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VINCENT ALGAR
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VANADIUM**

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Image: FMG.

GAINING GROUND

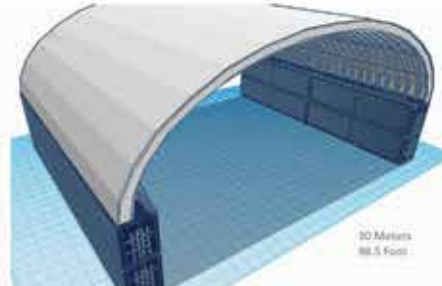
Fortescue Metals Group – led by chief executive Elizabeth Gaines – has a busy year ahead with construction of the 30mtpa Eliwana iron ore project set to begin, as well as continued shipments of its new higher grade West Pilbara Fines product.

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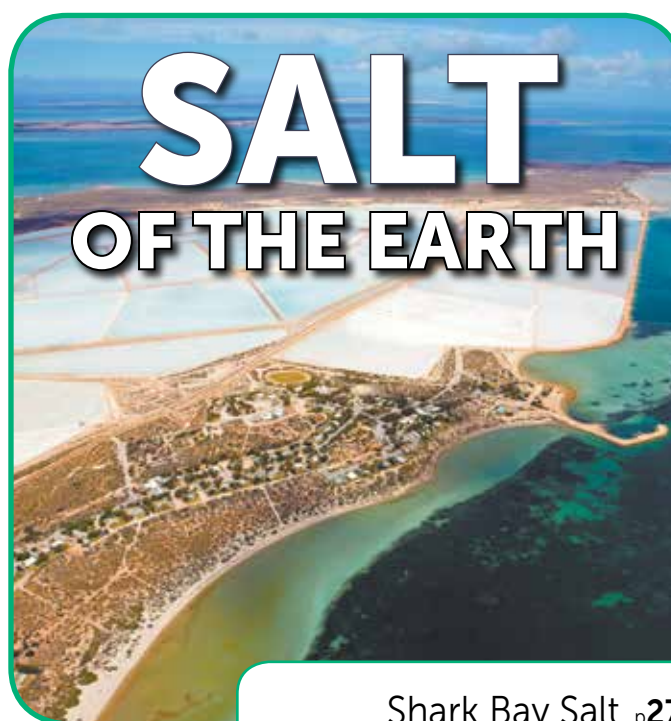
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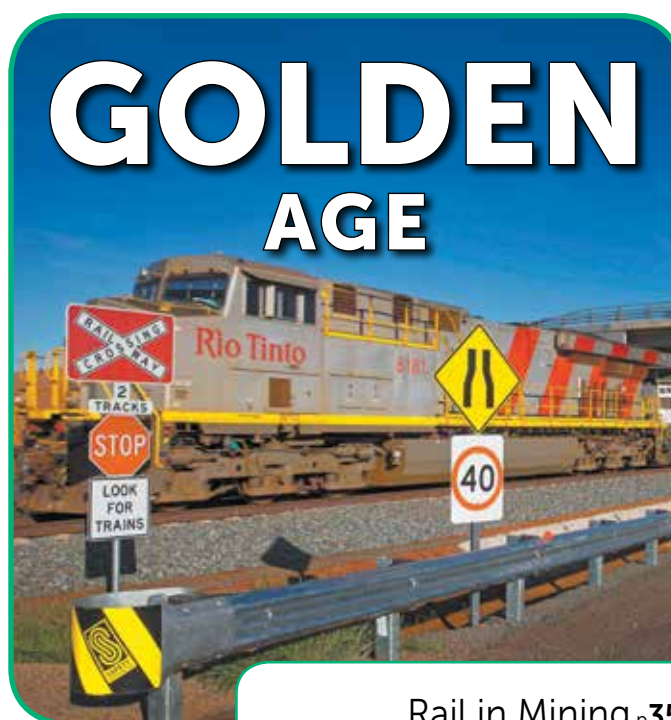
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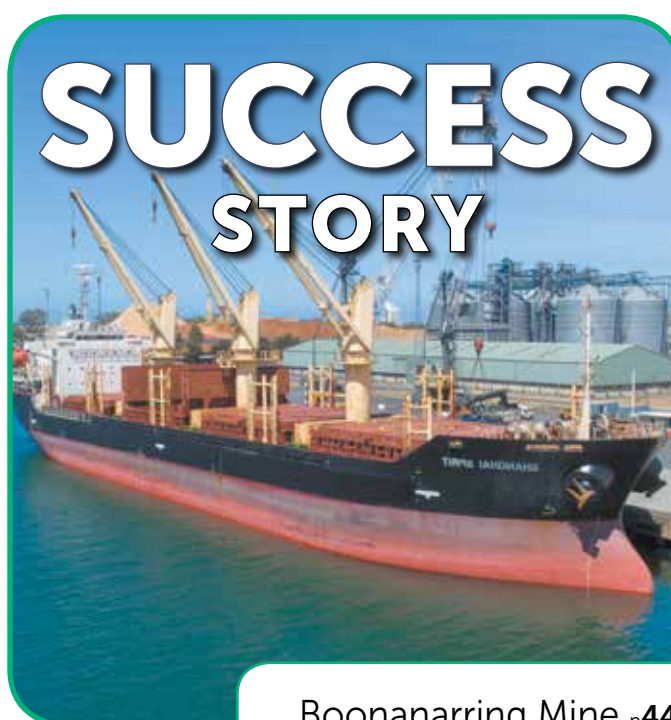
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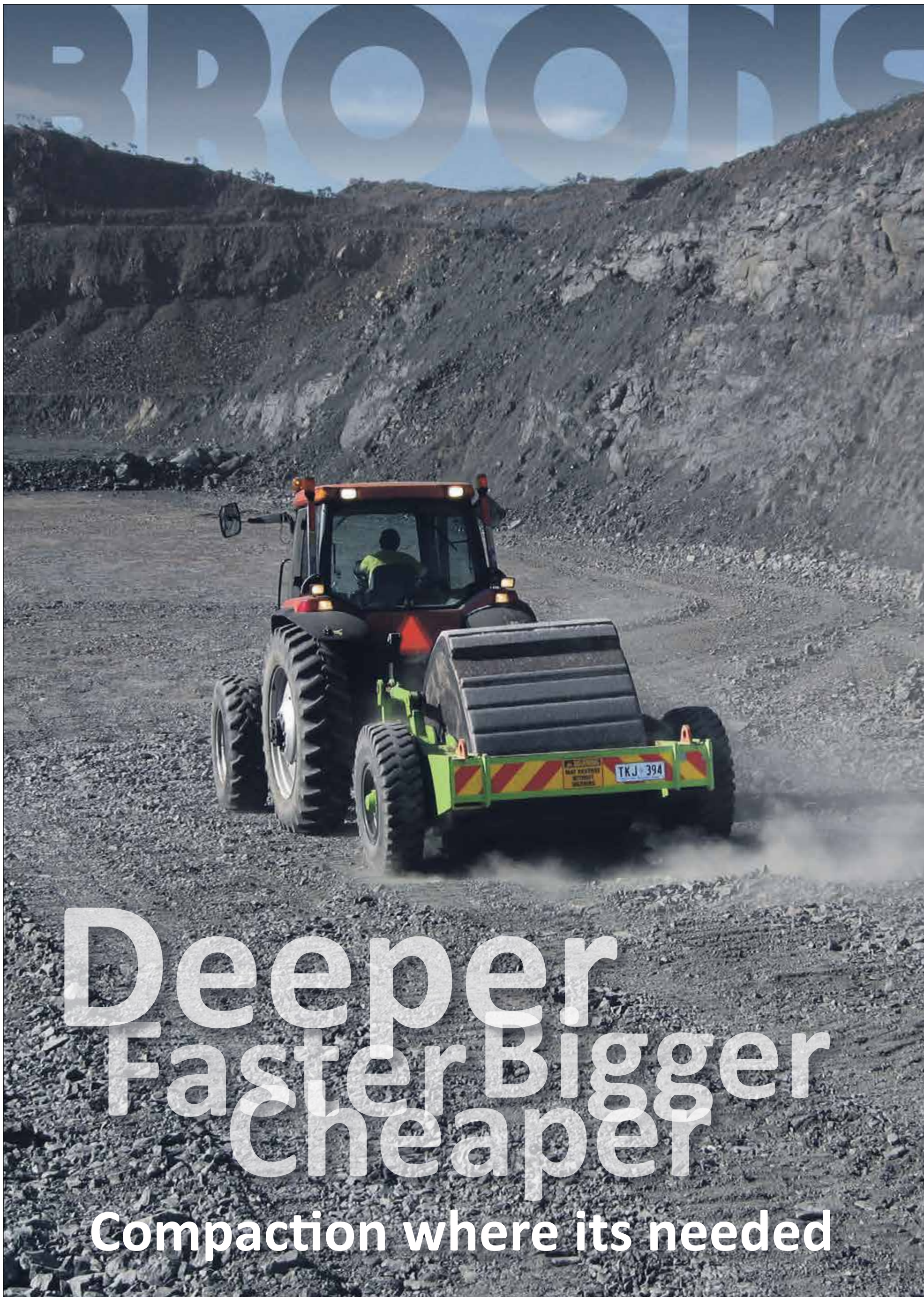
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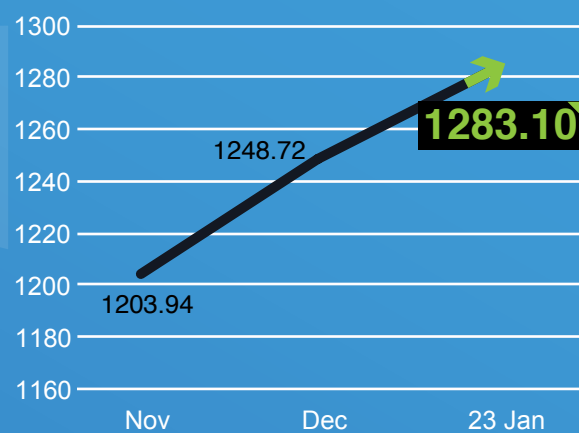
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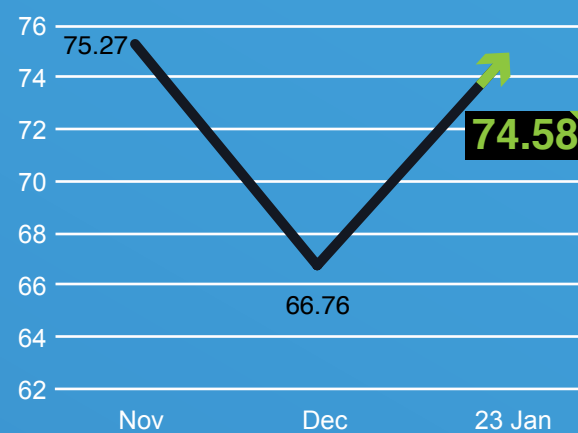
Gold prices edged higher in January, hovering between the \$US1280 and \$US1300 mark.



IRON ORE

\$US/t
62% Fe CFR China

After a tough run late November and early December, iron ore prices are back on their feet rallying to multi-month highs of \$US74/t.



COPPER

\$US/t
LME Price

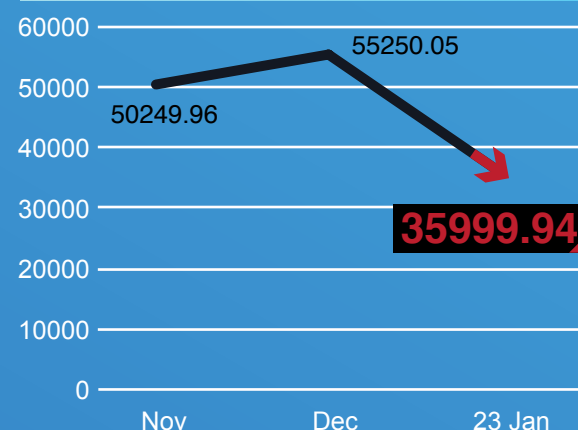
The red metal's prices are still yet to recover from lows experienced in late 2018, in light of recent reports confirming a slowdown in China's economy.



COBALT

\$US/t
LME Price

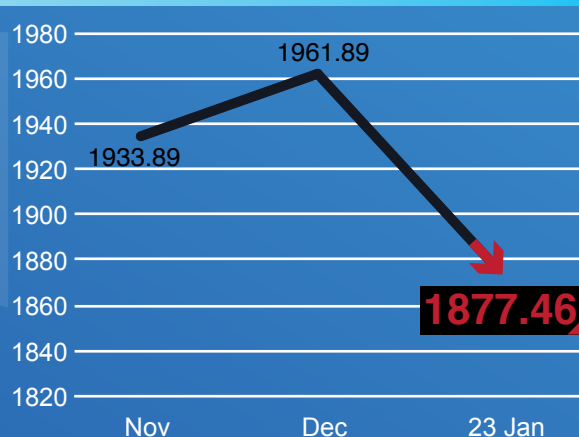
Cobalt spot prices took a tumble in January with supply of the metal beginning to outweigh demand.



ALUMINIUM

\$US/t
LME Price

Aluminium prices saw some improvement in January before falling again, despite tighter China supply.



ZINC

\$US/t
LME Price

Zinc remained relatively flat in January as Chinese consumption of the metal lowered ahead of the Chinese New Year.



LEAD

\$US/t
LME Price

Lead prices drifted higher through the month tipping above \$US2000/t due to rising demand from consuming industries.



NICKEL

\$US/t
LME Price

Nickel prices hit a 10-month high in January to above \$US11,615/t with analysts optimistic for the year ahead.



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Image: Deloitte.

Deloitte's Ian Sanders believes miners need to rethink their strategies in an ever-changing market.

Miners must keep pace: Deloitte

AMY BLOM
NATIONAL

MINING companies have begun to adopt key technologies to help them adapt in a changing market, but are still lagging behind other industries, according to Deloitte's *Tracking the Trends 2019*.

According to the report, released on 29 January, many miners had already begun exploring and investing in analytics and artificial intelligence (AI), but had not kept up with the automotive and manufacturing industries in their efforts to digitalise supply chains.

It stated that while miners tended to digitalise discrete pieces of equipment such as trucks and trains – they had not extended these efforts across the entire supply chain, from pit to port.

“As a result, the data they generate from the technology they have installed exists in a vacuum – hampering their capacity to generate true insights that could otherwise enable them to reduce inventory costs through just-in-time procurement, enhance asset utilisation rates, and improve their production outcomes by making their Engineering, Procurement and Construction relationships more dynamic and responsive,” the report stated.

“In essence, a supply chain paradox exists; although most mining executives agree that the supply chain is a top priority for digital transformation investments, supply chain leaders are generally not consulted when it comes to making decisions about those investments.

“As a result, supply chain improvements remain incremental rather than delivering innovations designed to optimise operations.”

Deloitte National mining leader for Australia Ian Sanders said miners also needed to go beyond technology in their ability to adapt in an ever-changing market.

“Disruption and volatility has become the new normal,” Mr Sanders said.

“Australian mining companies must not only adapt to the disruption of industry from a technical viewpoint, but the disruption being brought about by changing community standards and attitudes towards mining.”

BHP \$US600m productivity hit



Image: BHP.

Productivity for the December quarter was impacted by lower volumes at WAIO, Olympic Dam and Spence.

EMMA DAVIES
WA

BHP has revealed a derailment of a train carrying iron ore in November and several high profile outages has cost the miner about \$US600 million.

In the company's December quarterly report it said productivity had been impacted by the iron ore train derailment in the Pilbara, as well as lower than expected volumes at Olympic Dam brought on by an unplanned acid plant outage in August 2018; and a fire at the electro-winning plant at the Spence copper project in Chile in September.

The unplanned incidents resulted in a 4 million tonne loss in iron ore volumes, and a volume impact of 45,000t copper at Olympic Dam, and 25,000t copper at Spence.

Despite the result, BHP assured production guidance for FY19 remained unchanged for iron ore, and copper guidance had increased to between 1.6mt and 1.7mt with the retention of its Cerro Colorado asset.

However, in a separate matter the miner was hosing down claims it had underpaid iron ore royalties to the WA Government for more than a decade with the alleged total owing between \$200 and 300 million, due to issues relating to the miner's Singapore marketing hub.

In a statement BHP said the Mines Department had recently queried a “long-standing and historically accepted deduction for costs related to the sale of WA iron ore”.

“The long-standing deduction has been consistently audited and accepted by the Mines Department as part of BHP WA

iron ore royalty calculations,” the company stated.

“It is concerning that previously audited and accepted payments to the government are now being revisited and BHP is working with the Mines Department to resolve this matter.”

BHP was also facing widespread criticism of the decision to scrap a historic domestic shipping contract, which would leave about 80 Australian shipping workers from two iron ore vessels without a job.

“BHP's decision destroys one of the oldest national domestic shipping supply chains in Australia and seafarers aboard the MV Mariloula and MV Lowlands Brilliance have been discarded, left high and dry,” International Transport Workers' Federation (ITF) Seafarers' Section chair Dave Heindel said.

New mine approved for Northparkes

ELIZABETH FABRI
NSW

CHINA Molybdenum Company (CMOC) and Sumitomo have green lit a new \$200 million block cave mine at their Northparkes copper and gold project in Central West NSW.

The mine – E26 Lift 1 North (E26L1N) – was expected to enter production mid-2022 and produce about 40 million tonnes of ore over 10-years.

E26L1N would include 11km of underground development, an underground primary crusher, conveying systems and associated infrastructure.

CMOC executive chairman and chief executive Steele Li said the joint venture partners were “really excited to see this project come to fruition and to watch Northparkes continue to develop and grow”.

“Northparkes plays a pivotal role in our strong and long-term presence in Australia as an internationally renowned mining company,” Mr Li said.

Northparkes acting managing director Hubert Lehman said Northparkes was the first mine in Australia to use the block cave mining method and this new mine was a



Image: Northparkes Mines.

major investment.

“We know the exploration potential of Northparkes and we believe we will discover more copper and gold deposits to take us even further into the future,” Mr Lehman said.

“Northparkes is the world's most automated underground block-cave mine and we are

proud of our history and achievements.

“The mine has been operating for 24 years and we have a vision of a century of mining together, here in NSW's Central West.”

During peak construction the project would employ up to 180 people made up of direct employees and contractors.

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IN BRIEF

Battery Industry Strategy launched

WA

WA Premier Mark McGowan has launched a WA Future Battery Industry Strategy to grow the State into a world-leading exporter of future battery minerals.

“Our Future Battery Industry Strategy will drive the development of the Western Australian battery materials industry that will create local jobs, contribute to skills development and economic diversification, and maximise benefits to regional communities,” Mr Mark McGowan said.

“Western Australia has all the battery minerals you need to make batteries and energy technologies, we also have a stable and robust economy with low sovereign-risk.”

Alliance to acquire 100pc of Wilcherry

SOUTH AUSTRALIA

ALLIANCE Resources has entered into an agreement with Tyranna Resources to acquire the remaining 18.59 per cent interest in the Wilcherry project and an 80-person Kimba camp for \$1.5 million.

Under the deal, Alliance would also acquire the high-grade Weednanna gold deposit, where a mining and processing scoping study was currently underway.

Tyranna said the sale of its remaining interest would allow it to focus on its 100-per cent owned Eureka gold mine in the Goldfields, WA, and Jumbuck project in South Australia.

