.

Thermoshield works on the principles of insulation.

Two coats of Thermoshield is applied at 250 microns per coat (total 500-micron wet film thickness). Once applied, Thermoshield dries to 375 microns dry-film thickness.

For such a fine coating, Thermoshield punches well above its weight. At 500 microns wet-film thickness, the Thermoshield coating performs just as well as an R-4.5 batt, and in direct sunlight can go as high as R-6.5.

The company can guarantee its work on a restored roof for 10 years, where a brand new roof is only guaranteed for six years.

Thermal shock

Thermal shock is the most common form of roof stress and degradation.

It causes warping, cracks and ultimately leaks to appear on the roof surface, and it is a real problem in our hot, mineral rich areas such as the Pilbara and far north Queensland.

When the surface of the roof heats, the metal expands, then once the temperature drops, the tin contracts and warps, causing permanent damage.

Thermoshield can completely negate the effects of thermal shock by providing a physical, impermeable and insulated barrier that keeps the roof substrate cool.

The application of this product to a steel roof not only protects it from thermal shock, by keeping the roof surface cooler, but also



The glass spheres that give Thermoshield its insulating properties.

increases the performance and efficiency of solar PV cells.

The optimal temperature for PV cells is below 30 degrees Celsius, a temperature you would be hard pressed to find in the shade on the coolest summer's day in the Pilbara.

Corrosion

High explosives probably aren't the first thing that comes to mind when you think of a roof coating, but the applications of Thermoshield on the mine site go beyond futureproofing and insulating roofs.

It has been used as a solution for major problems caused by one of the most difficult to store and highly corrosive substances on mine sites – ammonium nitrate.

With a PH of five, storing large quantities of ammonium nitrate comes at a high cost – generally a new facility needing to be built every six years.

When Thermoshield helped Rio Tinto with its ammonium nitrate storage, the results were outstanding.

Large, open-roofed storage facilities were once given a life of six to seven years before the ammonium nitrate would cause rot in the concrete and corrosion in the tin, ultimately causing the structure to collapse on itself.

Thermoshield has provided a fire-retardant, corrosion-proof solution that continues to stand the test of time.

By applying the coating to the walls and ceilings of the structure (external and internal), the company has kept the building functional and free from corrosion and rot for nearly 10 years.

So how does it work?

Well, it's micro-tech.

The best high-tech should operate on simple principles and that is exactly what Thermoshield accomplishes.

Custom made, ultra-durable ceramic spheres are set in a water-based emulsion that has the consistency of paint.

These microspheres have been specially manufactured to withstand the harshest conditions and treatment the Australian outback can throw at them.

The locally manufactured coating technology has been designed to be hardy, durable, simple and easy to apply using just about any sort of applicator – from a paintbrush to a 2000psi airless spray unit and everything in between.

Those micro spheres are the real, ground-breaking advantage of Thermoshield.

The insulation principle of dead air space is scaled down to the micro level and then, by layering the hollow beads upon one another, the dead air space principle is exponentially amplified.

When this is combined with the water-based emulsion that binds the spheres together, you get a rock-solid coating that insulates as well as reinforces any surface it is applied to.

The spheres are strong enough to pass through a 2000psi airless unit, but also versatile enough for the grey nomads who also love this product and paint it on by hand when they want extra insulation and protection for their caravans.



Thermal shock has buckled the tin and the damaged coating has led to corrosion.



A severely corroded interior wall.

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ELASTOMERIC
LINING**

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- ✓ PROTECTS EQUIPMENT FROM IMPACT
- ✓ STOPS AND PREVENTS CORROSION
- ✓ CHEMICAL RESISTANT

Film stars

TREVOR PICKETT
QLD

MINING equipment and infrastructure in any industry are often subjected to the harshest environmental factors, such as heat, constant impact, abrasion, corrosion and chemical attack.

Surface coating technology is making great headway toward protecting this valuable equipment and prolonging service life.

After 26 years in the protective coatings industry, Queensland manufacturer, LiquiMix, has developed a range of polyureas that solve many expensive and environmentally sensitive problems facing the mining industry.

LiquiMix's range of Tufflon polyureas contain varying degrees of hardness, impact resistance and flexibility, with added qualities of anti-static, fire-resistance, extra-slip and potable-water approval.

All-rounder Tufflon-P80, a polyurea coating designed for permanent immersion (and complies with AS4020 for potable water) is ideal for lining chemical bunds and for use over geofabric to provide a flexible repair of damaged concrete and dams. Tufflon-P80 has an elongation of 450pc pairing strength with great flexibility.