“In this climate of soaring Australian gold prices, we are focusing on accelerating the cash generation potential of Eureka,” it stated.

NAIF due diligence at Sulphur Springs

WA

THE Northern Australia Infrastructure Facility (NAIF) will investigate the potential to provide debt financing for Venturex Resources’ Sulphur Springs copper-zinc project.

Up to \$5 billion of debt finance could be provided to support and encourage infrastructure development – if Venturex proved it could generate benefits for local communities in the Pilbara region during and beyond the life of the mine.

“We welcome the progression of the project to NAIF’s due diligence phase and look forward to working closely with NAIF over the coming months as the company moves closer to a final investment decision on the project,” Venturex managing director AJ Saverimutto said.

Sconi declared “prescribed project”



The project would create 500 jobs during construction.

EMMA DAVIES
QLD

AUSTRALIAN Mines’ flagship \$1.4 billion Sconi cobalt-nickel-scandium project in North QLD is a step closer now it has been given prescribed project status by the State Government.

Prescribed project status would enable the company to fast-track Sconi to development, with a more streamlined regulatory approval process.

It would also allow the Coordinator-General to intervene – if necessary – to ensure timely decision making.

Australian Mines managing director Benjamin Bell said he was “delighted” that the State Government had formally recognised the regional economic potential



Images: Australian Mines.

of the project, which was set to produce 8500 tonnes of cobalt, 53,500t of nickel sulphate and 77t of scandium oxide per annum over an 18-year period.

During the construction phase alone, Sconi was set to create up to 500 jobs, and a further 300 full-time equivalent jobs during operations.

In a Bankable Feasibility Study released in November, Australian Mines said it was committed to allocating 90 per cent of the ongoing annual operational expenditure to local businesses.

“\$922 million of the project’s total capital expenditure was anticipated to be spent with Australian businesses, with a preference for North Queensland companies,” Mr Bell said.

“We have also committed to significant upgrades to local infrastructure in the

Greenvale region, including upgrading the water supply, regional public roads and the Greenvale regional airport as well as the construction of an accommodation village and the establishment of a 24/7 medical facility.”

Queensland Resources Council (QRC) chief executive Ian Macfarlane applauded the Government’s decision to declare Sconi a prescribed project, but urged it to continue work to unlock the more than \$70 billion pipeline of resources sector projects.

“The challenge and onus for the Government is to ensure we have stable policy – from assessment and approval of projects to the underpinning policy for the operation and rehabilitation of projects to rates of royalty taxes paid back to the Government – to ensure we secure as much of this project pipeline as possible,” Mr Macfarlane said.

Newmont mega merger with Goldcorp

ELIZABETH FABRI
INTERNATIONAL

NEWMONT Mining has entered a deal to acquire Canadian gold company Goldcorp for \$US10 billion.

The acquisition marked the second large-scale merger in the gold industry in the last six months following Barrick Gold’s landmark purchase of Randgold Resources in September 2018 for \$US6 billion

Under the deal, the two miners would form Newmont Goldcorp; the world’s largest gold miner by output, with a portfolio of assets across North and South America, Canada, Australia and Africa.

Newmont would acquire each Goldcorp share for 0.3280 of a Newmont share, with Newmont and Goldcorp shareholders to own 65 per cent and 35 per cent of the combined entity respectively.

Goldcorp currently operated four mines in Canada, one in Argentina, one in Mexico, as well as two joint venture mines, while Newmont’s operations included Boddington, KCGM and Tanami in Australia, as well as projects in Ghana, North and South America.

Together the companies would aim to produce between six and seven million ounces of gold per year for at least a decade.

Newmont chief executive Gary Goldberg said the deal would create “the world’s leading gold business with the best assets, people, prospects and value creation opportunities”.

“We have a proven strategy and disciplined implementation plan to realise



Image: Newmont Mining.

Newmont’s Tanami operation in the Northern Territory.

the full value of the combination, including an exceptional pool of talented mining professionals, stable and profitable gold production of six to seven million ounces over a decades-long time horizon, the sector’s largest gold Reserve and Resource base, and a leading project and exploration pipeline,” Mr Goldberg said.

“We expect to generate up to \$100 million in annual pre-tax synergies, with additional cost and efficiency opportunities that will be pursued through our proven Full Potential continuous improvement program.

“The combination is expected to be

immediately accretive to Newmont’s net asset value and cash flow per share.”

Goldcorp president and chief executive David Garofalo said both teams were “fully committed” to delivering on the transaction’s value proposition for all stakeholders.

“Newmont Goldcorp will be one of Canada’s largest gold producers and will have its North America regional office in Vancouver, and expects to oversee more than three million ounces of the combined company’s total annual gold production,” Mr Garofalo said.



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IN BRIEF

Promising drilling results for Magmatic

NSW

A RECENTLY completed diamond drilling program at Magmatic Resources' Buryan prospect has confirmed potential for a significant porphyry copper-gold system.

Within the Buryan prospect there were 22 drill intercepts at greater than 20 metres at 0.15 per cent copper with best results including 16m at 0.11 per cent copper, 0.09g/t gold.

"Magmatic is very encouraged by these results and has begun planning further drilling programs," Magmatic Resources managing director David Richardson said.

"This work comes after our recent purchase of the NSRs for Alectown and all our other East Lachlan projects."

St Dizier mining lease granted

TAS

THE Tasmanian Government has granted Stellar Resources an initial six-year mining lease for its St Dizier deposit at the Heemskirk tin project.

An updated internal scoping study indicated that the company was in a strong financial position to take advantage of market conditions and could fast-track production within three months at a low capital cost of \$3.3 million.

"The scoping study shows attractive returns on investment from the St Dizier open pit mine and development of St Dizier may be an important part of a 'fast start' option which the company is continuing to review," Stellar Resources managing director Peter Blight said.

High-grade gold at Langi Logan

VIC

NAVARRE Minerals has revealed high-grade gold intersection from a first-pass air-core drilling program at its Langi Logan gold project in western Victoria.

The program delivered Navarre's highest-grade AC drill intercept to date from its extensive drilling campaigns within the Stawell gold corridor, with individual assays up to 15.8 grams per tonne (g/t), within a broader zone of 33m at 2.9 grams per tonne from 66m to end of hole.

"This continues an excellent start to our first-pass air-core drilling program at Langi Logan, approximately 40km south of the Stawell gold mine," Navarre managing director Geoff McDermott said.

OZ Minerals enters exploration alliance



Red Metal is conducting greenfields exploration across WA and QLD.

AMY BLOM
WA/QLD

OZ MINERALS has struck a greenfields exploration deal with Red Metal, which would significantly increase its exploration footprint in Australia.

The Greenfields Discovery Alliance would give OZ Minerals a two-year option to fund a series of mutually agreed, proof-of-concept work programs on six of Red Metal's early-stage projects, targeting base metals mineralisation in WA and QLD.

OZ Minerals head of exploration and growth Richard Holmes said the alliance was borne from the experience the companies had gained working together on the Punt

Hill project near the Carrapateena copper project, currently in construction in South Australia.

"Red Metal has demonstrated all the qualities we look for in partners – strong technical ability, a collaborative approach to ventures and external stakeholders, and an entrepreneurial spirit," Mr Holmes said.

"The projects selected for the Alliance offer a rare opportunity to gain access to large land holdings in terranes with significant mineral endowment and frontier terranes with low cost programs to test new concepts.

"Many of these areas are under cover and enable OZ Minerals to provide its technical expertise for exploring under cover to support our partner."

OZ Minerals has committed to funding

\$8.05 million in exploration and \$1.8m in initial cash payments over the first two years.

The miner could earn between 51 per cent and 70 per cent of a project.

Exploration under the Alliance would begin early in the 2019 field season with high-resolution gravity surveys on the copper-gold and copper-nickel targeted Nullarbor project on the Nullarbor Plain in WA, and Lawn Hill near Mt Isa in QLD.

This would be followed by proof-of-concept drilling at Mount Skipper and Gulf, also near Mt Isa in QLD, and at Nullarbor.

Work programs on the Yarrie project in north-west WA and the Three Ways project in QLD were pending granting of the tenement, which was expected in 2019.

Galena secures \$90m project equity

EMMA DAVIES
WA

GALENA Mining has announced that Japanese lead and zinc smelting company, Toho Zinc, will invest \$90 million for a 40 per cent stake in its Abra base metals project.

The transaction with Toho would be paid in three tranches; an initial \$20m, a further \$10m on completion of the Abra Definitive Feasibility Study, and a final \$60m tranche paid on confirmation of project financing debt.

The Abra base metals project was a globally significant lead-silver project in the Gascoyne region of WA, about 110km from Sandfire's DeGrussa project.

The project was expected to have a 14-year mine life producing a high-value, high-grade lead-silver concentrate containing about 91,000 tonnes of lead and 760,000 ounces of silver per year after ramp-up.

"This is a great transaction that provides the equity required to develop Abra, recognising the strategic value of the project," Galena Mining managing director Alex Molyneux said.

Both Toho and Galena Mining would have the right to off-take their percentage share of Abra production on arms-length, benchmark terms and then on-sell to third-parties.

The transaction would be a key step in



Exploration activities underway at Abra.

providing the equity funding to commence construction, and both Toho and Galena would apply the majority of the first two tranches (together comprising \$30 million) to pre-development and early development works at the site - substantially advancing and de-risking the project.

"Toho is a key player in the global lead and zinc industry and an experienced miner so we look forward to the benefits of a true partnership in the development of Abra," Mr

Molyneux said.

Galena anticipated construction to begin in April 2019, initial production by 2021 and the first full-year of steady-state commercial production to be achieved by 2022.

In January the junior announced an updated JORC Mineral Resource estimate (Indicated plus Inferred) at 5 per cent led cut-off of 37.4mt at 7.5 per cent lead and 18 grams per tonnes silver.



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IN BRIEF

GR Engineering wins Sandy Ridge work

WA

TELLUS Holdings has awarded an engineering, procurement and construction contract to GR Engineering Services at its Sandy Ridge kaolin project about 75km northeast of Koolyanobbing in WA's Goldfield's region.

The \$50 million contract included the engineering, procurement, construction and commissioning of the waste cell infrastructure, access roads, raw water supply and other key facility infrastructure.

Stage one was expected to begin within weeks, while stage two would begin in mid-2019, with the project expected to be fully operational by 2020.

"We look forward to working with Tellus to safely deliver the Sandy Ridge project," GR Engineering managing director Geoff Jones said.

DRA scores Dargues contract

NSW

DIVERSIFIED Minerals has awarded DRA Global the engineering, procurement, and construction (EPC) contract for the Dargues gold mine in NSW.

As part of the contract, DRA will deliver a 355,000 tonne per annum gold processing facility and mine backfill plant, which would deliver 50,000 ounces of gold per annum in the first six years of production.

Site work would begin in February, with first ore expected to be processed in early 2020.

DRA Asia Pacific Region executive vice president Greg McRostie said the contract further enhanced its global position as "the partner of choice" for clients in the gold industry.

Sedgman lands \$155m coal deal

QLD

CIMIC Group's mineral processing company, Sedgman, has won a contract at QCoal Group's Byerwen coal mine in Central QLD.

The engineering, procurement and construction (EPC) contract would deliver an expansion on the first phase of the project, which Sedgman was awarded in February 2018, and included the duplication of the existing coal handling and processing plant - with planned completion in early 2020.

"We look forward to assisting with the expansion of the Byerwen mine in a timeframe that optimises QCoal's benefit," Sedgman managing director Grant Fraser said.

Key contractors flagged for Finnis



Image: Core Lithium.

Core Lithium was on track to begin construction at Finnis this year.

EMMA DAVIES
NORTHERN TERRITORY

CORE Lithium has announced key contractors for its Finnis lithium project just days after the Northern Territory Government granted a mineral lease for the project.

The three contractors included Primero Group as the preferred EPC contractor; Lucas Total Contract Solutions as the preferred contractor to deliver mining services; and Qube as the preferred contractor for transport solutions.

A Front End Engineering & Design (FEED) study by Primero was now underway to improve the accuracy of the EPC estimate on the 1 million tonne per annum processing

plant and associated infrastructure.

Primero has previously worked on a number of hard-rock lithium projects in WA, including Pilbara's Pilgangoora and Tawana/Alliances' Bald Hill projects.

Core Lithium managing director Stephen Biggins said it would work with the key contractors to finalise the terms that reflect the most cost-effective and time-efficient solution for the project.

"We believe we have selected the best contractors for the respective contracts out of a field of worthy contractors, and look forward to working with Primero, Lucas TCS and Qube once the contracts have been finalised and the next phases of work at Finnis get underway," Mr Biggins said.

"Final award of these contracts will follow

the completion and release of the Definitive Feasibility Study and financing of the Finnis project, which should see Core on track for first production at Finnis by the end of the year."

The project, about 90km from Darwin by road, was expected to create up to 150 jobs during construction and 90 during operation.

"Creating jobs is the number one priority of this Government and this is an important milestone for this project," Northern Territory Primary Industry and Resources acting minister Dale Wakefield said.

"If it successfully goes through the rest of the approvals process, this mine could not only provide direct jobs for Territorians on site, but also flow-on effects for Territory businesses through contracts and tenders."

Ausdrill secures \$171m in new contracts

AMY BLOM
WA

MINING services company Ausdrill has secured four contracts across WA totalling \$171 million, including two through its recent acquired subsidiary, Barminco.

Barminco was awarded a three-year underground mining services contract at Regis Resources' Rosemont gold project, worth \$113 million.

Regis recently approved an expansion of the mine to an underground operation directly below the Rosemont open pit, 130km north of Laverton, with Barminco to perform development and production work at the underground deposit.

Onsite works would begin in the first quarter of 2019, with Barminco expected to employ about 100 people to staff the project.

Barminco chief executive Paul Miller said the project added to the company's extensive experience in the WA Goldfields, with current mining projects at Sunrise Dam and Agnew.

"We will draw on our deep capability across Barminco's people, equipment, systems, processes, and expertise in underground mining to ensure we provide a safe and reliable service at Rosemont and look to build a strong, long-term relationship with Regis," Mr Muller



Image: Ausdrill.

Ausdrill subsidiary, Barminco, has secured two new mining contracts.

said.

Barminco was also awarded a 14-month contract from Western Areas to perform decline rehabilitation and development works at the nickel miner's new Odysseus mine.

Ausdrill's other recent contracts were exploration drilling services at Consolidated Minerals' Woodie Woodie manganese mine in

the Pilbara, and the Bellevue gold project in the Eastern Goldfields.

Ausdrill managing director Mark Norwell said the new projects demonstrated the diversity of the expanded Ausdrill group across different projects and resources, solid progress of Barminco, and the professional service its businesses had been providing to customers.



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Image: Mining3.

Mining3 carried out unconfined detonation tests in December.

Alternative explosives on the way

AMY BLOM
QLD

AN alternative to ammonium nitrate-based commercial explosives in mining is a step closer, according to Mining3, following a recent detonation performance test of a non-toxic post-blast substitute explosive.

Mining3 had been working with the University of Queensland's School of Mechanical and Mining Engineering to test the explosive formulation, which replaced the nitrogen component with hydrogen peroxide as the main oxidising agent.

While the ammonium nitrate formulation was considered highly effective, the explosives didn't always detonate efficiently, which could cause nitrogen oxide fumes to be produced, posing serious health and environmental risks.

By comparison, hydrogen peroxide was a simple compound predominantly made up of water, meaning it was not harmful.

Mining3's hydrogen-based gel alternative would be reliant on mechanical sensitisation and influenced by the diameter of the void spaces.

Using the two new physical sensitisation materials based on glass and polystyrene in its formula, Mining3 conducted a series of detonation tests in December 2018, before announcing its results on 24 January.

According to Mining3, the tests delivered improved explosive performance, reliability and product stability.

Mining3 explosives research chemist Andrew Kettle said the researchers had a renewed confidence in the robustness and performance of alternative explosives, superseding chemical gassing techniques.

"We also had the opportunity to manufacture prototype cartridges for packaging the explosive, in preparation for underground mine-site trials proposed for 2019," Dr Kettle said.

Surface applications would also be trialled in 2019.

Rock bolt research off the ground



Image: USQ Photography.

Dr Ali Mirzaghorbanali (middle) with students Peter Gregor and Ashkan Rastegarmanesh.

EMMA DAVIES
QLD

GEOTECHNICAL engineering expert, educator and researcher Dr Ali Mirzaghorbanali from the University of Southern Queensland (USQ) has embarked on a two-year-long research project to improve mine safety.

Dr Mirzaghorbanali formed part of a multi-university collaboration with Professor Naj Aziz (University of Wollongong) and Professor Paul Hagan (UNSW) to increase safety in mining

operations via rock bolts for stabilising rock excavations.

Funded by the Australian Coal Association Research Program (ACARP), Dr Mirzaghorbanali and his colleagues planned to develop a modelling approach for more effective application of cable bolts in different ground conditions.

The research collaboration would enhance mine safety, increase productivity and reduce costs through fit-for-purpose designs.

"We are aiming to create a comprehensive computer based model to simulate various features of coal mining support systems," Dr

Mirzaghorbanali said.

"However, there is a need to further understand cable bolt performance in the laboratory and field as well as development of advanced computer based numerical codes."

The project would focus on the function of pretensioning and shear displacement of cable bolts in ground support and how ground and stress conditions impact the performance of support systems.

The team would also establish an Australia-wide database on the cases of cable bolt failures and complete back analysis using numerical modelling.

Newcrest enters tech partnership

ELIZABETH FABRI
NATIONAL

NEWCREST Mining aims to improve efficiencies across its Australian and PNG operations through a new technology partnership with Interlate.

The agreement would see Interlate provide decision support and near real-time productivity improvement services to Newcrest operations, combining data science and Internet of Things (IoT) technology.

Newcrest already had a busy year ahead with a team currently working towards a \$598 million expansion of the Cadia operations in NSW with plans to release a feasibility study in the first half of FY20.

Newcrest Lihir and Cadia executive general manager Craig Jetson said the miner was pleased to partner with the tech company at this crucial time.

"Remote support that leverages advanced data analytics is a key part of our operational improvement strategy — Interlate's Sentinel service is the solution we were looking for, enabling those improvements to be sustained in the future," Mr Jetson said.

"Given their experience in remote monitoring, their solution provides us a 'safe on-ramp' into this space, without closing the door on developing our own capabilities in this area internally in the future."

Interlate currently operated out of an Operations Intelligence Centre based in Brisbane with a focus on harnessing the power of connected machines and technical innovation.

In late October it entered a Memorandum of



Image: Interlate.

Interlate's operations intelligence centre.

Understanding (MoA) with global technology giant Siemens to collaborate on benchmark digital and data services for mining and develop predictive and prescriptive solutions to optimise the total lifetime value of critical assets.

Interlate chief executive David Meldrum said the team were "delighted" to now be assisting Newcrest.

"Working together, Newcrest and Interlate have already discovered significant productivity improvement opportunities in Newcrest's operations, which could contribute millions of dollars in profit each year," Mr Meldrum said.

"This value will steadily increase as Newcrest realises further gains from the

real-time productivity improvement services."

The agreement followed Newcrest's collaboration agreement with Tata Consultancy Services in October to establish an innovation and digital operations centre in India.

The centre facilitated collaboration in engineering, research and development, data analytics and IoT between the two companies.

At the time, Newcrest Mining managing director and chief executive Sandeep Biswas said Newcrest was "committed to being leaders in technology and innovation".

"We want to enhance and accelerate the way we use automation and artificial intelligence across our business to improve our returns to shareholders," Mr Biswas said.

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Brumadinho death toll climbs

AMY BLOM
BRAZIL

BRAZILIAN miner Vale is facing increasing criticism as the death toll continues to rise from the Brumadinho dam failure.

At least 110 people had been confirmed dead, a week after a tailings dam burst at the Feijão mine in Brumadinho on 25 January, sending a torrent of sludge into the miner's administrative area and the surrounding Vila Ferteco community.

The toll was expected to continue rising, with 238 people still unaccounted for, and little hope they would be found alive, according to local officials.

In the days after the dam collapse, Brazilian authorities arrested five people and issued seven search warrants, on suspicion of murder, falsification of documents and environmental crimes.

Among those arrested were three Vale employees, including two senior managers, and two other engineers working on behalf of the company.

Bloomberg quoted Brazilian Vice President Hamilton Mourão as saying there must be punishment for those responsible for the disaster.

"If there was any malpractice, recklessness



Vale chief executive Fabio Schvartsman flies over Brumadinho after the dam breach.

or negligence on the part of someone inside the company, this person has to answer criminally," Mr Mourão said.

The Brazilian Government has declared a state of public calamity, launched the Ministerial Disaster Response Council, and issued \$R250 million in fines to Vale.

It has also declared Vale a repeat offender and said it could suffer further civil, administrative and criminal sanctions once

investigations were complete.

On 26 January, Vale issued a statement that it was investigating the causes of the dam collapse, but that the dam had passed stability tests in June and September 2018.

It also stated that safety at the site had been in accordance with international best practice.

As a result of the disaster, Vale announced new measures to provide financial and

psychological support to the families of affected people, and to mitigate the impacts of the failure.

Vale finance and investor relations executive director Luciano Siani Pires said this included containment measures, a commitment to continue paying mining royalties to the City of Brumadinho and a donation of R\$100,000 (about \$37,123) to the families of each missing person or confirmed fatality, regardless of whether they were a Vale employee.

"This has nothing to do with indemnification, which needs to be sorted out together with the authorities," Mr Siani Pires said.

Vale had also suspended payouts to shareholders and executive bonuses.

Shares in Vale went into freefall following the disaster, dropping 24.52 per cent as at 29 January.

The Brumadinho dam failure was the second deadly mining disaster involving Vale in less than four years.

On 5 November 2015, a tailings dam collapsed at a nearby mine run by Samarco Mineiracao, a joint venture between Vale and BHP, killing 19 people and causing catastrophic environmental damage to the Rio Doce river basin.

Rio enters JV option with Valor

ELIZABETH FABRI
PERU

RIO Tinto subsidiary Kennecott Exploration (KEX) has inked a Joint Venture option deal with ASX-listed Valor Resources over its Berenguela copper-silver-manganese project in south-eastern Peru.

Initial terms of the agreement included a payment of \$US700,000 before February 2019, and further \$US2 million spend on exploration over the next 12 months.

At the completion of initial expenditure, Kennecott would be entitled to form a 50:50 incorporated joint venture by paying an additional \$US3 million to Valor, and increase its stake to 75 per cent by spending an additional \$US5 million within three years.

Valor Resources executive director Nicholas Lindsay said bringing Kennecott in as a partner to the project was a significant and exciting step forward in its development, and endorsed the project's value.

"We welcome KEX's involvement in the project's development going forward and we are encouraged about the exciting near and longer term prospects," Mr Lindsay said.

The Berenguela project had a measured indicated and inferred JORC Reserve of 45.9 million tonnes at 0.77 per cent copper, 86 grams per tonne silver, 0.28 per cent zinc and 5.1 per cent manganese.

A Pre-Feasibility Study was currently in the works, which was determining the metrics of developing a shallow open pit mine.

Perth-based junior Valor also owned the Picha copper-silver project in Peru, which did not form part of the agreement.

Sandfire targets MOD



An artist's impression of the future T3 campsite.

AMY BLOM
BOTSWANA

SANDFIRE Resources has launched a takeover offer for MOD Resources, a WA-based explorer with a focus on Botswana, which rebuffed the move.

Following recent media speculation of a takeover, Sandfire said it had written to MOD to express its interest in acquiring 100 per cent of MOD shares, on the basis on \$0.38 per share.

At stake was MOD's 100 per cent owned T3 copper project in Botswana's Kalahari copper belt.

Discovered in March 2016, MOD believed T3 presented the potential for a long-life, high-margin, open pit copper mine with significant exploration upside.

MOD managing director Julian Hanna said Sandfire's offer undervalued the company's assets.

"The unsolicited, indicative proposal for 100 per cent of the company received from Sandfire confirms the potential of the T3 copper project, however the Board considers it significantly undervalues the assets of the company," Mr Hanna said.

Despite rebuffing the initial offer, MOD told the ASX it would be willing to engage with Sandfire and grant confirmatory due

diligence should a compelling price be presented.

MOD's refusal followed its recently completed \$10 million capital raising to advance T3.

Mr Hanna said funding from the capital would enable MOD to progress the project towards a development decision, and conduct further drilling for additional resources.

"With strong ongoing support of our shareholders through a placement and a fully underwritten rights issue, we believe that the company will have sufficient working capital to achieve our objectives," he said.

MOD expected to complete T3's feasibility study in the first half of 2019.



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Image: Rio Tinto.

DIAMONDS ARE FOREVER?



Australia's only operational diamond mine, Argyle, is almost at the end of its run leaving a huge void for emerging juniors to fill once it is depleted. Attention is now turning to the WA Government to relieve cost pressures facing budding producers, namely high royalty rates.

ELIZABETH FABRI

THE Rio Tinto-owned Argyle mine's days are numbered with a little over a year on the clock until its doors close.

The mine, not far from Kununurra in the East Kimberley, WA, was famed for its rare pink gems as well as its more common champagne and cognac-hued stones, which can fetch in the millions via international auctions.

The end of Argyle will be a sad day for the national (and global) mining industry, and what happens after is still up in the air.

What we do know is that the closure will see a massive 10 per cent drop in global production (about 14 million carats per annum) at a time when world diamond sales were going strong, even in the midst of the growing synthetic diamond sector.

Argyle has been a key pillar in global diamond production since it opened in 1983 as an open pit.

But it hasn't been WA's only main diamond production source.

WA's Ellendale mine was also an important contributor to global supply between 2002 and 2015, producing the fancy yellow diamonds, seen in Tiffany & Co jewellery.

However, in 2015 its owner, Kimberley Diamond Company, was placed into the hands of administrators after it relinquished its environmental liabilities and mining lease to the WA Government.

Flash forward to 2019: various juniors were now making headway at a cluster of exploration projects in and around the Kimberley region but still yet to enter production.

Companies on the Rise

Lucapa and Gibb River Diamonds (formerly



Image: Rio Tinto.

The Argyle pink Jubilee diamond, weighing in at 12.76 carats.

POZ Minerals) were among some of the explorers, with some promising assets to boot, including their respective Brooking and Blina projects.

Lucapa – which also had a suite of operational and exploration assets in Angola (Lulo), Lesotho (Mothae), and Botswana (Orapa Area F) – began exploration at Brooking in 2017, comprising the Little Creek Spring deposit, 50km from the mothballed Ellendale mine.

Last year, the miner recovered a large amount of micro and macro diamonds, including more than 1100 diamonds from a single drill hole, with results from a bulk sample expected early February.

Lucapa chief executive Stephen Wetherall said the company was using new technologies and innovations across Brooking, including innovative processing of geophysical data from airborne magnetics

to identify, map, classify and target different kimberlite types and lamproites; and soil geochemistry sampling and interpretation methods.

Gibb River Diamonds was also onto a good thing at its Blina project, which was adjacent to Ellendale, about 100km east of Derby.

The company recently changed its name to reflect its focus and confidence in diamond exploration in the Kimberley.

"The Blina diamond project is fully permitted and shovel ready, we have purchased our major plant items, are seeking final \$2.5 million funding to mobilise and construct the project and commence bulk sampling, which we anticipate will lead into trial mining," Gibb River Diamonds executive chairman Jim Richards said.

"Our innovative use of the latest in

Ground Penetrating Radar technology to track bedrock in ancient river systems and thus to find high grade alluvial diamond trap sites is extremely exciting."

The Royalty Debate

With a clear path to production, both Lucapa and Gibb River plans were dimmed slightly by concerns they had with State royalty rates.

Both were of the view the current royalty rate for diamond producers (7.5 per cent) was too high, and urged the Government to consider reducing it at this critical time.

"When Argyle closes, there will potentially be no operational diamond mine in Australia," Gibb River Diamond's Mr Richards said.

"This reflects State and Federal government policy failures within the sector, nothing more, nothing less.

"The royalties on diamonds need to be cut from the outrageous 7.5 per cent to at least 5 per cent (as recommended in the last WA government *Royalty Review*).

"But in reality, the royalty rate should be zero until the industry recovers."

Mr Richards said the "sky high rents" on mining tenements also needed to be curbed for diamond producers to about 10 per cent of current rents.

"The Derby Shire are killing off mineral exploration with their exorbitant Shire rates which are greater than the DMIRS rents," he said.

"The destruction of the flow-through Exploration Development Incentive (EDI) scheme in 2016 by Federal Resources Minister Matt Canavan was a real kick in the guts for explorers like ourselves and prevented us passing on our tax losses directly to shareholders."

(CONTINUED ON PAGE 20)



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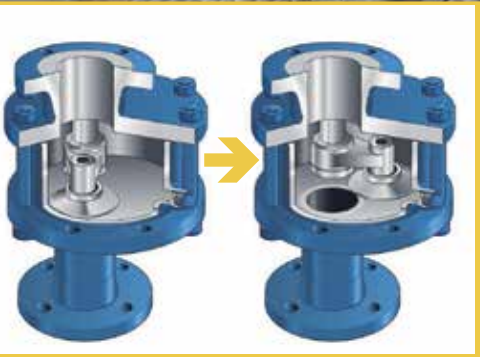



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“When Argyle closes, there will potentially be no operational diamond mine in Australia.”

Image: Lucapa Diamonds.

A 404 carat diamond found at Lucapa's Lulo mine in Angola.

(CONTINUED FROM PAGE 18)

Lucapa's Mr Wetherall said he was sure the WA and Federal Government were aware of how difficult diamond exploration was.

“Large companies, like Rio Tinto and De Beers, invested considerable amounts in such exploration,” Mr Wetherall said.

“Large companies have larger budgets and are able to allocate these resources to more sizable exploration programs.

“Smaller exploration companies that are currently active in WA do not have those large budgets and therefore the exploration life cycle is lengthened somewhat.”

Mr Wetherall said exploration in Australia was far more costly than in Africa and alternate policies, plans or structures that the Government was able to introduce to reduce the administrative costs, lengthy timelines and lowering of royalty rates “would be very helpful to both existing explorers and in attracting new entrants”.

Their comments come more than a year since the WA Government's proposal to increase the gold royalty rate (from 2.5 per cent to 3.75 per cent when the Australian gold spot price was above \$1200) was blocked by WA Liberals following strong backlash from mining companies and industry groups.

Department of Mines and Petroleum, Industry Regulation and Safety (DMIRS), Deputy Director General Dr Phil Gorey said the royalty rate for diamonds and gold differed due to the different levels of processing.

“Gold receives a metal royalty rate of 2.5 per cent and diamonds have a crushed and screened royalty rate of 7.5 per cent,” Dr Gorey said.

“In 2006, the State Government applied a royalty rate of 5 per cent for the Argyle diamond mine when the site operations changed to an underground mine.

“This royalty rate was specific to the Argyle operation and did not amend the general royalty rate for diamonds in the regulations.”

From January 2009, an ad valorem rate

of 5 per cent was also applied to Ellendale's diamond operations.

WA Mines minister Bill Johnston said WA's royalty system delivered “a fair return to the community from the loss of its resources”.

“Royalty obligations are just one of the many factors that companies have to consider when making investment decisions,” Mr Johnston said.

“There are no plans for the Government to change the royalty rates that apply to diamond production.

“Argyle has been an important development for the State, creating hundreds of jobs, millions of dollars annually in State royalties, as well as providing regional and indigenous employment opportunities.

“The State is now focussing on working with Rio Tinto on an orderly closure process in the coming years.

“It is encouraging that multiple companies continue to explore Western Australia for the next big diamond discovery.”

Reviving Ellendale

Another measure the WA Government had in place prior to Argyle's closure was finding a new operator for Ellendale, which still had a lot of resources left to mine.

After being approached by several companies seeking an invitation to access the mine, in late 2018 the WA Department of Mines, Industry Regulation and Safety opened up a tender for expressions of interest (EOI) from companies interested in reopening Ellendale on a new mining lease.

In September, Gibb River Diamonds (POZ at the time) threw its hat in the ring in for the project, which was conveniently adjacent to its Blina deposit.

Gibb River said having these two projects under common ownership would be “transformative” and create significant commercial advantages and synergies.

For one, the company had already negotiated a Mining Agreement with the local Bunuba Traditional Owners over the adjacent Blina project, which resulted in granted mining leases.

In late 2018, interested parties toured the site, however Lucapa's Mr Wetherall said his company was not one of them.

“While the Lucapa board and executive team have significant experience on the Ellendale mine, Lucapa chose not to participate in the Government's bidding process for Ellendale,” Mr Wetherall said.

“Lucapa believe that the development of its current suite of assets will provide a better return for its shareholders.”

EOI submissions closed on 30 November, with Gibb River Diamonds speculated be a front runner.

WA's Mines minister Mr Johnston was expected to select a company within the coming months, in which the company would be able to apply for a new mining lease.

However, it won't be straight back into mining for the successful party.

According to DMIRS, there were a number of factors to take into account, with Native Title negotiations potentially taking up to two years.

It said once the mining lease was granted, the holder would need to apply for and wait for approval of a Programme of Work to conduct ground-disturbing exploration on the lease, and approval of Mining Proposal.

Marketing laws signal new era for Lulo

ELIZABETH FABRI
AFRICA

ASX-listed Lucapa Diamonds has submitted its first round of diamonds from its Lulo mine at international tender following new diamond marketing laws in Angola enacted by President Lourenco.

The sale, scheduled to close on 31 January, was being organised in Luanda by SODIAM, a state-owned company responsible for the trading of diamonds in Angola.

Previously, diamonds produced were required to be sold via SODIAM to a small number of approved buyers through negotiation, according to Lucapa chief executive Stephen Wetherall.

“Under, the new diamond marketing policy and regulations being introduced, the diamond producers will be able to utilise a number of different and more competitive channels to market their production, as well as invite a larger number of other leading global diamantaires to bid or buy for the first time,” Mr Wetherall said.

“These new channels and buyers will bring more competition for the diamonds and it will result in more optimal sale prices being achieved by the producers.”

As part of the tender, Lucapa planned to sell seven large, special sized and coloured diamonds from the Lulo mine.

“The Lucapa Board believes the introduction of the new Angolan diamond marketing regulations and the commissioning of our new Mothae mine are two very important milestones which have set up Lucapa for an exciting new era of growth,” he said.

“While Lucapa has to date sold all of its diamonds in the rough at the mine gate, these milestones will also enable Lucapa to pursue another strategic goal in 2019.

“That goal is to move along the diamond-value chain by entering partnerships with leading global manufacturers and diamantaires for the cutting and polishing of select high-value diamonds, generating significant additional income streams for the company's mining projects.”



Image: Lucapa Diamonds.

SPECIAL FEATURE

FORTESCUE METALS GROUP

21

THE ROAD AHEAD

All images: FMG.

It's all systems go for Fortescue Metals Group (FMG). After launching its higher grade West Pilbara Fines iron ore in December, the miner is now gearing up to begin construction at Eliwana – the third new iron ore project green lit for WA's Pilbara region.

ELIZABETH FABRI

THE shipment of a higher grade West Pilbara Fines (WPF) product in December was the beginning of a new chapter for iron ore giant FMG.

Up until now, FMG was best known for its 58 per cent iron ore mined from its Chichester and Solomon Hubs.

But, over the last 12 months FMG grappled with wide discounts for this lower grade product, as Chinese steel mills' appetite for higher grade ore grew.

The average 15 per cent discount FMG received for its 58 per cent ore (compared to the benchmark 62 per cent ore specification), climbed to as much as 42 per cent.

However, the launch of the 60.1 per cent WPF product would act as a key plank in FMG's marketing strategy going forward, enabling greater flexibility to customers.

WPF would initially be blended using higher iron, low alumina ore from the western pits at Cloudbreak with ore from the Firetail mine, with an aim of producing up to 10 million tonnes of the product per annum for the next two years.

FMG chief executive Elizabeth Gaines said for the last decade, the company delivered a range of differentiated products with a high value in use for its customers.

"As we look out to FY19 and beyond, West Pilbara Fines will further enhance the range of ores available, as we continue to ensure that our quality control and product consistency are maintained at the highest levels for our customers in China, Asia and



FMG's Cloudbreak processing plant.

Europe," Ms Gaines said.

This message was reinforced further at a media and investor tour of its Chichester Hub mines, and port operations in late November.

FMG's core leadership team gave an in-depth update into its business, from operations, to finance, marketing and automation.

A common thread was that its balance sheet was in the best shape in years, and that the spread between higher and lower grade ore was narrowing.

Ms Gaines said China would remain a key focus for the company despite environmental reforms.

It was only in November that FMG signed a further eight Memoranda of Understanding (MOU) deals with major public and private

Chinese steel mills on the side-lines of the inaugural China International Import Expo (CIIE).

Maiden shipments have also been made to Vietnam and Malaysia, with sales to non-China customers now accounting for 10 per cent of total shipments.

In FY19, the miner was aiming to ship between 165 million tonnes and 173 million tonnes of ore, C1 costs to hover between \$US12-13 per wet metric tonnes, and capital spend to reach \$US1.2 billion.

Recent results from the December quarter showed FMG was on track, with a six per cent increase in shipments to 42.5 million tonnes, bringing half year shipments to 82.7mt.

Average prices realised for its ore also increased to \$US48 per dry metric tonne,

with C1 costs decreasing to \$US13.02 per wet metric tonne.

Ms Gaines said the strong quarter was bolstered by the completion of the first long term contract for WPF, with a number of customers already committing to future off-take.

"The first cargo of our 60.1 per cent iron grade West Pilbara Fines product was shipped to China on 16 December 2018 and we now expect to deliver between 8-10mt of this product in FY19," she said.

"Initial customer feedback has been excellent."

Ms Gaines said WPF was not just a short-term product either, with a view to maintain the 60.1 per cent grade out to 2050 through Eliwana.

Building Eliwana

Approved by the board in May 2018, the \$US1.275 billion Eliwana project was set to begin construction mid this year, with the aim of first production in December 2020.

The project involved extending the rail line from FMG's Solomon Hub via 143km of new tracking, including two bridges; and two construction camps.

Eliwana had a mining inventory of 540 million tonnes, with an 18-year mine life and opportunity to expand.

However, the project would not add to FMG's overall output initially, instead replacing production from its depleting 30mtpa Firetail mine.