The elastomeric properties of Tufflon allow for thermal expansion and contraction of the concrete or steel substrate underneath, without tearing or splitting, bridging hairline cracks and providing permanent protection.

Coal wash plants are a highly abrasive environment where Tufflon-P80 shines; it is three times more abrasion-resistant than steel and has proven very successful as a lining for inside coal wash down chutes.

Conveyor pulleys are prone to rapid wear from dust and contaminants and are also highly resonant and noisy during operation, if insufficiently lagged.

Because Tufflon-P80 has excellent adhesion to steel, when it is applied to these pulleys they wear significantly less, have longer service intervals and operate far more quietly.

The anti-static grade Tufflon-P90AS prevents even more coal and iron ore dust from clinging to the pulley, reducing wear even further.

Tufflon-D60 is harder than P80 and was developed for application directly to steel without a primer, however best results are achieved when the surface is blasted first, in



A coal mine wash tank being sprayed with Tufflon-P80 polyurea – a tough and flexible anti-abrasive coating.



A coal mine wash tank before being coated with Tufflon-P80. This is an incredibly harsh environment but the coating is three times more wear resistant than steel.

preparation.

Exceptional impact resistance is D60's star selling point, as it can withstand the constant pounding of the ore.

This coating finds extensive use in the trays of mining tipper trucks and has been widely accepted by the Australian Transport Authority because of its unique characteristics.

Variant Tufflon-D60SL has an extra slip additive allowing for loads to release more easily and at a lower angle than an uncoated tray.

Typically, D60SL allows a load of material to release 20 degrees earlier than an uncoated tray surface.

Thus, if a load would normally begin to slide at 45 degrees, the Tufflon-D60SL coating would allow it to release at only 25 degrees.

As a result, the tipper tray is lower when

the load begins to move, which is safer for personnel and less likely to cause the truck or trailer to tip on an uneven or soft surface.

Tufflon-D60 is particularly useful in aluminium trays. Aluminium construction helps to reduce GVM and therefore increase the vehicle's actual payload, but the alloy is notoriously wear-prone and suffers greatly from the continuous impact and abrasions of coal and ore.

D60 or D60SL can be applied at a thickness of only 3mm at the front end and on the sides of the tray and gradually increased to a thickness of 8mm at the rear of the tipper, where the greatest abrasion occurs.

Tufflon-D60 and D60SL have excellent impact resistance but also superb adhesion to all metal. In the case of aluminium though, the surface should be blasted and etch-primed before the D60 top coat is applied.

LiquiMix tests all applications for adhesion, using a hydraulic adhesion tester.

Hydraulic force is applied to the lining until the Tufflon is eventually pulled away from its substrate.

The force required to break it away is measured and recorded. Forces of 5Mpa (725psi) have been required to pull Tufflon off aluminium and as much as 12Mpa (1740psi) have been required to tear it off a steel substrate. This is a significantly high level of adhesion.

It is this level of bonding between Tufflon and a variety of substrates that makes it suitable for coating steel pylons before they are driven into the ground, to prevent corrosion.

It is also used extensively on offshore rigs for corrosion protection of metal infrastructure and equipment at sea.



This bucket was sandblasted and masked-off before being sprayed with Tufflon-D60. This coating was designed to be applied directly to steel and has very high impact resistance.



This coal mine settling tank has been sprayed with Tufflon-P80. The coating's anti-corrosion, high adhesion and high abrasion resistance make it perfectly suited to this application.

Both P80 and D60 can be applied to concrete to form a seamless coating suitable for containing everything from potable water through to the harshest acids and alkalis.

However, fast-curing epoxy primer Civilox is required before either coating is applied to bare concrete to avoid pinholes in the finish.

Application of P80 and D60 polyureas are done with specialised plural spray equipment that accurately proportions the two parts,

pressurises and heats them and then mixes them at the gun.

This airless spray system is produced by Graco. LiquiMix is the leading Graco Reactor distributor throughout Australia and New Zealand and has the largest Graco service centre in the southern hemisphere.

Another product earning its stripes in the Australian mining industry is Liquibond, a unique single-part polyurethane that binds the



After the coating has dried, a technician checks for final dry film thickness with an ultrasonic tester.

surface of gravel roads or compacted road base.

Liquibond can be applied by spraying or dribbling it over the road, at which point it penetrates the top 50mm below the surface providing long-term consolidation and very effective dust control.

Heat, dust, salt, abrasion, water and noxious chemicals constantly take their toll on mining equipment and infrastructure but

LiquiMix's range of polyurea coatings are cost-effective and create long-term savings over the life of the mine.

They work hard and extend maintenance service intervals, increase component service life, improve tipper safety and protect expensive fixed plant equipment.