(CONTINUED OVER)

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It would although increase FMG's WPF production to 40mtpa.

Ahead of construction, FMG said it had a string of innovations in place to drive down costs throughout the build.

Interestingly, the railway line to Eliwana would be 12 per cent longer than the Solomon railway line, but lower cost.

The processing plant would also have a significantly smaller footprint, with less steel required, with further cost reductions to be achieved through the purchase of a 200-person fly construction camp from the Wheatstone oil and gas project.

A power station would also be relocated from Roy Hill to the Eliwana site.

And for the first five years of operation, Eliwana would have a low haulage distance from pit of less than 5km, which would significantly reduce costs.

The FMG leadership team said it was confident Eliwana remained on track for its December 2020 target despite it still being "early days".

Construction tenders were currently being finalised, with NRW already named the preferred contractor to undertake earthworks for the new rail line.

However, with two other mega projects entering construction in the Pilbara this year – BHP's South Flank and Rio Tinto's Koodaideri project – access to a pool of skilled workers could pose a challenge in the recruitment stage.

Ms Gaines said it was fair to say there were some key skills and trades where it was becoming more challenging.

"We have to be very competitive in our offering for those key skills and trades," she said.

"I do think that the Fortescue culture and the Fortescue brand is actually highly sought after and that there are people who actively seek positions at Fortescue, and there are some positions that we advertise and we get a significant number of applicants.

"But it is fair to say there are some key skills and trades where it is very competitive and we are mindful of that and we've put in place all the appropriate practices we need to make sure we're attracting the best talent."

Driving Automation

Meanwhile, the FMG team was also busy rolling out automation drives across its Chichester Hub operations; Christmas Creek and Cloudbreak.

Cat Command, part of Caterpillar's MineStar technology, was first used on a commercial scale at its Solomon Hub back in 2013.

In a global first, the company would now utilise Cat Command for hauling across all its operations, which will be retrofitted on CAT and Komatsu trucks.

Ms Gaines said by the end of 2019, FMG will become the only iron ore operation in the world to have a fully autonomous haulage fleet, which to date had delivered a 32 per cent improvement in productivity.

However, the miner assured truck drivers and operators would not lose out, and instead be redeployed to other roles within the company.

FMG had also introduced a new innovative relocatable conveyor at Cloudbreak; a piece of infrastructure typically seen in coal and underground operations but not in iron ore.

The 5km conveyor replaced 12 manned trucks, increased accessibility to remote ore bodies, and reduced haulage costs.

It included a semi-mobile primary crusher station that fed directly into the Cloudbreak ore processing facility.

More importantly, when an ore body was depleted, the conveyor could be packed

"The first cargo of our 60.1 per cent iron grade West Pilbara Fines product was shipped to China on 16 December 2018 and we now expect to deliver between 8-10mt of this product in FY19."



The new 5km relocatable conveyor at FMG's Cloudbreak operation.

up and moved along to another deposit, delivering significant cost savings for future developments.

Autonomous drills introduced across its operations had also seen a 30 per cent improvement, removing safety risks, and enabling a 20 per cent reduction in drills deployed.

The Road Ahead

Beyond Eliwana, FMG was expected to make a decision on its Iron Bridge magnetite project soon, also in the Pilbara.

FMG had a 60 per cent interest in the project, and was currently progressing feasibility studies with its JV partners, Taiwan's Formosa Group and China's Baosteel Resources, a subsidiary of China's Baowu Group.

"We have said in the past we hope to have a decision by the end of the 2018 calendar year, but this is something we are still working through," Ms Gaines said.

"Yes, we did set a timetable, but really it is in the hands as well of our joint venture partners."

FMG chief operating officer Greg Lilleyman said Iron Bridge would require less energy than CITIC Pacific's Sino Iron Ore project.

He added a full size grinding plant had been built to complete processing trials, and if the project was approved, additional plants would be added.

Ms Gaines said FMG produced a 67 per cent iron magnetite concentrate product at Iron Bridge, and described the project as "very high-grade", which would sell at a significant premium in the current market.

The project was strategically positioned 100km south of Port Hedland, and contained a 7.9 billion tonne magnetite resource.

In addition, FMG was also actively exploring other areas in the Pilbara, NSW, South Australia, Ecuador, Columbia and Argentina in not only iron ore but lithium, copper and gold.

"We've got a farm-in in NSW near Orange with a junior, and we're putting money into the ground," Ms Gaines said.

"There have been developments in exploration techniques, and certainly with the use of satellite imagery and other imagery, there have been ways where we can hone in and be a little bit more precise about where we target our drilling programs.

"We've got a team that are constantly looking at those opportunities and that's how we've managed to get the position where we're the largest tenement holder in the Pilbara.

"That's been an ongoing process for us."

FMG was also committed to reducing its

carbon footprint through renewable energy initiatives.

The miner recently partnered with the CSIRO to develop and commercialise hydrogen.

The collaboration included a five-year agreement to fund and support select CSIRO technologies in the hydrogen space, including CSIRO's metal membrane technology, which would make the transportation of hydrogen economically viable.

Ms Gaines said the agreement built on the company's previous energy initiatives, including the conversion of the Solomon Power Station from diesel to gas generation and the development of the Fortescue River Gas Pipeline.

"Working with CSIRO to capitalise on

the benefits of a low emission fuel such as hydrogen demonstrates Fortescue's commitment to reduce our carbon footprint by ensuring security of supply of cost-effective energy for our operations," Ms Gaines said.

FMG chairman Andrew Forrest said partnering with CSIRO would enable FMG to firmly establish its position in the global hydrogen industry.

"Importantly, we see potential for a significant export market in hydrogen and look forward to collaborating with third parties to ensure Australia's leadership in the new energy economy," Mr Forrest said.

"We are at the beginning of an energy revolution and Fortescue intends to be at the forefront of this once in a generation opportunity."

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Having wrapped up a successful year that saw a number of milestones, including the celebration of 50 years since operations began at Savage River in Tasmania and record pellet premiums, Grange Resources' sights are now set on increased production and extending mine life.

All images: Grange Resources.

AMY BLOM

THIS is the year that could decide the future of the Savage River mine, according to Grange Resources general manager of operations Ben Maynard.

The Savage River magnetite iron ore mine in Tasmania's northwest is a long-life mining asset, and is Grange's principal operation.

At Port Latta, on the northwest coast of Tasmania, Grange owns a downstream pellet plant and port facility producing more than 2 million tonnes of premium quality iron ore pellets annually.

Having celebrated 50 years since mining operations began at Savage River last year, the miner will spend this year on expansions projects, including continuing to progress its underground development project at Savage River, as well as conducting investigations into Centre Pit and Long Plains.

"2019 is probably the year that is going to give us a good indication of which way it will go; I think by the time we've got through what we have planned this year, that will be giving us a good indication as to whether the underground is a true, viable option for the Savage River operation," Mr Maynard said.

"I'm optimistic and I think you have to be in this game – we're certainly driving out plans fairly hard and we think we have some real opportunities here."

The underground project has the potential to add additional resources to the mine life, which was currently beyond 2030, with access to the ore body at greater depth.

Mr Maynard said Grange was continuing to progress the diamond drilling program currently underway to investigate the ability to access the ore body in North Pit through underground development.

"We're still going through the testing – we've done the initial phase – and we're working through and following up with the testing of our diamond drill core," he said.



Grange also operates a downstream pellet plant and port facility producing more than 2 million tonnes of premium quality iron ore pellets annually.

"That seems to be showing us that the orebody is continuous at depth.

"We've got a bit to do to square that up and get those results out, but it's certainly positive at this stage."

The deep diamond holes began in Q3 2018 and combined downhole geophysics, hydrogeological assessment, laboratory testing of diamond drill core and modelling for input feasibility studies.

Since then, Grange's board has approved further expenditure of \$15 million to establish an exploration decline alongside the open pit.

Mr Maynard said this would be implemented in 2019, and would allow further testing of the orebody at greater depth and progression of the feasibility study.

"We've started some preliminary works on site, which is exciting," he said.

"While still at an early stage, there is potential to reduce the operational costs in the long term for underground operation and reduce the amount of waste stripping from the open pits; this will be

studied through the feasibility project."

Next up for Grange was Centre Pit, which had been mined in iterations over the life of the Savage River operation.

Mr Maynard said the current reserve was about 8 million tonnes, but Grange was reviewing the economics of assessing the orebody to allow ore blending with the high-grade North Pit ore.

He said work was progressing on the feasibility study for Centre Pit.

"The surface diamond drilling program has progressed with the diamond drilling focussed on geotechnical data collection informing slope stability and increasing confidence in the geological model," Mr Maynard said.

Finally for Savage River, Grange was working on a prefeasibility study of the Long Plains deposit to determine whether the ore source formed part of the life of mine strategy.

"While the deposit is smaller than the main Savage River ore body, it will be able to supplement ore feed into the existing infrastructure," Mr Maynard said.

Long Plains is a magnetite resource totalling 107mt at 33 per cent Davis tube recovery, 8km south of the current mine lease.

Mr Maynard said aside from work on extending mine life and increasing production, Grange was also continuing research and development to improve safety and production at the mine.

He said Grange was currently looking to build a high-wall scaler, which could remove the need for manual scalers to walk down walls, and dramatically improve safety.

A Productive Year

While the scene was set for a busy year ahead, Grange was well-placed, having just wrapped up a successful 2018.

"As a result of continued demand from China for higher-quality, low impurity products following ongoing environmental restrictions and strong steel margins, Grange has received record pellet premiums above the 62 per cent iron fines lower quality products," Mr Maynard said.

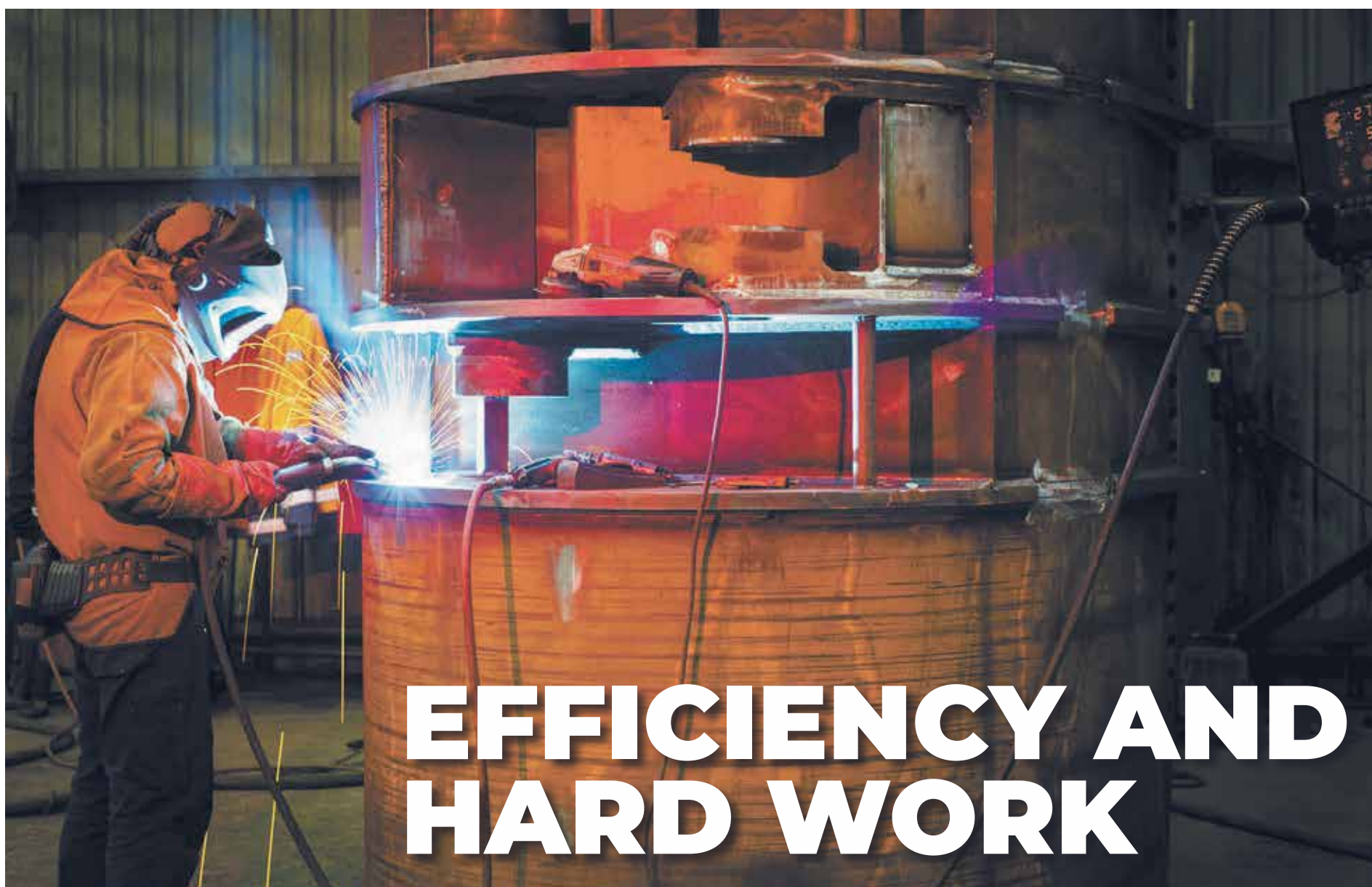
Pellet production continued to increase in the December quarter to 517,000 tonnes compared to 437,000 tonnes in the September quarter.

While pellet sales did decrease in that period, going from 499,000 tonnes to 466,000 tonnes, Mr Maynard said that was expected, and was confident in a sustained demand from the Chinese market.

"I don't know that we'll continue to see those heights, but we certainly think that there's going to be sustained demand for pellets," Mr Maynard said.

"There has been a significant change in the market in China; the Chinese Government has been really strict now on air emissions – they're chasing blue sky, they want to improve their air quality, and they're being quite directive now about how often a plant can run and how many lines can run depending on its air emissions.

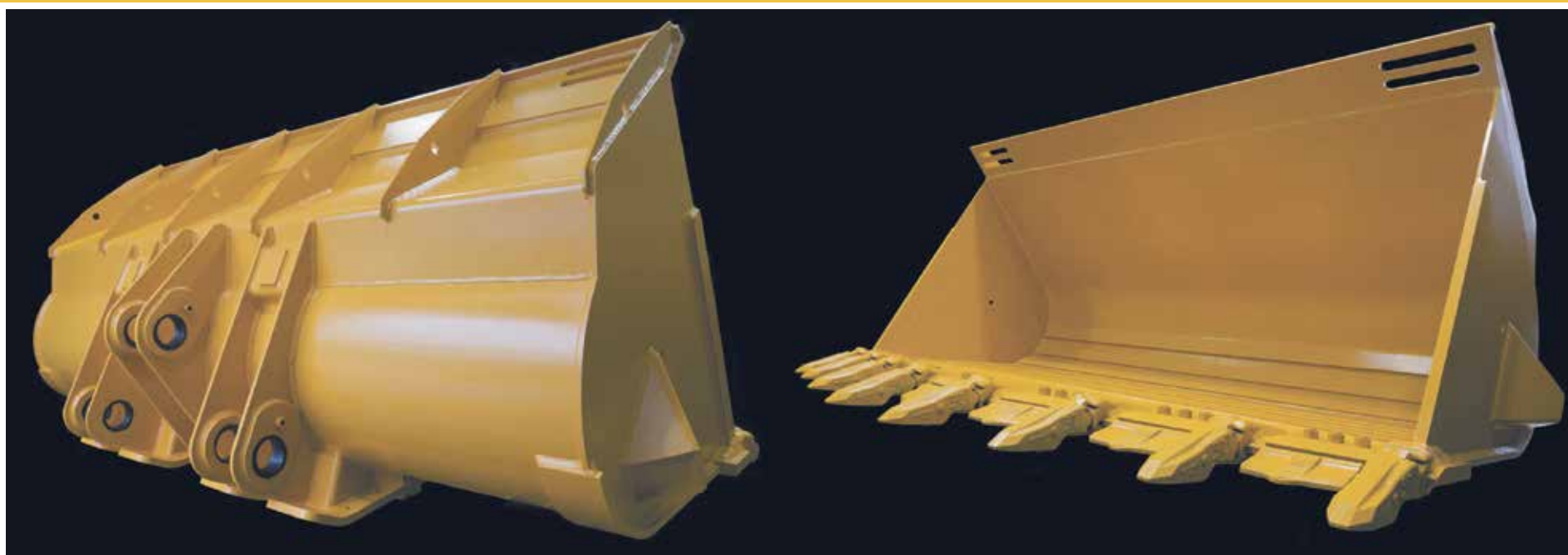
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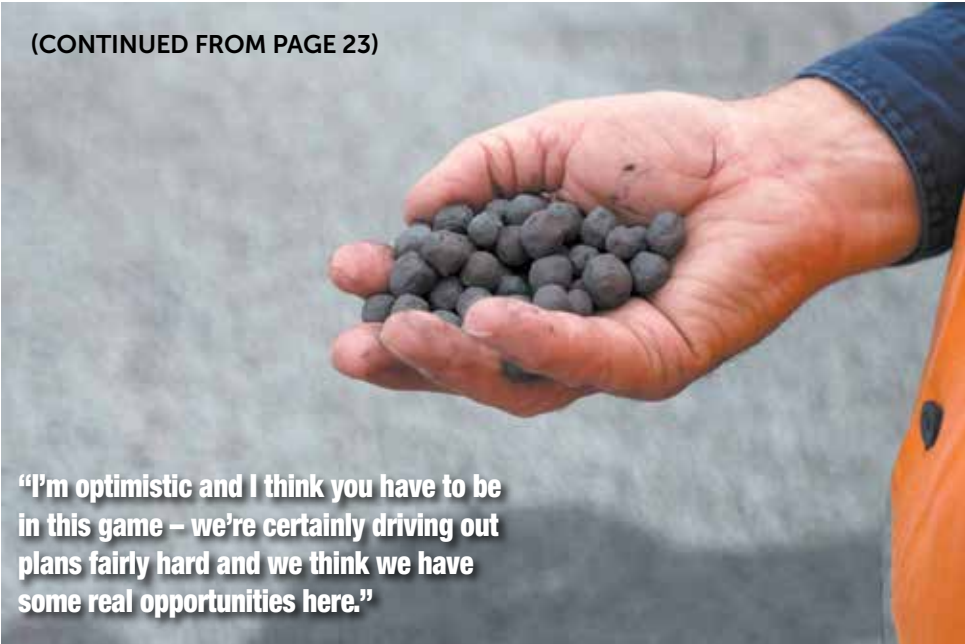
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(CONTINUED FROM PAGE 23)

“I’m optimistic and I think you have to be in this game – we’re certainly driving out plans fairly hard and we think we have some real opportunities here.”

Grange received record pellet premiums in 2018.

“So the prescription of the government now is really driving the need for these high-quality, lower impurity inputs.

“If you use our pellet in your steel-making furnace, you’ll create less dust, you’ll create less emissions, you’ll get a higher yield of iron, and you’ll require less maintenance on your furnace because you’ll get a better quality2 input.”

In another 2018 highlight, Grange completed commissioning of the South deposit tails storage facility in November.

Mr Maynard said the facility would provide tailings storage for the current life of mine, and mitigate some of the legacy and environmental issues on the site.