Tufflon coatings may not bask in the limelight but they are definitely film stars.

MORE INFORMATION: LiquiMix Pty Ltd | 07 3277 6655 | www.liquimix.com

Thick skinned

TREVOR PICKETT
QLD

DICEROS bicornis might sound like a chemical compound found in a polyurethane formulation but it is, in fact, the Latin name for a Black Rhino – the beast with an incredibly tough hide.

Rhino Linings were named after these thick-skinned juggernauts and the name aptly describes their range of protective coatings.

Two-part, spray-applied, high build polyurethane was developed in the US in the early 80s to protect the beds of pickup trucks – the highest selling vehicles in America for many years.

Russell Lewis, the founder of Rhino Linings Corporation in the US, was a pioneer in this process and perfected the technology and spray equipment for the application of two-part high build polyurethane.

He recognised the benefit of the product and its ability to resist the rigours of wear and abuse in pickup beds, long before the advent of drop-in plastic liners (also known as 'load accelerators' to those in the trade).

Rhino Linings Corporation started operations in the USA in 1988 and Australia in 2001.

In the early to mid-90s, spray-applied pure and hybrid polyurea coatings were developed in the USA and released to industry as a new product. On the other side of the world, in Australia, Polychem on the Gold Coast saw the opportunity to expand into this range of products before joining Rhino Linings.



A pulley coated with Rhino Tuff Stuff.

It was the Australians who took the lead when it came to designing and building safe and cost-effective, hydraulically-driven, analogue spray equipment to suit the application of these polyurea coating systems. So, just as the US had supplied Australia with polyurethane spray technology, Polychem reciprocated by supplying its polyurea equipment to the US and joined Rhino Linings Corporation as Rhino Linings Australasia Pty Ltd.

Now, polyurethane coatings, like Rhino's ute protection, can be applied at room temperature and the two-part mix will cure in 15-25 seconds. Polyurea however, and particularly Pure Polyurea,

is a different creature altogether and must be pre-heated to 60 degrees Celsius before it can be applied.

It cures in five to seven seconds and is not affected by humidity. Each component of the two-part mix is stored in a specially made, sealed 200l drum and a pump station circulates each part separately through a heater (including the hoses to the spray gun) until they are both up to temperature. This typically takes half an hour.

Once up to temperature, the modern-day Graco-designed solid state electric and/or

hydraulically-driven pump systems apply between 2500 and 3000psi of pressure to the two parts, and they are mixed in the gun before being sprayed onto the prepared surface.

The brilliance of this type of spray system is that after the job is finished, the system can be allowed to cool and because the two parts are only mixed at the gun, the unused portions of each drum are uncontaminated and are free to be used at any time in the future on the next job. Even the gun does not require flushing.

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(CONTINUED FROM PAGE 81)



Rio Tinto salt pulleys with Rhino Tuff Stuff-encapsulated ends/fastener cover plates installed.



The coverage is also superb because a total of 400l (200l of each part) will cover 400m² with a 1mm coating thickness.

Rhino Linings Pure Polyurea is also highly chemical-resistant and some versions have added flame retardants for specialised applications.

The Rhino Pure Polyurea family of products are hard wearing, chemically-resistant and tough, yet flexible in some versions.

It is well-suited to chutes, buckets and concrete clarifier tanks.

In the case of concrete tanks, the optimal application time is before the tank is put into service as the coating bonds with the concrete and prevents any leaching of chemicals into the substrate once applied.

Because polyurea cures so quickly it can be applied to a tank, which can then be returned to service within 12 hours.

The Australian-manufactured Pure Polyurea PPI195 coating is seamless (like all of these coatings), will not separate from the concrete, will not catch or interfere with the rotating arms in a clarifier tank and has a tensile strength in excess of 3200psi.

Mine site engineers have recognised the long-term benefits of Rhino's polyurea coatings too, when it comes to the life of chemical storage bunds.

Acids, alkalis, fuels and harmful chemicals soon seep into unsealed concrete bunds and eventually make their way into the subsoil – hardly an environmentally acceptable situation.

Once again, the best option is to coat these bunds before they are used so that the coating can bond with the concrete from the outset for a perfect impervious seal that will offer total chemical resistance for many years in most applications.

Polyurea is also ideally suited for the corrosion and impact protection of steel structures and tanks.

To say that Rhino's thick-skinned ute lining is versatile is a masterpiece of understatement.

Apart from offering years of scratch, dent and rust protection to tens of thousands of pickups and utes around the world, it also has anti-ballistic properties and that is why it is used on the rear doors of Chinook helicopters and applied to body-armour.