He said this included dealing with the pyrite that had been dumped in the early days of mining at Savage River.

As an iron sulphide, when pyrite is

exposed to air and water, it can react to create sulphuric acid.

“When they mined the first part of the operation in the first 20 or 30 years, there wasn’t the understanding of acid rock drainage and acid rock generation that there is today,” Mr Maynard said.

“They wouldn’t classify the material or identify where the pyrite was and treat that separately, so there were a couple of legacy issues from the very start of the operation where there’s old tails that were exposed to air that have pyrite in them.”

Mr Maynard said storage methods had changed at Savage River over time, but the South Deposit tail storage facility was designed not just for new tail storage, but also to capture some of the old sweeps from the old dumps.

“We’ve cleaned up Savage River – it

was a dead creek back in the 1990s, but now we have white bait and other fish running, however there were some areas where metal and acid was coming from these old dumps, so the facility now captures the run-off from those areas,” Mr Maynard said.

“Now there’s clean water being driven down-stream.”

Beyond Savage River

While Grange’s operations consisted principally of owning and operating Savage River, it was also a majority joint venture partner in a major magnetite development project at Southdown, near Albany in WA.

SRT Australia, which is owned by Japan’s Sojitz Corporation and Kobe Steel, had the remaining 30 per cent stake in the project.

According to Mr Maynard, the process of seeking a strategic investor or investors for the project was ongoing and alternative options were being explored to assist in the implementation of the project.

“The Southdown magnetite project is an advanced project with more than 1.2 billion tonnes of high-quality mineral resources, including ore reserves of 388 million tonnes,” Mr Maynard said.

“The project has been designed to produce 10 million tonnes per annum of high-grade, quality magnetite concentrate at 69.5 per cent iron.

“This is expected to command a premium price in the iron ore pellet feed market over a potential mine life of around 30 years.”

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The company employed more than 50 permanent staff comprising boilermakers and welders, sheet metal workers, fitters and turners, belting and rubber technicians, diesel mechanic, industrial sandblasters, industrial painters, apprentices and skilled trade assistants.

With facilities in Camdale in North West Tasmania, Coastal Engineering and Belting supplied to and maintained an Australia-wide client base.

The company has always striven to be the best in the business, while providing comprehensive services by delivering precision work on time and on budget to clients across Australia.

At Coastal Engineering and Belting efficiency and hard work was all part of the service.

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the Savage River mine and Port Latta, Epiroc, MMG Rosebery, BHP Billiton Olympic Dam, Fosterville gold mine Bendigo, Bluestone Mines Renison, Elphinstone Group, Caterpillar Global, Forico, Hellyer Gold Mines, Keech Castings and McCain Foods.

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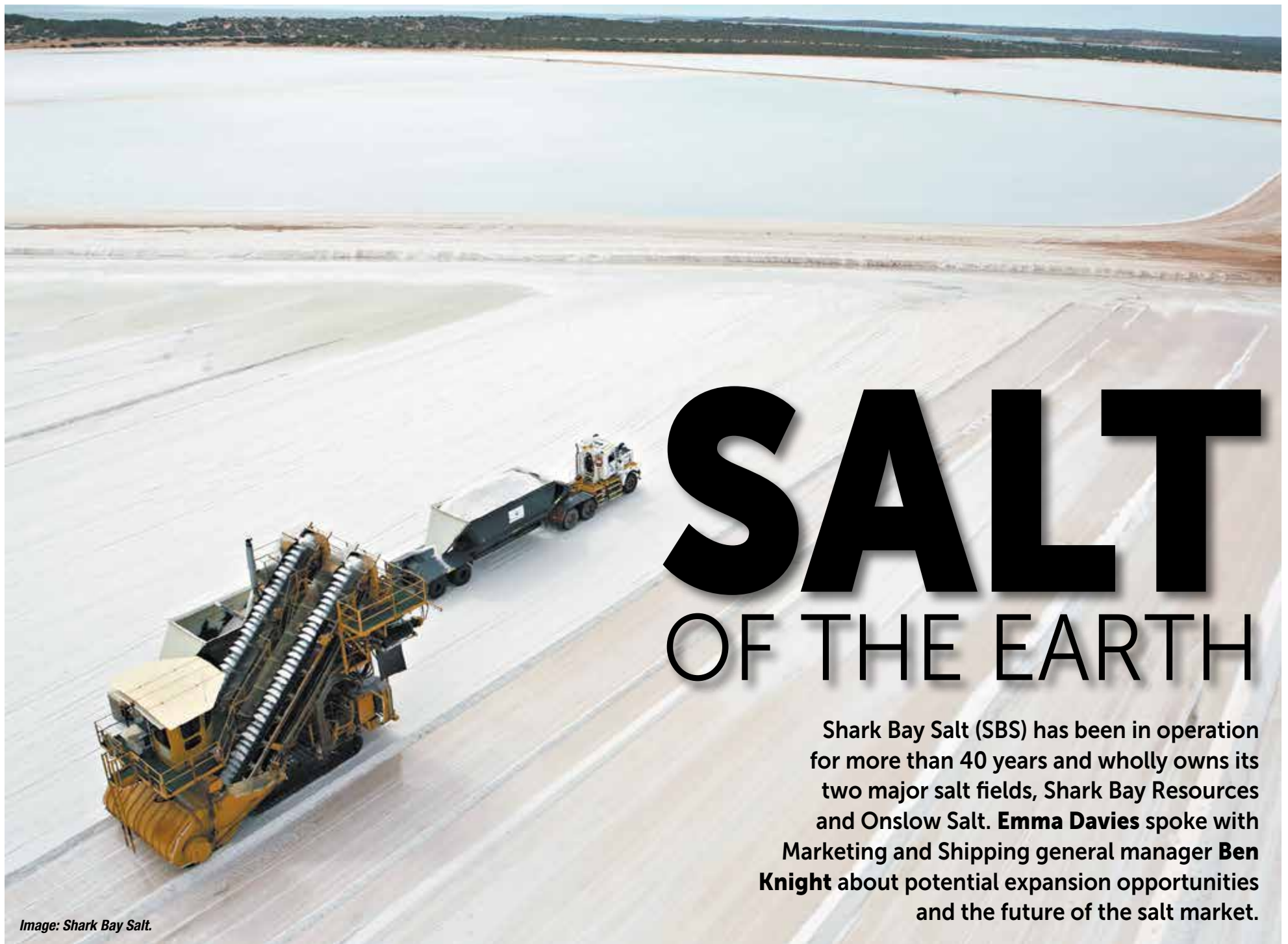


Image: Shark Bay Salt.

SALT OF THE EARTH

Shark Bay Salt (SBS) has been in operation for more than 40 years and wholly owns its two major salt fields, Shark Bay Resources and Onslow Salt. **Emma Davies** spoke with Marketing and Shipping general manager **Ben Knight** about potential expansion opportunities and the future of the salt market.

Q. What is the main factor that has led to Shark Bay Salt's success over the last 40 years?

Situated in the best location for salt production and surrounded by pristine sea water, we have been expanding our production and sales to provide good quality salt to our customers and the constantly growing demand in Asia.

To achieve consistent production of great quality salt, it has been a continuous effort to improve, innovate, and to maintain our salt field, facilities and equipment in excellent condition. All of which are done by our people.

Our people are the most important component of our success.

We have also remained focussed on maintaining long-term relationships with our customers, providing competitive pricing and streamlined logistical services and of course, the highest quality of salt.

Q. Annual production is about 4 million tonnes – are there any expansion opportunities being investigated?

Mitsui [of whom Shark Bay Salt is a wholly owned subsidiary] has a strong global network, which continuously provides Shark Bay Salt with opportunities for further expansion into Asia and beyond.

With a forecast increase in demand and a global shortage of solar salt, particularly in the industrial sector, we are currently engaged in studies for further expansion.

In 2016, Onslow Salt increased production capabilities by 500,000 metric tonnes to bring Shark Bay Salt's overall production to 4 million metric tonnes as a result of the

expansion of crystalliser ponds. Further to this, we are also looking at various options to increase supply capabilities with feasibility studies currently underway to explore options that can increase salt production. These increases will come on the back of improved land utilisation and some other enhancements to our production process.

Maximising these efficiencies through improved land utilisation and enhancements to our production processes is key — this will ensure that Shark Bay Salt continues to be a reliable source of the highest grade solar salt in the Asian seaborne market.

Q. How has the residential village benefited SBS employees and the company?

We pride ourselves on employing a permanent residential workforce.

The company operates a residential village close to the Shark Bay Resources operation, which provides employees and their families housing, recreational facilities and schooling.

Our employees are provided with private housing with all utilities included. Schooling is administered by the WA Department of Education from prep through to Year 6.

For Shark Bay Resources there are a host of advantages to offering our workforce residential living. These include the opportunity for our workers with families to come home to them every night and attaining a good work-life balance.

Housing gives our employees personal space; they reside in their own home without communal dining and fixed meal times. It

also organically grows stronger team work because our employees and their families not only work together but they socialise together. It creates a cohesive dynamic.

Q. When the public think of salt they think of table salt – how would you explain the vast uses and importance of the commodity?

Salt is one of the oldest and longest traded commodities in the world.

Salt is essential to life with its importance in economical and industrial development around the globe being very well documented. We cannot live without it. Therefore, the need for salt has shaped the history of the human race.

Over time, the technology for producing salt and the range of its uses have developed dramatically.

Salt has a very diverse role in the world, both in its industrial and chemical use through to the salt that is used in food production and in its rawest form, table salt. By volume, salt's biggest use is in the chlor-alkali industry where about 70 per cent of Asian salt demand is derived. This is used in the production of plastics, PVC, alumina and pulp and paper to name a few.

Most manufactured goods that we use in our day-to-day life have salt in their composition, as such, we expect salt demand will increase stably along with GDP growth in Asian countries.

Our salt is also utilised widely in the food manufacturing and table salt markets across Asia. Indonesia — one of the key markets for Shark Bay Salt — consumes about 400,000 metric tonnes of imported solar salt per annum for use in their food

production including in the fishing sector (salting and preserving seafood), instant noodle manufacture, in food seasoning and as a preservative.

Salt is also widely used in Japan for pickling various foods and in the production of soy sauces.

Q. Do you see market growth for salt in the next five to 10 years?

Steady growth in the world economy is creating organic growth in demand for salt. Most notably chlor-alkali demand for salt which has seen the largest increase over the past 12 months and is a trend that we anticipate to continue over the next five to 10 years.

Forecasts are for a supply shortage of 20 million metric tonnes per annum in the Asian seaborne market by 2025. These figures seem optimistic, however there is undoubtedly going to be a very significant supply gap that will in turn put considerable upward pressure on salt prices.

On the back of this, we have seen several Australian and multinational companies looking to develop salt fields in North-Western Australia to capitalise on this supply shortage.

There is strong demand for our salt both in the Asian industrial sector for its superior yield in the chlor-alkali process and in the food segment owing to its purity.

With opportunities for expansion and with our operations strategically located in close proximity to the growing Asian markets, Shark Bay Salt is well positioned to ensure a steady supply of highest-quality salt to meet the market's requirements for years to come.

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"Our marine pilots are licensed for a number of our contracted ports, which gives them a unique perspective on port operations.

"It is the experience gained in this multi-port environment that gives West Coast Pilots an advantage over single port pilot providers," Mr Melville said.

West Coast Pilots provides experienced Master Mariners to perform pilotage and load master functions at Shark Bay Resources' (SBR) export facilities at Onslow and Useless Loop.

The company has an excellent safety record, working closely with SBR's shipping department to ensure continued reliability and efficiency in marine operations at both sites.

"West Coast Pilots has been pleased



West Coast Pilots offer reliable and efficient marine pilotage services.

to provide strong operational support to SBR during a period of increased exports from both Onslow and Useless Loop," Mr Melville said.

"West Coast Pilots looks forward to continuing its partnership with Shark Bay Resources in the years ahead and to building on a strong relationship that

began in 2005, and we wish SBR continued success in the years ahead."

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

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West Coast Pilots



Growth in the lithium battery market is driving Galaxy Resources to ramp up production at its flagship Mt Cattlin mine in Ravensthorpe, WA and increase greenfields and brownfields exploration to meet future demand.

All images: Galaxy Resources.

EMMA DAVIES

GALAXY Resources’ Mt Cattlin mine has been operational for two years and is now aiming to ramp up spodumene production to more than 210,000 dry metric tonnes per annum (dmtpa).

In the December quarter, the company produced only 33,780 dmt of spodumene concentrate at a lower than average reserve grade and recovery rate due to the majority of ore mined coming from a lower grade 2SW pit.

Galaxy also reported lower margins than the previous quarter, completing three shipments of lithium concentrate at an average cash margin of \$US288 per dry metric tonne sold due to increased

production costs.

However, the company was poised to finish FY19 on a high; scaling up its operations and increasing productivity for Q1 2019.

“Galaxy is now focussed on optimising operations at Mt Cattlin in order to expand production volumes beyond those achieved in 2018 and is looking to achieve this following the implementation of a Yield Optimisation Program (YOP) at the plant,” Galaxy Resources managing director and chief executive Anthony Tse said.

“This will include the addition of an ultra-fines DMS circuit, a secondary floats re-liberation circuit and optical sorting circuits.”

Prior to the implementation of the

YOP, the Mt Cattlin plant comprised two separate DMS lines that concentrated spodumene ore based on density and particle size (coarse and fines).

The ultra-fine material was not treated further (not included in the final product) and was stockpiled separately.

“The installation of an ultra-fines DMS circuit (a third line) will allow for the treatment of ore from even finer particles than currently treated, as well as the re-treatment of previously stockpiled ultra-fine material,” Mr Tse said.

“This will result in a greater overall recovery of spodumene through the plant.”

Each of the DMS circuits effectively concentrated spodumene via differences in the density of spodumene and waste materials.

The waste product separated from concentrated ore (floats) often still contained fine particles of spodumene that were not liberated due to the size fraction to which the particle was crushed.

“The re-liberation circuit takes this material, crushes it to a lower particle size and then recirculates it back through the plant,” Mr Tse said.

“The installation of the ultra-fines DMS circuit will effectively allow for greater overall liberation of spodumene from the ore material.

“The optical sorter circuits use differences in the colour of spodumene and waste material to further improve the quality of both the feed ore and final product, by removing the waste and impurity materials.”

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The new YOP circuits will optimise productivity at the site.

Construction of the YOP circuits was completed in the December quarter of 2018 and commissioning was 85 per cent complete with completion, and the corresponding improved recoveries and production volume in the range of between 40,000 and 45,000 dry metric tonnes (dmt), expected from Q1 2019.

A Revised Resource

An updated resource and reserve estimate for Mt Cattlin was released on 23 January and showed a 42 per cent increase in

total Measured, Indicated and Inferred Resource tonnes to 16.7 million tonnes, at 1.28 per cent lithium oxide (Li₂O) grade containing 214,400t of lithium.

Other highlights included a 16 per cent increase in total Measured and Indicated resource tonnes to 12.1mt, at 1.27 per cent Li₂O grade.

Mr Tse said the mine plan and the mine life of the Mt Cattlin project was correlated to the defined project resource and would be revised based on the updated reserve model.

Galaxy had also recently obtained the

necessary permits and approvals from the WA Department of Mines, Industry Regulation and Safety (DMIRS) to transition mining away from the Dowling and 2SW pits.

These areas had been the focus of mining since the recommencement of production at Mt Cattlin, and Galaxy had now commenced mining activities east of and on Floater Road with the aim of beginning to treat ore in Q1 2019.

"Mining in this region had always been contemplated as part of the mine plan," Mr Tse said.

Market Outlook

The lithium sector growth was now dominated by the adoption of lithium-ion battery technology in everything from consumer electronics, portable electronics, to electric and plug-in hybrid electric vehicles, as well as mass energy storage systems.

Mr Tse said that lithium consumption was expected to grow a projected compound annual growth rate (CAGR) of between 15 per cent and 20 per cent (2017-2025) and that the current consensus estimated project demand at between 800,000 tonnes and 1 million tonnes of lithium carbonate equivalent (LCE) demand by 2025.

"Key demand indicators through 2018 were reflective of the scope of consumption growth, as well as real demonstrated execution in the adoption of lithium-ion battery technologies," he said.

"New Energy Vehicle (NEV) production in China totaled approximately 1.27 million units in calendar year 2018, while sales totalled approximately 1.26 million units, reflecting growth of 59.9 per cent and 61.7 per cent year-on-year respectively.

"Other key growth markets such as the US and Europe reported growth figures for plug-in vehicle sales of 81 per cent year-on-year (January-December) and 34 per cent year-on-year (January-November) respectively.

"China is targeting annual production of 2 million NEVs by 2020 and a 20 per cent penetration rate of NEVs by 2025."

The rest of the world was also expected to follow suit, resulting in exponential demand growth for lithium with the key inflection point for accelerated growth to be realised within the next three to five years.

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A four-stage circuit can produce in excess of 1.6m tonne of crushed feed material per annum.

High powered circuit at Mt Cattlin

WA

RAPID Crushing has installed a four-stage modular electric crushing and screening circuit at Galaxy Resource's Mt Cattlin lithium project able to produce in excess of 1.6 million tonnes per annum of -14mm crushed feed material.

The high-powered circuit crushes material to Galaxy's specifications for delivered to the site's fine ore bin for feeding the site's concentrator.

It's a continuous 24 hours a day project.

The Mt Cattlin installation is typical of Rapid Crushing's unique system of operation.

The company tailor-designs its plant to meet the grind and comminution specifications, the required production

output and most importantly, to a mine-site's configuration - a system that ensures maximum efficiency.

Rapid has this capability because it began 41 years ago as an engineering company servicing crushing and screening machinery.

Machinery at the time brought from overseas was poorly suited to Australia's outback conditions and when it broke down there were often delays in obtaining parts and personnel able to undertake repairs.

Rapid subsequently went a step further by building its own plant, better suited to the conditions, and able to be configured to a client's site to give maximum efficiency.

More information can be found at www.rapidcrushing.com.au.

“It is our core intention to maintain our leadership position within the lithium raw materials market and to potentially grow our market share through the continued optimisation of production at Mt Cattlin.”

A large yellow excavator is shown in the process of loading a yellow dump truck. The excavator's arm is extended, and its bucket is positioned over the truck's bed, dumping a load of light-colored, rocky material. The truck is parked on a dirt road, and a large pile of the same material is visible in the background. The sky is overcast and grey. The foreground is slightly out of focus, showing more of the rocky material.

A large pile of dark, granular material, likely coal or gravel, is shown from a low angle. A yellow crane or conveyor system is positioned above the pile, with a chain or belt extending down towards the material. The background is a bright blue sky with scattered white clouds.

A vertical collage of five images showing heavy machinery and infrastructure. The top image shows a yellow excavator with a large bucket, illuminated by bright lights at night. The second image shows a white semi-truck pulling a long train of black containers. The third image shows a yellow and blue locomotive pulling a train of orange containers. The fourth image shows a large white and yellow industrial building. The bottom image shows a large cargo ship on the water.

www.piacentini.com.au

HISTORY IN THE MAKING

The next big gold discovery in Victoria could belong to anyone. Considering historical operations, Bendigo and Ballarat are set to benefit with a hive of exploration activity currently underway by juniors, like Chalice Gold.

Image: City of Greater Bendigo.