Compared to these applications, protecting the underside of mud guards on mining equipment or coating fuel and oil tanks is a walk in the park.

An interesting case history of Rhino's polyurethane ute lining is its application to conveyor rollers in the hot and acrid environment of WA's salt mines.

These rollers can vary from 600mm in diameter, 2m in length and 4t in weight to 3m in diameter, 5m long and 15t in weight.

The end plates on these rollers work hard under load.

They have a drive mechanism and a shaft at each end and the bolts that hold these plates in place are subject to dust, salt, water and vibration.

This is the perfect storm for bolt failure as tiny stress fractures eventually form and the ingress of salt and water causes corrosion inside the bolt shaft, which ultimately leads to the bolt failing under the tensile load.

In many cases, the rollers would fail in as little as a year and when that happened the whole conveyor went down and the line was out of service – a costly exercise.

However, when the Rhino Lining's Tuff Stuff spray-applied polyurethane was applied, in the field, to these end plates, it was able to coat all the nooks and crannies and provide a flexible, corrosion resistant coating that prevented all the contaminants – especially salt and water – from reaching the bolts in question.

As a result, those end plates have not failed since the coating was applied over six years ago. A remarkable result in such a savage environment.

Another coating yielding impressive results in the concrete construction arena is Rhinthane Hard Coat.

This is a hard, tough, solid plastic type coating that is typically applied to styrofoam and used as a core filling in bridges and numerous other concrete structures.

The Rhinthane coating prevents the styrofoam from collapsing under the weight of the concrete, and when the coated foam component is set in place it can serve as a former for reinforcing steel and also saves on the amount of concrete required for the job. This is another cost saving resulting from a clever coating.

Rhino Linings can supply the equipment, parts, primers, products, training and tech support for the application of polyurea coatings.

It is the only company in Australia that manufactures in Australia and it frequently produces big batches of polyurea and polyurethane, nearly every week, and truck it to customers around the country and overseas.

Its other manufacturing plant is in Texas, which means it also has the capability to ship internationally.

Rhino's linings may be thick-skinned but the company is still sensitive to their customer's needs.



A Rhino Linings applicator applying Rhino Pure polyurea in the field.


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PREMIUM PROTECTION

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for your next project.**

High quality, spray-applied coating solutions that provide superior protection against corrosion, impact, abrasion, slipping and noise.

MORE INFORMATION: Rhino Linings Australasia Pty Ltd.
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Revolutionary coating systems

NATIONAL

EQUIPMENT on mine sites can face extreme conditions, so protective coatings are essential to ensure machinery functions to a high standard for its entire life cycle.

Unfortunately, the drying time in coating systems has traditionally be a long and drawn-out process, with one day needed for the primer coats, the need for sanding between each coat and a final day required to apply the top coat.

Masterblasters owner and general manager Tim Hamblin was confident the company could find a solution and avoid this extensive downtime – and that solution was the three-coat system.

“We developed the three-coat system with our paint supplier, Paint-n-Colour Toowoomba, which would allow us to reduce the drying time on coatings by 33 per cent,” Mr Hamblin said.

“Essentially, instead of spending multiple days on each piece of equipment we can be in and out in one day – saving our clients valuable time and money.”

Usually protective coatings dry in fine sand-like particles on the equipment, requiring the crew to sand down all surfaces before applying the final coat of paint.

Masterblasters’ three-coat system uses a paint that does not dry in fine particles – negating the need for sanding.

“With that step removed in the drying process, we can complete our work faster and still to an incredibly high standard,” Mr Hamblin said.



Masterblasters has developed a revolutionary three-coat system which cuts drying time by 33 per cent.

The system can dramatically extend the life cycle of machinery in challenging environments where equipment is often cleaned and washed down with mine water, which is often saltier than sea water.

“We developed the system to cater for these clients and give them the high quality protection they need in less time than our competitors,” Mr Hamblin said.

“With a variety of drying bays available for

different sized equipment, along with our three-coat system, we really can cater for most of our clients’ needs.”

Abrasive blasting

Abrasive blasting removes millscale, rust and damaged paint caused by operating in environments with excessive heat and UV, exposure to

chemicals and other corrosive elements.

Masterblasters can prepare a metal surface by removing any corrosion or previous coating, providing a clean profile for paint to adhere to.

This is a crucial step in the process for the overall protection and longevity of mining equipment protective coatings.