PROJECTS IN FOCUS

Pyramid Hill (Chalice Gold)

Exploration began at the gold project in 2018 with encouraging results to date.

Ballarat Goldfield (Castlemaine Goldfields)

The active mine produces about 40,000oz of gold per annum and is one of the company's five tenements in central Victoria.

Costerfield (Mandalay Resources)

In January, Mandalay announced a 48 per cent increase in Proven and Probable Mineral Reserves for contained gold at its producing Costerfield mine.

Fosterville (Kirkland Lake Gold)

The largest gold producer in Victoria, Fosterville is 20km from Bendigo, and produced 124,307oz of gold in Q4 2018.

Stawell (Arete Capital Partners)

Stawell mine is set to re-enter production in early 2019, recently employing 100 staff.

Fingerboards (Kalbar Resources)

A Bankable Feasibility Study for this mineral sands project at Glenaladale, East Gippsland, was currently underway.

Nagambie (Nagambie Resources)

The junior has identified four strong underground sulphide-gold targets at its Nagambie mine, (Nagambie, Nagambie North, Cahill and Racecourse) and was completing further exploration.

Tandarra (Navarre Minerals and Catalyst Metals)

Navarre Minerals owns a 49 per cent share in this high-grade gold project in central Victoria with Catalyst Metals set to earn a 51 per cent equity interest by spending \$3 million over four years to advance the project towards mineral resource status. Catalyst was also completing other exploration in the region.

Yendon (Pure Alumina)

High-grade, low impurity kaolin deposits close to Ballarat, Victoria. A Definitive Feasibility Study was expected to be complete by Q3 2019.

EMMA DAVIES

CHALICE Gold holds exploration licences over an area of more than 3000sqkm and is one of the largest junior players in the highly prospective north Bendigo zone – which hosts Kirkland Lake Gold's Fosterville operation.

The company commenced drilling at its Pyramid Hill gold project in November 2018 and is focussed on testing the top 30m of basement rock on 3km spaced drill lines, looking for gold and pathfinder elements, which even at low levels can indicate proximity to large mineralised systems.

"Chalice has already drilled more drill holes into the target basement than all explorers before it," Chalice Gold managing director Alex Dorsch told *The Australian Mining Review*.

"A surprising fact given our proximity to world-class gold deposits like Bendigo and Fosterville."

Mr Dorsch said the company had high hopes for the Pyramid Hill gold project over the next few years.

"Our ambition is to make a globally significant, multi-million ounce gold discovery at the Pyramid Hill gold project in 2019," he said.

"We truly believe this is a possibility, given the regional analogues such as Bendigo and Fosterville, as well as the strength of the targets we have defined."

Regional Benefits

Should Chalice or another explorer make a discovery, there was likely to be significant positive impacts for the local community and wider Bendigo area.

Who could forget the flurry of activity following Fosterville's resources upgrade from 1moz to 1.7moz in early 2018.

Bendigo mayor councillor Margaret O'Rourke said that there were a range of businesses that had historically provided

machinery and other technology to support the mining sector.

"There are also various trades that would come in to maintain equipment, even down to catering and uniform companies that feed and clothe the industry and health and wellbeing providers that ensure worker safety," Ms O'Rourke said.

Mining growth had created employment in the local communities and attracted new residents to live and work in the city.

"As a result, partners generally seek jobs in the local economy, they might buy a home, their children go to school nearby, they shop locally, seek out healthcare locally, play sport or enjoy a great range of recreation opportunities," Ms O'Rourke said.

"To see these companies succeed delivers many flow-on benefits to Greater Bendigo's economy, including to supporting industries and businesses."

Ms O'Rourke said manufacturing was also a thriving industry in Bendigo – particularly for the mining industry.

"Our economy is valued at \$7 billion. Unlike many parts of Australia and across the world, manufacturing, particularly the more specialised advanced manufacturing sector, is thriving here in Bendigo and is valued at \$2.2 billion per annum," she said.

"The resurgence of the region, driven largely by Fosterville, is extremely positive for the industry."

"Employment in manufacturing in Bendigo, in contrast to most other areas, is virtually holding its levels."

Investing in Exploration

Mr Dorsch said while there had been considerable gold mining in the State since the mid-1800s, exploration efforts had been quite limited in the past few decades.

“As such, services required for mineral exploration activities like drilling, laboratory testing and equipment hire are somewhat limited,” Mr Dorsch said.

“Chalice has utilised some local and some interstate service providers to conduct its activities.”

But the good news was that Victorian exploration expenditure was on the rise.

In 2016/17 it rose 40.8 per cent or \$28.9 million to 40.7 million, according to the Australian Bureau of Statistics (ABS), and was growing at a higher rate than other States.

Between March and June 2018, exploration expenditure in Victoria increased 33 per cent — compared to just six per cent growth for all of Australia over the same period.

Late last year, the Andrews Labor Government extended the mining license for Fosterville gold mine out to 2035 and State Resources minister Tim Pallas flagged a further land release for minerals exploration north of Fosterville in an area with similar geology.

“This is a great result for the local economy and demonstrates the positive impact the resources industry can bring to our regional areas,” Mr Pallas said at the time.

“The extension of these licences is a boost to the Bendigo region, it’s great for jobs and allows the success story of these mines to continue.”

Balancing Act

Ms O’Rourke said that while mining was regulated through the State Government, it was the responsibility of mining companies to meet their obligations for respecting natural surrounds.

“Mining operations in the City of Greater Bendigo are largely in rural areas, so it can be a challenge for some rural residents who have chosen to live rurally but then come up against a mining expansion near to their property,” Ms O’Rourke said.

“The real challenge is when mining companies want to expand their operations.”

While Chalice was still in an early reconnaissance stage of exploration, Mr Dorsch said the aim was to minimise the company’s environmental footprint.

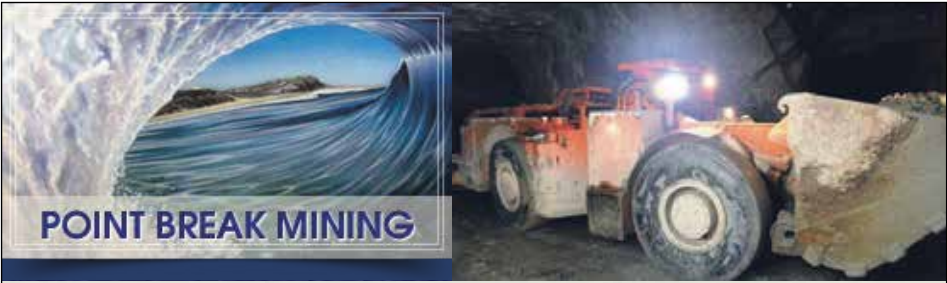
“We are capturing all drill waste, minimising dust and noise, and completely rehabilitating drilling sites — this is working exceptionally well, with almost non-existent remnants of our operations at rehabilitated drill holes,” Mr Dorsch said.

“Environmental impacts of a mine depend largely on the specifics of how the deposit will be mined, however as can be seen with modern operations like Fosterville, environmental impacts from mining can be managed effectively to minimise impact on the immediate community.”

Mr Dorsch said the company hoped to continue sustainable exploration and to fully define the size of its discovery with the aim to begin development activities in the next few years.

“The resurgence of the region, driven largely by Fosterville, is extremely positive for the industry and region,” he said.

“Chalice commenced exploration activities in mid-2018 and plans to be a long term player in this exciting gold district.”



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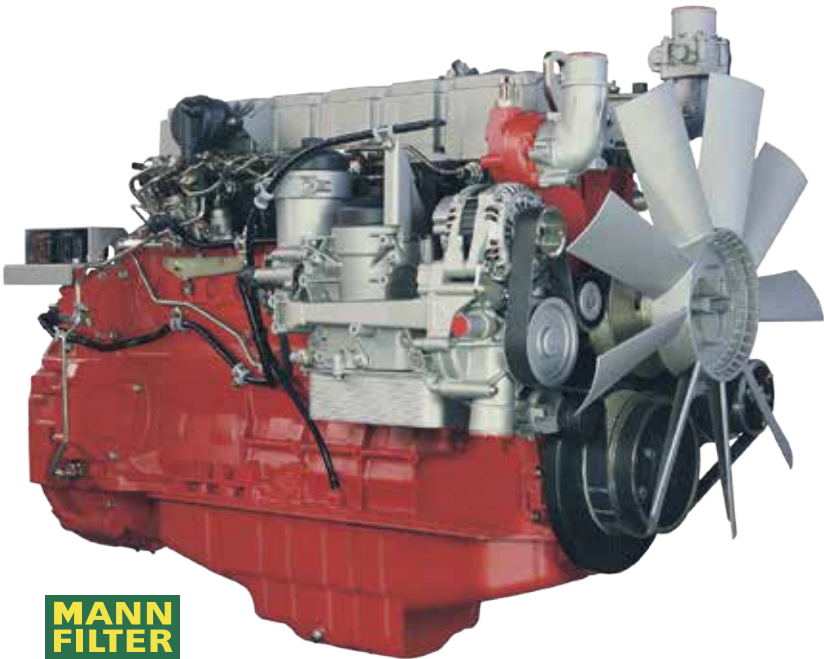
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All images: Mineral Resources.

THE BIG PICTURE

Mineral Resources' acquisition spree continues – this time a farm-in deal with Brockman Mining, the owner of the Marillana iron ore project in the Pilbara.

ELIZABETH FABRI

THE increasingly diversified Mineral Resources (MinRes) has been striking deal after deal in recent months.

Rewind the clock back to June, and there was the landmark purchase of Cliff's closing Koolyanobbing iron ore operations following its unsuccessful takeover bid for Atlas Iron.

In October, its next deal: an acquisition of BCI Minerals' Kumina iron ore project in the Pilbara.

A month later a \$1.58 billion agreement to sell half its share in its Wodgina lithium project to Albemarle followed, along with a separate JV deal to acquire a share of Hexagon Resources' McIntosh graphite project in WA.

Then came December when MinRes signed an agreement to increase its interest in Mt Marion from 43.1 per cent to 50 per cent.

Marillana Farm-in

After the Christmas break it was straight back into business for the team, with its Brockman Mining deal declared 'unconditional' and proceeding to the farm-in stage.

The JV, first announced to market in July, would see MinRes acquire a 50 per cent stake in the Marillana project.

Marillana was within the Hamersley Iron province in the WA Pilbara, and capable of producing a saleable product grade of at least 60 per cent iron.

The project would initially operate a 20 million tonne per annum iron ore export operation, with potential to increase to 30mtpa.

Conditions for acquiring the project included obtaining necessary approvals; a \$10 million loan to Brockman; \$250,000 spend on exploration and development activities; the completion of the process design criteria of the processing plant; optimisation of the mine plan study; and finalisation of its mine development layout plan.

"Upon satisfaction of the farm-in obligation, Brockman and MRL will form an unincorporated 50:50 joint venture which will proceed to develop Marillana."

"Upon satisfaction of the farm-in obligation, Brockman and MRL will form an unincorporated 50:50 joint venture which will proceed to develop Marillana," Mineral Resources said in a statement.

"The Mine to Ship Logistics agreement remains subject to a number of conditions precedent, including MRL executing a State Agreement with the Western Australian Government, procuring all the leases and licences for the light rail system and port infrastructure within the inner harbour of Port Hedland, obtaining project finance to fund the construction and commissioning of the rail and port infrastructure and the company's board making a final investment decision to proceed.

"Once unconditional, the Mine to Ship Logistics Agreement provides that the company will construct, commission and operate the rail, rollingstock and port infrastructure required to transport up to 30mtpa of iron ore from the mine site to Port Hedland, and load it on to vessels for export, for the life of Marillana."

2019 Outlook

In the company's 2018 Annual General Meeting, it said FY19 would be the most important year in its history to date, with

multiple projects either ramping up or ramping down.

Highlights of the year would include commissioning of Train 1, 2 and 3 at the Wodgina spodumene concentrate plant, and upgrades at the Mt Marion lithium project to increase nameplate capacity to 450,000 tpa and achieve a higher 6 per cent grade product.

FY19 planned production included 7mt of iron ore from Iron Valley; 3.5mt of iron ore from Koolyanobbing; 315,000 tonnes of 6 per cent and 75,000t of 4 per cent spodumene concentrate from Mt Marion; and 422,000t of DSO from Wodgina, and 60,000t of 6 per cent spodumene concentrate.

Partnering up at Wodgina

Once ramped up, the Wodgina project was expected to produce up to 750,000tpa of 6 per cent spodumene concentrate initially for sale, and ultimately feedstock for a lithium hydroxide plant.

MinRes' transaction to sell a half stake in Wodgina to Albemarle was expected to be completed at some point this calendar year.

From here, the parties would jointly fund, design, build and operate a battery grade lithium hydroxide plant at Wodgina in two stages.

Each stage would be targeted to produce up to 50,000tpa of lithium hydroxide (LCE basis).

But the timing of the second stage would depend on subsequent lithium market conditions.

MinRes managing director Chris Ellison described the Wodgina JV as an extremely good fit.

"Our organisations share the same vision to develop Wodgina, a tier one asset, as a world class, 30-plus year integrated lithium operation together," Mr Ellison said at the time.

"I am confident that with MRL and Albemarle working together at Wodgina, we will produce and supply high-quality, competitively priced lithium products into the market to meet increasing global requirements for these important energy storage products."

Spending Big at Mt Marion

Mt Marion was another area of focus for the company during FY19 after MinRes and Ganfeng Lithium agreed to increase their interest in the project by acquiring Neometals' 13.8 per cent interest for \$103.8 million cash (\$51.9m each).

The deal was anticipated to be finalised at the beginning of February.

MinRes said purchasing a higher stake was "consistent with MRL's strategy of identifying value-adding opportunities in the lithium sector."

The deal would still enable Neometals to have 'life of mine' offtake option rights for 57,000 tonnes of spodumene concentrate per annum from February 2020, which would be fed into its planned downstream processing facilities in Kalgoorlie.

Neometals managing director Chris Reed said the timing was right to sell its interest in the project.

"The company is changing its focus and exposure away from upstream concentrates and pursuing a more holistic and integrated approach to the lithium battery thematic," Mr Reed said.



Image: Australasian Railway Association.

Rail is set to boom in mining, with several rail-reliant iron ore and coal mines scheduled for development in WA and QLD, and a renewed focus on innovation. However, the industry continues to be challenged by a skills shortage.

AMY BLOM

RAIL has entered a golden age, particularly within the mining industry, but it is still struggling to attract young talent, according to Australasian Railway Association (ARA) chief executive Danny Broad.

Mr Broad, who has previously warned of a skills shortage, said there had been a huge increase in rail investment, which was good for the country, but presented challenges if the industry was not prepared.

“It’s the golden era of rail at the moment, there is so much investment going on in both Australia and New Zealand; we forecast there is more than \$100 billion of investment in new rail infrastructure – so that’s passenger and freight – over the next 10 years,” Mr Broad said.

This included four iron ore mines currently scheduled or already under development in WA’s Pilbara region by mining giants – Rio Tinto, BHP, FMG, and Roy Hill, as well as a number of coal mines in QLD.

Even more rail projects could be on the horizon for Australia’s mining sector.

In January this year it was announced Talison Lithium, rail operator Arc Infrastructure, and the Government’s South West Development Commission had cooperated on a pre-feasibility study examining the reopening of a disused section of rail in WA to carry lithium concentrate from Talison’s Greenbushes mine to Kemerton, Bunbury and Kwinana, and to support the State’s lithium industry.

The study found the \$150 million rail option was financially competitive with Talison’s current plan of hauling



Australasian Railway Association chief executive Danny Broad said while mining developments were good for the rail industry, it was exacerbating a skills shortage.

“It’s really great for both Australia and New Zealand that this money is being invested, but it’s creating challenges, especially in skills and resources in terms of a shortage.”

concentrate out of Greenbushes by road.
“What a long-term pipeline of work does is provide the opportunities for companies, like contractors, to invest in their people because they know there’s work over a long period, it’s not lumps coming and going,” Mr Broad said.

“It’s really great for both Australia and New Zealand that this money is being

invested, but it’s creating challenges, especially in skills and resources in terms of a shortage.

“That is especially for customers who are planning these major investments and their project teams; for the contractors whose role it is to build this new infrastructure; and for the supplier and manufacturers who supply the rolling stock, or other components and

parts for that new infrastructure.”
Mr Broad said the increasing number of large new developments were also challenging in terms of operations.
“When you have bigger networks, you need more people operating them and you also need more people maintaining them,” he said.
“So it’s not just building the jolly things; once they’re built you’ve got to run them for the next 10 or 20 years, and you need more people in terms of operation and maintenance to ensure that they run efficiently.”

Establishing a Skills Pipeline

According to Mr Broad, part of the reason the rail industry was not prepared for the growth in the mining industry was the lack of an established pipeline.
“You find it in a lot of industries in that there was market failure in terms of bringing on new people and training them in the 1980s, 1990s and so forth,” Mr Broad said.
“Prior to then, you had government agencies who were doing all the training, cadetships, and apprenticeships, but that reduced down over a period of time, so all these cadets and apprentices who had gone through are now in their forties and fifties, and there isn’t a big wave coming in behind.
“It’s really important that we promote the rail industry to schools, parents, universities and colleges, because there’s such a variety of jobs in the rail industry, especially now when there’s so much

(CONTINUED ON PAGE 37)



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We are part of Australia's railway network and pride ourselves on contributing to its safety, reliability and cost-efficiency.

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In addition to our machine manufacturing, Plasser Australia's range of after sales service includes:

- Original spare parts
- Machine (complete or partial) overhaul, remanufacture, repairs and/or regauging
- Component repairs and overhauls
- Technical training (pre-deliver and on site)
- Field service support
- On site commissioning services
- Technical customer service
- Digital documentation

(CONTINUED FROM PAGE 35)



Rio Tinto deployed AutoHaul in late December 2018.

Image: Rio Tinto.

investment going on.”

ARA sounded the alarm back in November, with the release of the *Australasian Railway Association Skills Capability Study*, prepared by BIS Oxford Economics.

The study found there was overwhelming evidence that there was a fast developing skills crisis that was deepening with every new rail project.

It found the inevitable result would be a substantial blow out in project costs and unavoidable delays in project delivery, and

that the issues were being exacerbated by an ageing workforce and the “stop-start nature of rail investment.”

The report’s key recommendation to addressing the “conundrum” was to establish a taskforce, made up of senior bureaucrats, industry chief executives, and training sector leaders, as a mechanism to achieve greater cohesion between jurisdictions for country-wide outcomes with strong industry engagement.

Its purpose would be to facilitate the development of an Australasian Rail Industry Pipeline of rail projects,

which would be tasked with the purpose of mapping skills required across construction, manufacturing, operations and maintenance.

The taskforce would drive reform in education and training systems, and adding its weight to initiatives such as establishing branding partnerships with related industries across transport, mining and manufacturing.

Following the report’s release, Federal shadow minister for infrastructure and transport Anthony Albanese said Labor would create a taskforce that works with

the rail industry and training sector to come up with solutions for the shortage.

According to Mr Broad, other organisations have begun to address the looming skills shortage themselves, such as Pacific National in QLD, which has a demand for more train drivers due to the increased need for coal haulage.

Pacific National launched its program to train its own freight drivers back in May 2018, with the 12-month training program beginning in July.

When the first batch of 25 recruits finish the course in July this year, they will be awarded a Certificate IV qualification in train driving.

At the time, Pacific National’s coal division president Brett Lynch said the program was launched to keep pace with the forecast growth in demand for freight given the ageing workforce of drivers around the country.

Rail Remains Best Option

Despite the prospect of a skills shortage, Mr Broad said the onslaught of new projects was still a good thing for the industry, and in turn, rail was still the transport option of choice for the mining sector.

“We see it as the backbone of a supply chain network, whether it’s coal or iron ore – getting the product from mine to port, or mine to a production facility – rail provides that transport mode to maximise the capacity,” Mr Broad said.

Despite safety issues in rail being thrown into the spotlight following two train derailments in WA, BHP and Mineral Resources, Mr Broad said accidents were rare.

(CONTINUED OVER)

Leaders in track construction and maintenance machinery

NATIONAL

SPECIALTY track maintenance machine supplier Plasser Australia has wrapped up another successful year, delivering a number of new machines to the mining industry, as well as rail network operators throughout the country.

Plasser Australia said this included the RM900 ballast cleaning machine, which was proudly delivered to Rio Tinto Iron Ore.

“This machine forms part of a major network maintenance operation at Rio Tinto Iron Ore which is planning on ballast cleaning and resurfacing works for its rail network in an effort to enhance reliability, and ensure that this critical link in its supply chain remains operational and supports product delivery,” the company said.

“The tail end of 2018 also saw a great achievement for Plasser Australia in the delivery of the RM/FRM 902 ballast cleaning machine to Aurizon.

“After 40 months in the making, this machine has come to fruition, which was a very proud moment in the company’s history.”

At about 160 metres long, the RM/FRM 902 was the biggest ballast cleaner delivered in the southern hemisphere.

Weighing in at a combined 553 tonnes, it has 14 bogies and 28 axles – 12 of which are hydraulically driven.

It also had a total of 37 conveyors, three C27 and one C13 series caterpillar engines, and 69 fixed and variable hydraulic pumps.

The RM/FRM 902 has a peak production



More information can be found at www.plasser.com.au.

rate of 1650 metres cubed per hour.

Once connected with the previously delivered 24 MFS-3/150 material handling wagons and other support equipment, the RM/FRM 902 would be just under one kilometre in length.

Plasser Australia also delivered the SSP305 ballast regulator to Rio Tinto Iron Ore in late 2018.

As part of a major planning and maintenance strategy, this machine would form part of the ballast cleaning operations soon to commence on the RTIO network.

Plasser Australia were also in the privileged position of supplying numerous SSP series ballast regulators to various network operators throughout the country – the first being the SSP303 supplied to Rhomberg Rail Australia.

“The machine has the latest cabin designs and safety features incorporated in a well-proven machine,” the company said.

In January, the company delivered the first of many machines to Queensland Rail.

The SSP302 ballast regulator was the first of 12 resurfacing machines that would be supplied to Queensland Rail over the next two to three years as part of its fleet upgrade project in an effort to future proof its resurfacing and track maintenance operations.

These new machines would replace the existing Plasser units that have been in service for the better part of 20 years.

Established in 1970, Plasser Australia has built a solid reputation supplying machines to the mining industry and has remained at the cutting-edge of track

construction and maintenance technology.

This included using the latest in sensor and communications technology to give its customers direct access to machine data.

Using the company’s PlasserDatamatic 2.0 module, operators could monitor their machine through a desktop, smartphone or tablet with live information covering the location and condition of the machine, its operations, and the condition of the track below.

The system could keep operators abreast of anything from engine oil pressure, to battery voltage, right through to the conditions of hydraulic oil.

According to Plasser, its machine-enabled measuring and monitoring could generate smart data and a virtual track, allowing maintenance to be more efficient.



(CONTINUED FROM PAGE 37)

“Rail is an extremely safe transport mode – road produces 14 times more accidents than rail – and rail has a rigorous training and accreditation standard.”

Demand for train drivers is increasing in QLD due to the development of more coal mines in the Bowen Basin.

“Rail is an extremely safe transport mode – road produces 14 times more accidents than rail – and rail has a rigorous training and accreditation standard,” he said.

“It is the most cost-effective solution, it ensures faster delivery, and it’s more reliable and safer than other transport modes.

“In the Pilbara they deliver more than 800mtpa of iron ore to the ports for export and on the east coast we’ve got coal both in the Hunter and the Bowen Basin – together that’s close to 400mtpa of coal transported by rail – so it’s huge.”

Innovative Rail Solutions

Rail has also been making waves in the mining sector through a number of innovations, such as Rio Tinto’s deployment of autonomous trains at its WA iron ore operations in late December last year.

In a world first, the mining giant successfully deployed AutoHaul, establishing the world’s largest robot and first automated heavy-haul, long distance rail network.

Since completing the first loaded run in July, Rio Tinto has steadily increased the number of autonomous journeys across its WA operations, with more than 1 million km now travelled autonomously.

Rio Tinto Iron Ore Rail, Port and Core Services managing director Ivan Vella said the safe and successful deployment of AutoHaul across the miner’s network was a strong reflection of the pioneering spirit inside Rio Tinto.

“It’s been a challenging journey to automate a rail network of this size and scale in a remote location like the Pilbara, but early results indicate significant potential to improve productivity, providing increased system flexibility and reducing bottlenecks.”

According to Rio Tinto, over the coming

months the miner would continue to refine its autonomous operations to ensure it was able to maximise value.

Rio Tinto confirmed it was working closely with drivers and did not expect to make any redundancies in 2019 as a result of the deployment of AutoHaul.

Mr Broad, who welcomed the deployment, said it was one of a number of new measures being adopted by major miners as they continued to research and innovate to improve safety and productivity.

“I think if you look at the Pilbara where you have what we call heavy haul operations, they’ve actually invested a lot of money into research and technology over the years,” Mr Broad said.

“They are the best at heavy haul in the world, and how they achieve that is through research and new technology where they’ve looked at things like automation as well as digitalisation.

“For example, through digitalisation they’re able to get real-time data, and using the internet of things, support maintenance, their operation, and the autonomous operations.”

Mr Broad said innovations such as digitalisation meant miners were able to utilise condition-based maintenance to reduce lifetime costs.

“They can use predictive maintenance to eliminate service failures, because the last thing you want is for a train to break down halfway from mine to port,” he said.

“Through this real-time data they can also manage the operation of the train, so they can reduce the amount of fuel that the train needs for the operations.”

He said the new technologies applied to rail in the mining sector were unlikely to reduce the amount of skilled workers needed as they often changed jobs, rather than replacing them.

Reputation for quality

NATIONAL

RAILTRAIN Holdings Group (RHG) provides industry-leading, full service and integrated solutions for rail operators and infrastructure owners nation-wide.

As a leading provider of rail workforce development, training and rail infrastructure services, RHG has provided high-quality services to the Australian rail industry since 1999.

Through experienced, passionate and driven people, RHG has expanded its workforce to modernise and refresh the rail industry.

The company is a proudly Australian-owned and operated provider that has grown from its home in Perth, WA to operate on a truly national footprint.

Within RHG, RMC Rail Services provide turnkey project development and delivery, brownfield track renewals, track protection and signal maintenance and construction.

RHG has developed high-quality, bespoke training solutions to build a new generation of rail crews, providing career opportunities at sites from Roy Hill to Central Queensland.

Led by an executive team that has more than 200 years combined railway service experience, Railtrain Holdings Group is preparing for immense growth as it works to ensure its high-quality services adapt to the changing needs of the rail industry.

RHG chief executive, Stephen Cowan said the company is committed to maintaining its excellent safety record



A work train on a Pilbara construction site.

while never losing focus of regulatory and client obligations.

“Our reputation has been hard-earned through the dedication of our people, from head office to remote rail sites,” Mr Cowan said.

“We have developed a highly committed, performance focussed team

that is driven to make the Australian rail industry safer, stronger and successful.”

RHG has successfully leveraged high-performing teams that are backed by its nationally-recognised RTO (RTO Code 52221) and workforce recruitment teams.

This training has developed new operating models to deliver safe, reliable

and skilled train crews that meet and exceed client expectations.

Through the creation of new employment pathways, RHG has successfully introduced new entrants to an exciting career in rail.

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

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Image: Pilbara Minerals.

JOINING FORCES

As mining takes off again in WA's Pilbara region, communities are bracing themselves for another boom and working to ensure locally-based service providers have a share in the sector.



AMY BLOM

WITH three new major iron ore mines on the cards and the increasing prominence of lithium, gold and copper in the area, the Pilbara could be set for another mining boom.

But in the hopes of mitigating the highs and lows of the past, community leaders were encouraging a greater focus on awarding contracts to local service providers within existing hubs and a strategy of diversification.

Most of the services necessary for new developments were already in place in the Pilbara, thanks to the region's rich mining history, with many towns having been created specifically for the purpose.

City of Karratha mayor Peter Long said the relationship between mining and service-providers had shaped the Pilbara since gold was first discovered east of Whim Creek in 1887.

When an iron ore export ban that had been in place since 1938 was lifted in 1960, the large deposits scattered over the region suddenly became commercially viable, and a slew of towns were established to provide services supporting the new iron ore operations.

According to Mr Long, this was followed in the coming decades by gas discoveries, but more recently there had been a diversification in the mineral production of the region thanks to renewed interest in minerals such as gold and copper, and the new focus on battery metals.

"Lithium is one of the latest things of course, because it's required in batteries, and there's now three mines south of Port Hedland," Mr Long said.

"It's quite incredible and there's so much in the future as well – there's so much investment that's going to happen, so we're very fortunate.

"Providing the world market stays stable,

NEW PROJECTS

South Flank (BHP)



Koodaideri (Rio Tinto)



Eliwana (FMG)



Pilgangoora Stage 2 (Pilbara Minerals)



Pilgangoora Stage 2 (Altura Mining)



Wodgina (Mineral Resources)

Image: Rio Tinto.

it will be a very big year for Karratha, the Pilbara, and WA too."

Despite his optimism, Mr Long warned that jobs needed to be localised as much as possible, in order to avoid the issues of the last boom, which were characterised by inflated living costs and shortages in land, electricity, and sewerage capacity.

"We definitely want to keep jobs local and we don't want the rents to go crazy because already they're starting to go up quite significantly," Mr Long said.

It was a sentiment shared by Shire of East Pilbara president Lynne Craigie, who said services were already well-established within the region, but were increasingly facing the pressure of competing with larger, often multinational companies for key contracts.

"Local contractors have tried their best and up until a point recently they have provided services to the mining industry – it's only now as the economy is tightening that the big players are trying to come in and take over some of those services for mining companies, which is not advantageous to local communities," Ms Craigie said.

"Looking at my own community, something that would have employed 10 or 12 small contractors in town – those contracts are now being taken over by large multinationals."

Forming Service Alliances

For local contractors that have extensive experience in providing mining services, but are sometimes too small to compete against

larger, out of town companies, a joint tender may be the answer.

While Mr Long said he had yet to see a formal Pilbara-based mining service alliance, joining forces to compete for a contract was fairly common.

"As the City of Karratha, we split up contracts as small as possible so that local contractors can tender on them," Mr Long said.

"That doesn't always happen on these huge billion dollar projects, so what happens is that smaller companies have to band together, and that's actually happening already.

"I haven't heard of a specific alliance aimed at iron ore just yet, but some of our local companies have been very successful; they'll join with others, so one might be an expert in steel fabrication and they might join with an aluminium fabricator."

Ms Craigie said such alliances, whether formal or not, were a good way to ensure local services stayed in the region.

"I personally think it's a great idea because at the minute everything gets taken to Perth or further afield, or those multinationals get it," Ms Craigie said.

"Not only does it mean that the local contractors miss out on mining work, it also means they can no longer afford to offer those services to the rest of town.

"If you look at a local electrician for example, if all he's got is the odd bit of residential work around town, there's not going to be enough work for him to employ five, or 10, or 20 people; whereas if he can combine that with mining work, then the town gets the service as well.

"If we could have a Pilbara base of contractors, they could move around the Pilbara and provide services better."

Ms Craigie said utilising local service-providers could also make smaller mines more viable.

(CONTINUED ON PAGE 42)



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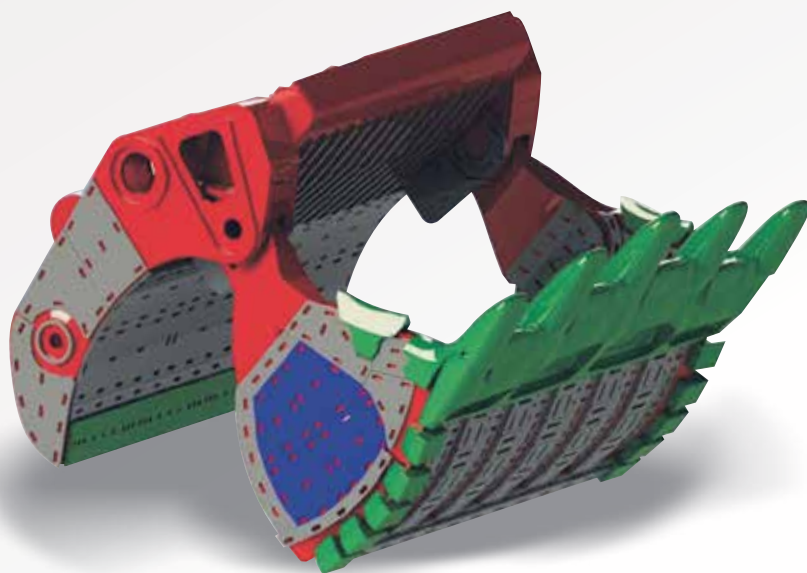
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(CONTINUED FROM PAGE 40)

“We talk about mining as in iron ore, and that’s great because iron ore is our bread and butter, but there are other small mines and other commodities that are almost on the edge of being financially viable to mine,” she said.

“If we can have local services provided so they don’t have some of that great expense of taking stuff in and out of the Pilbara, maybe that could help make them more viable too.”

A Local Focus

Many of the larger miners have already taken the local message on board, including BHP, which announced in October last year that more than 50 per cent of its contract commitments for its South Flank project was to businesses with Pilbara-based activity.

At the time, South Flank project director Simon Thomas said BHP embraced its 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 all to supply detailed methodology for providing maximum employment opportunities for Pilbara residents,” Mr Thomas said.

“We’re deliberate about making sure as many Pilbara-based businesses have the opportunity to benefit from South Flank too.

“Our contractors are clear on our expectations of subcontracting to local suppliers, and initiatives like our Local Buying Program make it easier for the

*Image: City of Karratha.***City of Karratha mayor Peter Long.**

smaller businesses to participate.”

Beyond the Boom and Bust Cycle

Concerns for jobs to stay local, were not just about ensuring existing service providers maintained work, but also about stemming the population flow into the region, which wreaked havoc with the cost of living during the last boom, according to Ms Craigie.

“The East Pilbara was damaged in a lot of ways by the boom – there wasn’t a lot of warning it was coming,” Ms Craigie said.

“We had a population explosion within the town and rents went up to absolutely ridiculous levels; you could pay \$800,000 for

*Image: Shire of East Pilbara.***Shire of East Pilbara president Lynne Craigie.**

a small three bedroom asbestos ex-mining house.

“While that was good for those who could sell in that market, it made it very hard for local business to compete and to bring new people into town.”

She said further damage was done when the boom ended and the bottom fell out of the housing market.

“You have that boom and bust cycle with mining traditionally, and that’s very damaging for the region, because prices go through the roof, and then it’s like someone has ripped the rug out from underneath them,” Ms Craigie said.

“There were foreclosures on houses

everywhere because people tried to get in on an investment level and paid \$800,000 or \$1 million for a house that wasn’t worth it, and then the bank suddenly values it at \$300,000 or less, but they still have an \$800,000 mortgage.

“We need to have land available so that if there is another boom and there’s a housing shortage, there will be land available and people won’t be paying top dollar – the land will be there and developed ready to plonk a house on if that’s what they need.”

Ms Craigie said while communities in the Pilbara were attempting to safeguard themselves against the typical boom and bust cycle, the increasing diversification of mining in the region would also protect local businesses and service providers by ensuring they were not reliant on the success of a single commodity.

“With the expansion of the type of stuff we’re mining – we’ve got more gold and lithium coming into the market – we’ve stopped being so reliant on one commodity price,” she said.

“The issue is that it’s all been iron ore in a pretty big way, and we are very much hamstrung on the price of that commodity, so if the commodity price of iron ore dropped, so does work in the Pilbara.

“If we can make it more diverse so that there’s a greater range of minerals being mined or other things happening, we’re not so reliant on that, and it should help to cushion that boom bust effect.”

Mr Long said Karratha was also working to safeguard the community against a boom, and were prepared for the population to double to 50,000, however diversification was still a vital component of the city’s strategy.

Boom times mean more meterage

NATIONAL

ENERFLOW Mining Services’ requirement for additional floor space served as further confirmation of the increase in activity within the mining sector.

The company recently moved into a 3000sqm state-of-the-art warehouse in Neerabup, in Perth’s northern suburbs, according to Enerflow Mining Services’ general manager David Smith.

“We have just moved to a facility because of a need for increased capacity to service the industry,” Mr Smith said.

“With three overhead cranes, five haul truck-sized work bays, plus areas for fabrication of loader buckets, mechanical and electrical workstations, and a dedicated spare parts area, the warehouse was a perfect fit for our requirements.

“Some of our recent work undertaken in our workshop to support projects in the Pilbara include a bucket rebuild for a 993 and a blast hole drill rig overhaul.”

Mr Smith said since the global financial crisis, Enerflow had steadily grown during the tough times and now intended to flourish in coming years, with the increase in demand from the mining sector.

“The move was necessary for us to be able to meet forecast requirements from our clients,” he said.

“Furthermore, the new workshop also provides for a more efficient and safe workflow that is consistent with our commitment to continual improvement as outlined within our ISO certificated

**Enerflow has expanded into new premises.**

Safety Management System.”

With iron ore majors increasing capacity and the lithium boom, Enerflow was just one of many businesses within WA, which were poised to benefit.

Mr Smith said Enerflow had a strong history and belief in giving back to the

community through several initiatives that included staff being able to give blood donations on company time.

“The driving force of this commitment is that the mining industry has provided our families with opportunities, which are rarely found around the world, and we are extremely grateful,” he said.

“This move of the facility also helps us give back to the community and local businesses.

“We have built relationships with multiple family-run businesses who are now growing with us and providing more work and opportunity to everyday Australians.”



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*Image: Image Resources.
Photography: Nathan Sixsmith.*

SUCCESS STORY

Image Resources' \$235 million Boonanarring mineral sands project is a hive of activity; first shipment of 10,000 tonnes of heavy mineral concentrate (HMC) was achieved in January, with the company now well-placed to capitalise on rising zircon prices.



EMMA DAVIES

IMAGE Resources' 100 per cent owned zircon-rich Boonanarring project is considered one of the highest-grade mineral sands projects in Australia.

It has been an interesting project to watch over the last few years, in part due to its fast timeline to production brought on by a series of transactions with Murray Zircon in 2016, including the acquisition of key plant infrastructure.

In April/May 2018, project funding was finalised and construction began in earnest.