(CONTINUED OVER)



DELIVERING HIGH PERFORMANCE OUTCOMES IN

**ABRASIVE BLASTING
PROTECTIVE COATINGS
MOBILE SERVICES**

FOR STRUCTURES AND EQUIPMENT OPERATING IN CHALLENGING ENVIRONMENTS:

- High temperatures
- UV exposure
- Corrosive environments
- Mining
- Industrial process plants
- Operations in remote and difficult terrains



WE GUARANTEE:

- High levels of durability & quality finishes
- Professional workmanship
- Comprehensive quality management
- Reliable turnaround times
- Consistent outcomes
- ISO 9001:2015 CERTIFIED
- NACE QUALIFIED EMPLOYEES
- MODERN & ENVIRONMENTALLY CERTIFIED BLASTING & COATING FACILITY

(CONTINUED FROM PAGE 83)



With a variety of drying bay sizes, Masterblasters can cater for a range of equipment sizes.

Mr Hamblin said the company used quality-assured garnet with low chloride certification, or alternative abrasive mediums to ensure consistency and maximum corrosion protection.

"The right combination of abrasive blasting and protective coatings can reduce the costs of repairs and replacement equipment and really add value for our clients," he said.

"Our rigorous assessment process enables us determine the best surface preparation method for your equipment or site.

"We consider factors such as humidity and

temperature, adhesion and chemical bonding, wear resistance, as well as cost efficiency and ongoing maintenance requirements."

"Our fully environmentally compliant blasting facility in Toowoomba caters for large scale equipment including drilling rigs, structural steel beams (of up to 18m), as well as smaller components; with extensive storage and set-down areas onsite," he said.

Custom coatings

Different equipment in separate locations on



mining sites experience varied exposure levels so it's essential a variety of high-performance, heavy duty protective coatings be considered.

In the same vein, the internal and external surfaces of processing, storage or thickener tanks will all have different coating requirements depending on the temperatures and chemicals they are exposed to.

Whether the need is for corrosion protection, fire protection, chemical resistance, long-term weathering, colour stability, abrasion, insulation, heat resistance, or immersion linings, Masterblasters can

source the right paint for any project.

"Our coatings help reduce downtime and in turn maintenance costs over the life of equipment," Mr Hamblin said.

"We offer comprehensive technical advice on all protective coating options for our clients."

Through supplier Paint-n-Colour, Masterblasters also offers custom paint matching services which are included with expert technical advice from industrial chemists on the best product and best coating options for any situation.



Depending on its location, equipment may be exposed to the elements and abrasion or a range of chemicals and temperatures – each with different coating requirements.



The right combination of abrasive blasting and protective coating can dramatically extend the life of mining equipment.

HAVILAH RESOURCES CHIEF EXECUTIVE WALTER RICHARDS

Over the past decade, Junior Havilah Resources has delineated a JORC Resource metal inventory of 1.3mt of copper, 3.2moz of gold, 31.6kt of cobalt and 450mt of iron ore. **Emma Davies** spoke with chief executive **Walter Richards** about the recent partnership with the GFG Alliance, the company's iron ore strategy and plans for the Mutooroo and Kalkaroo projects.

Q. Can you please tell me how the capital injection of up to \$100m from OneSteel Manufacturing will impact Havilah's iron ore assets and copper prospects?

This proposed investment in Havilah by GFG Alliance will see Havilah's work programs for its iron ore assets and its copper prospects in the Mutooroo Copper-Cobalt District, including the Mutooroo deposit, being fully funded through the completion of definitive feasibility studies.

This will allow Havilah to make decisions about investing in the development of the projects and potentially transforming them into actual mining operations.

Funding is an ongoing challenge for many junior explorers but this strategic alliance with GFG presents an opportunity for Havilah to advance its work programs to the benefit of all shareholders, and the wider South Australian community.

The work programs can be advanced with confidence, knowing that they are fully funded, including adequate allowance for contingency.

Q. How will the partnership with GFG help Havilah commercialise and gain access to global markets?

The GFG Alliance is a London-headquartered international group of businesses, founded and owned by the British Gupta family, with annual revenue of over US\$15 billion and around 15,000 staff. It combines energy generation, metal manufacturing, engineering, natural resources and financial services, working together to deliver a common business strategy.

The Alliance comprises Liberty, an integrated industrial and metals business; SIMEC, a resources and infrastructure group; Wyelands, a banking and financial services arm; JAHAMA, a division that manages and develops the Alliance's global property holdings; and the GFG Foundation, that focuses on retention and creation of engineering and industrial skills.

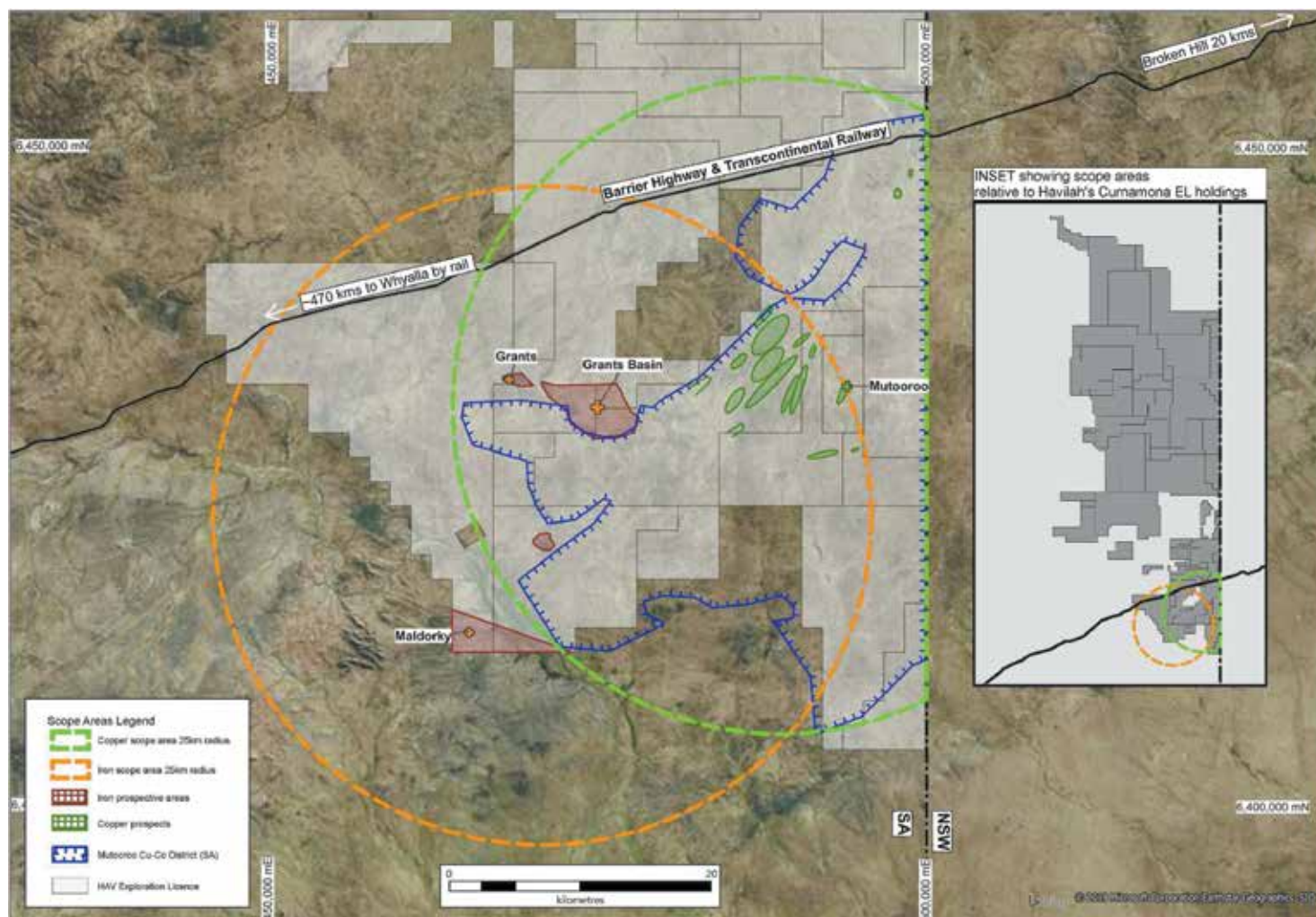
The acquisition of the ArcelorMittal European assets will increase the group's workforce to about 30,000 people and turnover to over US\$20 billion.

The GFG Alliance acquired the Whyalla steelworks, which also includes an iron ore export facility.

Establishing a relationship with the GFG Alliance provides access for Havilah's iron ore assets to a steelworks and a port.

Shipping directly to a steelworks, securing a market for the iron ore and avoiding the high capital cost associated with the construction of a port creates for Havilah the opportunity for value to be added and costs to be reduced.

Q. Can you please explain how the funding via equity placements will work and how Havilah will maintain control and independence?



Iron and copper project scope areas showing Havilah Exploration Licences and prospects.

An overview of the proposed funding via a Share Subscription Agreement (Agreement) was provided in our announcement of May 1, 2019, with further detail to follow upon the release of our Notice of Meeting, which is expected to be completed by the end of June 2019.

Broadly, Havilah will receive a committed initial placement of \$6m of funding by way of subscription for fully paid ordinary shares, with committed subsequent placements of \$44m subject to the achievement of project milestones and \$17m in conditional project funding, if required, to complete agreed work programs on the projects.

These subscriptions will take place over an expected three years, which is the current expected duration of the agreed work programs. GFG's interest in Havilah will therefore increase as the work on the work programs is completed.

It is expected that GFG will own 51pc of Havilah upon completion of the work programs.

A further \$25m in conditional development funding for the Mutooroo project is provided for in the agreement for funding of the development costs of the Mutooroo project post-delivery of a positive DFS.

Havilah will also have access to \$8m conditional discretionary corporate funding, if required.

Havilah will retain operational control of all assets including Kalkaroo and regional exploration.



Mr Walter Richards.

Havilah's board of directors will also continue to consist of a majority of independent directors and will have an independent chair.

As a listed entity on the ASX, Havilah will also need to continue to comply with the ASX Listing Rules and the Corporations Act which provides protection for minority shareholders.

Q. Now Havilah is fully funded, what are your plans for the Mutooroo project?

Work has already commenced on a new scoping study for the Mutooroo Project (Mutooroo), with the aim of developing Mutooroo initially as a higher throughput copper only operation.

This strategic rationale is based on internal modelling and option analysis that demonstrates Mutooroo project economics are enhanced significantly if plant throughput and mine life can be increased.

This approach can also reduce project risk by maximising the benefit from conventional processing methods and relatively low capital input to produce a copper concentrate.

Key to this strategy is the discovery of additional shallow copper-cobalt resources located in the surrounding highly prospective Mutooroo Copper-Cobalt District, within trucking distance of the existing Mutooroo resource.

Later stages of the program will seek to realise the potential value of cobalt contained in the Mutooroo ore as well as investigate the viability and potential value of transitioning to an underground mining operation (see summary of the planned staged work program in Table 1).

In summary, the approach to advancing Mutooroo is not changing, but work may be accelerated with the confidence once it is fully funded.

Mutooroo also stands to benefit significantly from infrastructure that will potentially be built to support the iron ore assets.

This could further improve the economics of the project.

Q. Can you please run through the next steps for Kalkaroo after the granting of three mining leases in South Australia?

(CONTINUED OVER)

(CONTINUED FROM PAGE 85)

On May 23, 2019, Havilah announced that the South Australian Minister for Energy and Mining had granted three Mineral Leases (MLs) and two Miscellaneous Purposes Licenses (MPLs) for the Kalkaroo Copper-Gold Project (Kalkaroo Project).

This decision now secures Havilah's right to mine the Kalkaroo Project.

The next step in the permitting process is to obtain permission to mine which requires the submission and approval of a Program for Environment Protection and Rehabilitation (PEPR), as required under South Australia's Mining Act.

Work continues on the finalisation of the updated prefeasibility study (PFS), due for completion in the last quarter of 2019.

Work is continuing on investigating development opportunities, which includes progressing discussions with potential investment partners.

Q. What is Havilah's iron ore asset project strategy and how is the iron ore scoping study progressing at Maldorky and Grants projects?

The iron ore scoping study commenced in June 2018 as part of the due diligence work led by SIMEC Mining on Havilah's Maldorky and Grants iron ore projects in north-eastern South Australia, near Broken Hill.

The scope of work assessed the resource, project life, production, infrastructure and ultimately commercial viability of the iron ore projects, culminating in the proposed funding of up to \$100 million from OneSteel Manufacturing Pty Ltd (trading as SIMEC Mining), a member of the GFG Alliance.

Work plans to provide a pathway to potential commercialisation of the iron ore



Aerial view of drill site GBRC005, recently completed within the Grants Iron Ore Basin'.

projects, as well as copper prospects in the Mutooroo Copper-Cobalt District will be executed following shareholder approval of the transaction.

Q. Where do you see Havilah in the next five years?

Havilah's strategy has been to develop what is within reach, fundable and manageable.

World metal prices and variable conditions in global financial markets have meant that Havilah has needed to maintain agility in order to take advantage of opportunities when and where they have arisen.

Our strategy to divest projects that are of lower priority where fair value can be obtained was implemented in our divestment of our North Portia project.

This divestment has seen Havilah

receive \$6m to date of a total divestment price of \$12m plus 1.5pc NSR royalty.

This is a very favourable outcome for Havilah considering that the North Portia Project is not a fully permitted project.

Whilst our preparedness to consider various ownership and funding arrangements for large capital projects is critical to our strategy, our core business is exploration.

Replenishing our project pipeline with new discoveries leveraging off our large prospective tenement holding and utilising our extensive knowledge base therefore remains our key focus.

My vision for the next five years is for Havilah to grow and realise the value of its multi-commodity portfolio, through discoveries and transactions, to generate a cash flow stream by focusing on the commodity of choice.

I will know that we have been successful when Havilah receives recognition for the value of its multi-commodity portfolio and its performance.

Q. Is there anything else you would like to add?

This strategic alliance with GFG Alliance provides Havilah with a rare opportunity to contribute on a larger scale to the prosperity of the South Australia, whilst retaining exposure for our shareholders to the potential project value appreciation as fully funded work programs are applied to move projects rapidly towards definitive feasibility studies.

This is an exciting time in Havilah's history and I am looking forward to executing the work programs as part of the proposed transaction with GFG whilst always looking for our next opportunity.

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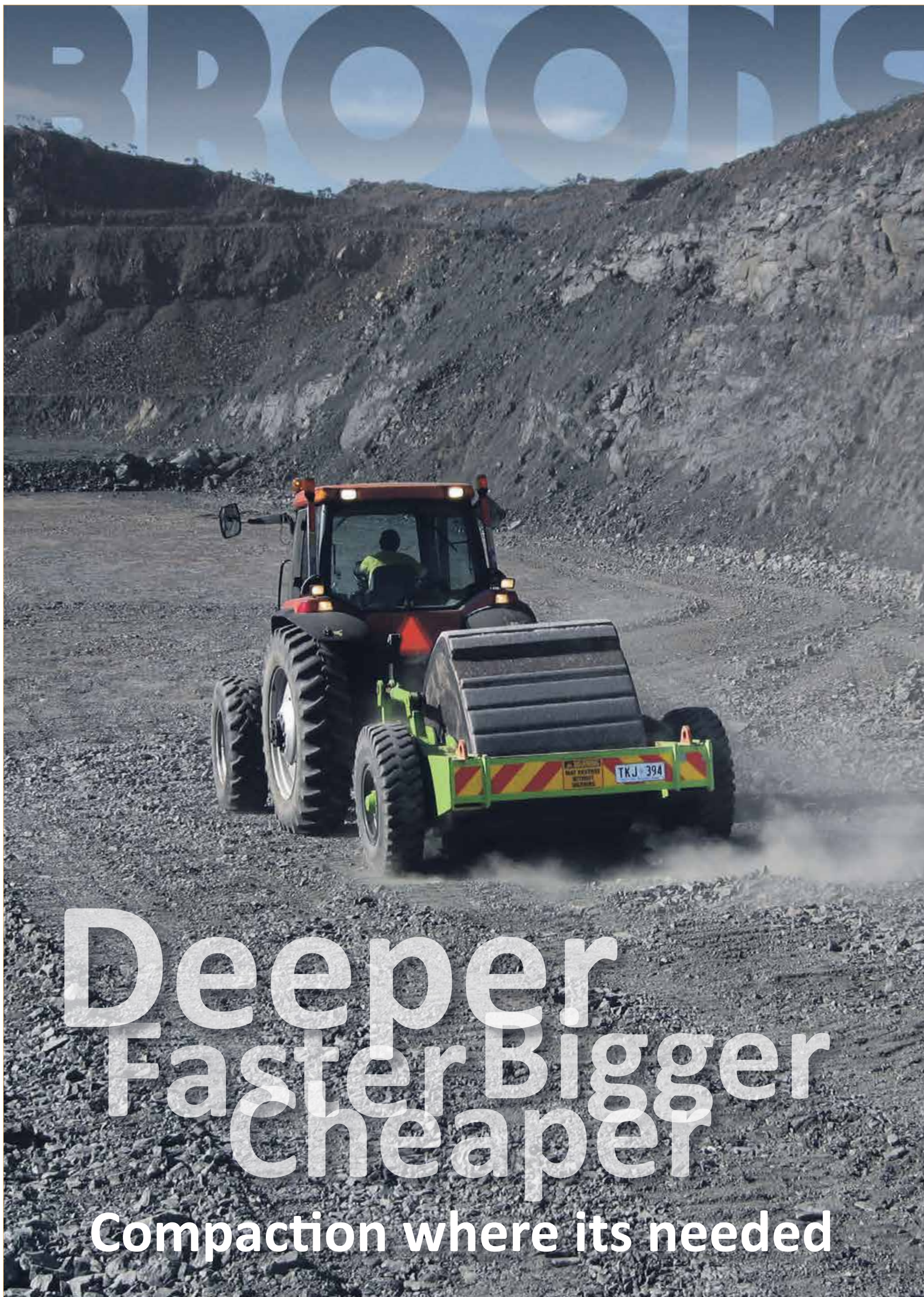
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