Following a six-month construction period, Boonanarring was commissioned in October-November 2018, and the planned six-month production ramp-up period began in December.

The production ramp-up at Boonanarring was aggressively scheduled to achieve an ore processing rate design capacity of 500 dry tonnes per hour in six months.

But production rates during December substantially exceeded this with the company achieving first shipment and revenue on 14 January.

The payment for the first shipment was secured under a life-of-mine offtake agreement with Shantou Natfort Zirconium and Titanium Co (Natfort).

Reflecting on recent achievements, Image Resources managing director Patrick Mutz described production to date as "remarkable".

"While the challenge of ramping up the ore processing rate to nameplate capacity and achievement of steady



The Boonanarring and Atlas deposits are situated in WA near Gingin and inland from Cervantes respectively.

state operations is still in front of us, the achievements of completion of construction and first HMC production on schedule provides confidence that the remaining development hurdles will be cleared," Mr Mutz said.

With processing rates continuing to exceed budgeted rates, Image Resources was building HMC inventory levels

for a second shipment scheduled for mid-February.

The company remained committed to completing its key project development milestone of achieving positive project cash flow at the end of the first quarter 2019 – and if the current processing rates were anything to go by this target was in sight.

Mr Mutz praised the teamwork leading up to the first shipment.

"The operating group, spearheaded by Todd Colton, COO and David White, operations manager, has delivered on another very significant milestone for the company, being completion of the first bulk shipment of HMC and receipt of first revenue," Mr Mutz said.



“The achievements of completion of construction and first HMC production on schedule provides confidence that the remaining development hurdles will be cleared”

Image Resources managing director Patrick Mutz.

“I want to thank Braemar, WA Mercantile and Qube Ports & Bulk for their valuable contributions to our first shipment, and our offtake partner Natfort, for working with Image on what has been a tight schedule during the end of year holiday period — we look forward to developing a routine nominal monthly shipping schedule to support our aggressive mining and processing schedule.”

A Positive Outlook

Figures from the WA Department of Mines, Industry Regulation and Safety put the State’s mineral sands sector sales in 2016-17 at almost 1.4 million tonnes of material, valued at about \$554 million.

While titanium materials (ilmenite, leucoxene, synthetic rutile and rutile) were mainly produced, Australia was estimated to have the world’s largest reserves of zircon — with 48 million tonnes, or about 64 per cent of the world’s total estimated reserves of 75 million tonnes.

Zircon prices increased 37.3 per cent from 2016/17 to 2017/18 and were forecast to climb over the next four years due to a predicted shortfall in zircon supply out to at least 2022.

This underpinned predictions of strong zircon prices at current levels or higher for the foreseeable future, meaning there was a strong market outlook for zircon in the medium term – with Image Resources’ Boonanarring project set to benefit.

The company’s Boonanarring and undeveloped Atlas deposit represented a total resource of 32.3 million tonnes

at 8.1 per cent heavy minerals, with the intention to mine the deposits at a rate of 3.3mtpa over a projected 10-year mine life.

In its September quarterly report, the company said its benchmark zircon price to be used to price Image’s HMC product, increased by 12 per cent to \$US1625 per tonne (middle of range).

“The price in China for Tronox Limited’s premium grade zircon price is even higher at \$US1645 per tonne (middle of range),” the company stated.

Future Focus

With a long-term vision for Boonanarring, the company was in discussions with two landowners regarding access agreements for delineation drilling over the 2.6km northernmost section of the extension of the high-grade Boonanarring deposit.

If approved, this would have positive ramifications for the mine life of the project and the economy of the local community.

To date about half of site-based personnel had been recruited from within the Shire of Gingin and surrounding areas and the company had been successful in attracting a team of experienced people to the project — successfully taking the Boonanarring project through the commissioning process to full production.

There will also be potential employment opportunities for local workers with Sunrise Energy Group entering into a binding Heads of Agreement with Image Resources for 3-4MW single axis tracking solar farm located next to the Boonanarring mine.

(CONTINUED OVER)

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(CONTINUED FROM PAGE 45)



First heavy mineral concentrate production.

Sunrise Energy Group would build, own and operate the farm on land leased from Image Resources and was expected to provide about 25 per cent of the required electricity for the mine on an annual basis.

The farm would be about 20km north of Gingin, adjacent to the Boonanarring mine and processing facility and connected directly to Image's embedded electrical supply network in a "behind the meter" configuration.

Image Resources was also exploring a potential expansion of the Atlas deposit, which contained a probable 9.5 million tonnes at 8.1 per cent heavy minerals.

The south extension of Atlas was on freehold land and was being tested with a 34-hole drill program which could lead to a link to the Woolka targets in the South.

The company was primarily focussed on exploration activities and increasing the overall life-of-mine around the Boonanarring and Atlas deposits.

And with the favourable infrastructure of the North Perth Basin, along with an amenable local community used to major mineral sands players like Iluka and Tronox, Image Resources has a promising future ahead.



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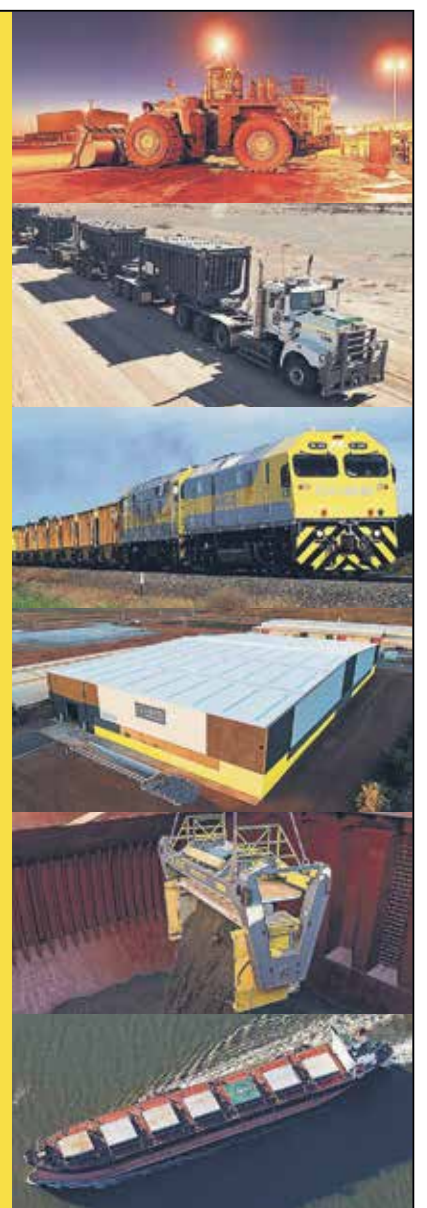
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Looming glut in lithium

NATIONAL

THOUGH 2018 is now firmly behind us, the lithium oversupply and bearish narrative that emerged last year has far from abated.

While most analysts agree that the lithium demand trend is strengthening, new up and downstream challenges are continuing to emerge – threatening the overall health of the market, as ever-promising demand indicators are not reflected in current prices.

The second annual *Lithium and Battery Metals Conference* – which forms part of the larger Minerals and Investment Week in Perth – will be taking a long and hard look at battery commodity markets, the inherent over and under supply issues and what to expect over the coming year.

At present, a downstream shift towards lithium hydroxide-intensive cathodes is making headway, with Benchmark Mineral Intelligence forecasting a need for 534,000 tonnes by 2028, which looks set to favour WA's burgeoning hard-rock producers.

So too is the clean energy movement and the rise of electric vehicles – lithium's most promising pathway to market – seeing more Australian manufacturers beginning to branch out downstream with governments, state and federal, looking to capitalise on the lucrative future market.

Further upstream however, new supply continues to be announced – both at home and abroad – with existing producers eyeing ramp ups and new players to enter



Minerals and Investment Week will be held in Perth in March.

the arena, making a big splash in what is essentially quite a small pond.

Nell Agate Tsui of IHS Markit, who will be speaking at this year's conference, said the continuing threat of market volatility was far from over.

"The fact that both upstream and downstream sectors of the lithium value chain continue to undergo transformative change ultimately introduces several challenges that are not always reflected in

regional prices," Ms Agate Tsui said.

"This year the real debate may hinge on whether we will see the spectrum of lithium chemicals for both battery and industrial applications rationalise, and which proactive NEV policy measures matter the most.

"I look forward to hearing from the wide range of producers at the Informa Conference to learn how they will turn challenges into opportunities."

Ms Agate Tsui will be joined by expert speakers from across the entire resources industry at the Minerals and Investment Week on 20-21 March 2019 at Crown Perth.

This year's event will feature four conferences, including the 22nd annual *Global Iron Ore and Steel Forecast*, 20th annual *Mineral Sands*, second annual *Lithium and Battery Metals* and the inaugural *Asia-Pacific Nickel* conferences.

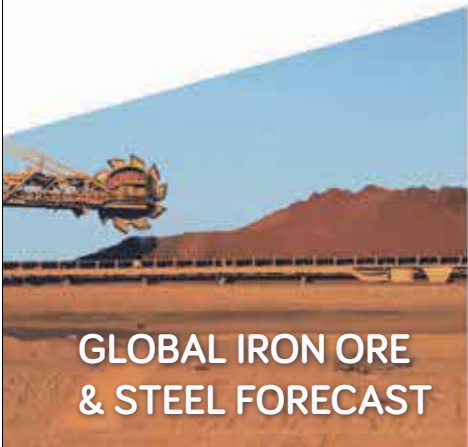


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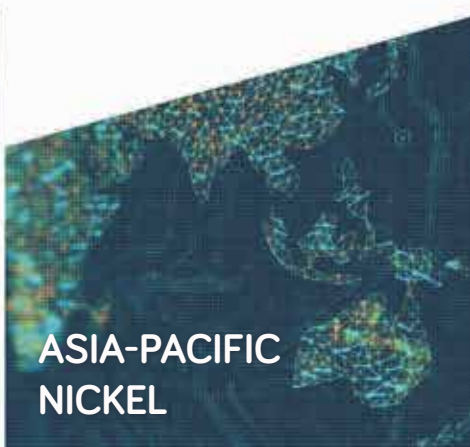
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INDUSTRY SPOTLIGHT

COMPANIES GEARING UP

Metso grinding mill minimises expenses

CASE STUDY

METSO'S grinding mill – customised precisely to the dimensions of the old equipment – proved to be the most economical solution for Yara Suomi's phosphate mine in Siilinjärvi, Finland.

In the engineered-to-order (ETO) project, a fully finished rod mill was installed in the mine's concentration plant during a normal annual shutdown.

"A quick calculation already shows us that we received a new custom-built mill at half the cost of what a standard mill and the required new power transmission, electrification and foundations would have cost us," Yara Suomi Siilinjärvi concentration plant manager Antti Savolainen said.

"We've noticed that most project expenses in old mill surroundings arise from the work that needs to be done in the immediate environment of the equipment in need of renewal.

"The old equipment's replacement with a finished mill, carried out in 10 days during the annual shutdown, was also a much better option for us than a traditional on-site installation, which takes 24 days and would have prolonged the shutdown considerably. Given the strong demand for our concentrate and a daily production volume of around 2,800 tonnes, the customisation was well worth the investment," Mr Savolainen said.

After Yara had ordered the tailor-made grinding mill in early 2017, Metso built an international team for the project.

The new 4x6 metre rod mill was designed in such a way that it could be installed precisely on top of the bearing housings of the old mill, installed in 1979.

The scantlings of the mill casing were thickened to 45 mm, and the ends



The finished, more than 150-metric-tonne grinding mill was lifted into place through a detached section of the concentration plant's roof.

were modernised to be replaceable.

Metso manufactured the grinding mill and the attendant plain bearings, and installed the mill lining.

The delivery also included the design and manufacture of a new installation cradle with a 350-metric-ton capacity, allowing the mill and its contents to be lifted when necessary.

Yara was able to utilise the entire old power transmission line, gearbox and foundations in the project.

The parts of the new grinding mill were shipped to a machine shop near

Kuopio for assembly in 2018.

Weeks before the delivery, the new grinding mill was given its finishing touches – the bearing housings at the ends were attached, the interior was lined with protective plates, hundreds of mounting bolts were tightened, and the mill was painted in Metso's beige color.

The mill, which weighed more than 150 tonnes, was transported to the mine on a 14-axle trailer in the week preceding the shutdown.

At Yara's mine, the mill was lifted into place with a massive lattice boom

crane, the crane hook of which was located at the end of a 60-metre boom.

The mill arrived at the site on a Tuesday and was installed within a week, with work resumed by the following Monday.

The rod mill now works 24/7, grinding the 25 mm ore feed into smaller pieces with 1250 kW of power and an hourly capacity of about 500 metric tonnes.

"Our target is for the new mill to grind phosphate ore at our mine with a 99.9 percent utilisation rate for the next 30 years," Mr Savolainen said.

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NATIONAL

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"We specialise in the supply of four main product types - abrasion and corrosion resistant process pumps,

metering pumps, magnetic drive pumps, precision gear pumps and accessories."

Mr Bowen said that the company's experience across a broad range of industrial process applications, including mining and mineral processing, industrial processes, manufacturing, food and beverage, pharmaceuticals and biotechnology, meant that the team had the skills and experience to find the solutions to suit all businesses.

"The team at XTron Pumps Australia strives to share knowledge, creativity and enthusiasm for providing value add solutions for the most demanding applications," Mr Bowen said.

"To achieve leadership in our industry, we strive to exceed all expectations to generate referrals and repeat business ensuring future success for our business partners and employees."

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NATIONAL

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ALLU Group, the manufacturer of ALLU equipment for more than 30 years, has recently partnered with RDW Group in an exclusive Australian distribution agreement.

RDW has appointed a dedicated Australian ALLU dealer network that has



ALLU Transformers ensure high production with lower operating costs by converting base machines into a mobile processing plant.

ready access to genuine parts and a wealth of operational knowledge and experience to ensure ALLU equipment continues to contribute to customers' profitability for their entire working life.

The network includes Walkers Hammers in Victoria, Groundtec in NSW, QLD Rock Breakers (QRB) in QLD and the Northern Territory, Total Rockbreaking Solutions (TRS) in WA, RAM Equipment in South Australia, and DLM Machinery in Tasmania.



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5000 PSI blaster safety breakthrough

NATIONAL

AUSTRALIAN Pump Industries (Aussie Pumps) has developed a new 5000 psi diesel drive heavy duty hydro-blaster designed specifically for mines duties.

Built to the same standard as the existing Aussie Predator Mine Boss special, the machine qualified under Australia's new Safety Standards for water jetters as a Class A unit.

By fitting into that class the onerous requirements for operation of a Class B machine under the standard were not applicable.

Class B machine operators were required to be trained and assessed as competent through a Registered Training Organisation, with mandatory refresher training at least every two years.

By comparison, Predator A operators would only be required to undergo training to make them cognisant of danger awareness, safety set up, machinery stop controls, hose and equipment inspection, and personal protection equipment.

Aussie's Predator A comes in a heavy duty galvanised steel frame with 23 hp Kohler air cooled diesel engine drive.

It is driven through a gearbox with a big Bertolini triplex pump operating at 1450 rpm.

The new compliant, super heavy duty



Aussie 5000 psi Predator A classified as a Class A hydro-blaster under safety standards.

machine could also be operated with an Aussie Turbomaster lance delivering an effective working pressure of 8500 psi (580 bar).

The Aussie Mine Boss product range consisted of a complete line of heavy duty diesel engine drive pressure cleaners and hydro-blasters from 3000 psi (200 bar) all the way through to the company's mighty Raptor Series of 7300 machines.

Mine Boss units all came with

integrated E stop, battery isolation, frame mounted fire extinguisher and heavy duty centre mounted lifting bar.

The machines came mounted on four steel wheels with big pneumatic tyres for ease of movement on site.

Aussie Pumps chief engineer John Hales said gaining a Class A certification for a 5000 psi diesel pressure cleaner was a big breakthrough for the company and the mining industry.

"It's consistent with our 'Safe Operator' program," he said.

Aussie Pumps also offered a full range of Class A Mine Spec 4000 psi blasters that are run by Yanmar diesel drive.

More information about the complete Aussie Mine Boss range was available from Australian Pump Industries, distributors around Australia or online at www.aussiepumps.com.au.

REFUSE-TO-FUSE™

THE FASTEST WAY TO JOIN HDPE PIPE – NO IFS, ANDS, OR BUTTS.



10X

INSTALLS UP TO 10X FASTER

Join HDPE pipe in half the time it takes to fuse a joint. Forget the fusion equipment. Gone are the days of waiting for plastic to heat up just to cool down. Installing in tight or vertical spaces has never been easier; the Refuse-to-Fuse system goes where no fusion machine has gone before. That's time savings you've never seen before.



INSTALLATION IS WEATHER INDEPENDENT

Whether it's rain, shine, or just downright frigid and fierce, Refuse-to-Fuse products can be installed. No need to check the weather forecast and worry about protection for fusion equipment or project delays any longer.



MEETS OR EXCEEDS PRESSURE RATINGS OF HDPE PIPE

If you thought your fused joint was tough, check out Refuse-to-Fuse product performance. Small diameter solutions call for dual rows of razor-sharp teeth that sink into the O.D. of HDPE pipe, forming a sealed hold that never lets go. Bringing out the big guns? Large diameter solutions enlist a rugged double groove to seal the deal. Push it, pull it, and drag it to the max; treat it the same way you would treat fused pipe.



INSTALLS WITH SIMPLE TOOLS

No need to set up your fancy fusion machine because all you will need with the Refuse-to-Fuse system is a simple socket wrench. If you want to get crazy, a cordless impact driver will do the job, too! Don't worry about training certificates or learning how to use fusion equipment, just stick with the basics.



Refuse-to-Fuse™ Transition Coupling for HDPE Pipe

- 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



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High-risk training with a difference

NATIONAL

BASELINE Training is part of the CPA Group, providing quality workplace health and safety education and organisation development training throughout Australia.

Baseline continually aimed to assist clients improve their safety results, meet their work health and safety obligations, develop their safety culture, and most importantly, keep their people safe, while enhancing productivity.

As a company that is a truly integrated provider of safe, innovative bundled health, safety and manpower solutions, Baseline Training ensured the people trained for industry make it home each night after work with zero harm.

The company’s key focus remains on quality training and current industry experts deliver training in order to ensure professional development is in line with best practices.

Expert experience within the field ensured Baseline Training is the service provider of choice for safety and emergency related training including: high-risk training; safety risk and worksite compliance training; first aid and mental health programs; emergency response training – and standby shutdown support; as well as workplace leadership and productivity improvement workshops.

Baseline adopted the ‘PMBOK’ project management methodology.

By following the nine main steps involving the management of: scope, time, cost, human resources, quality, communication, risk, procurement and integration; Baseline can customise any training project to best fit a company’s needs.



More information can be found at: www.baseline.com.

The company promised clients it would remain committed to delivering constant high-quality realistic and relevant training, supported by accurate and timely administration, excellent customer contact support and the provision of current industry trainers.

Baseline Training recommend

prospective clients ask their current training partner the following question: ‘when was the last time your trainers participated or worked within the industry?’

Clients need to be sure they are using the latest techniques and are up to date with current trends and future

innovations.

By always placing clients at the centre of everything it does, the company was able to ensure reduced risk, improved productivity, boosted confidence and maintained individuals competency in the workplace.

A century of field proven service

NATIONAL

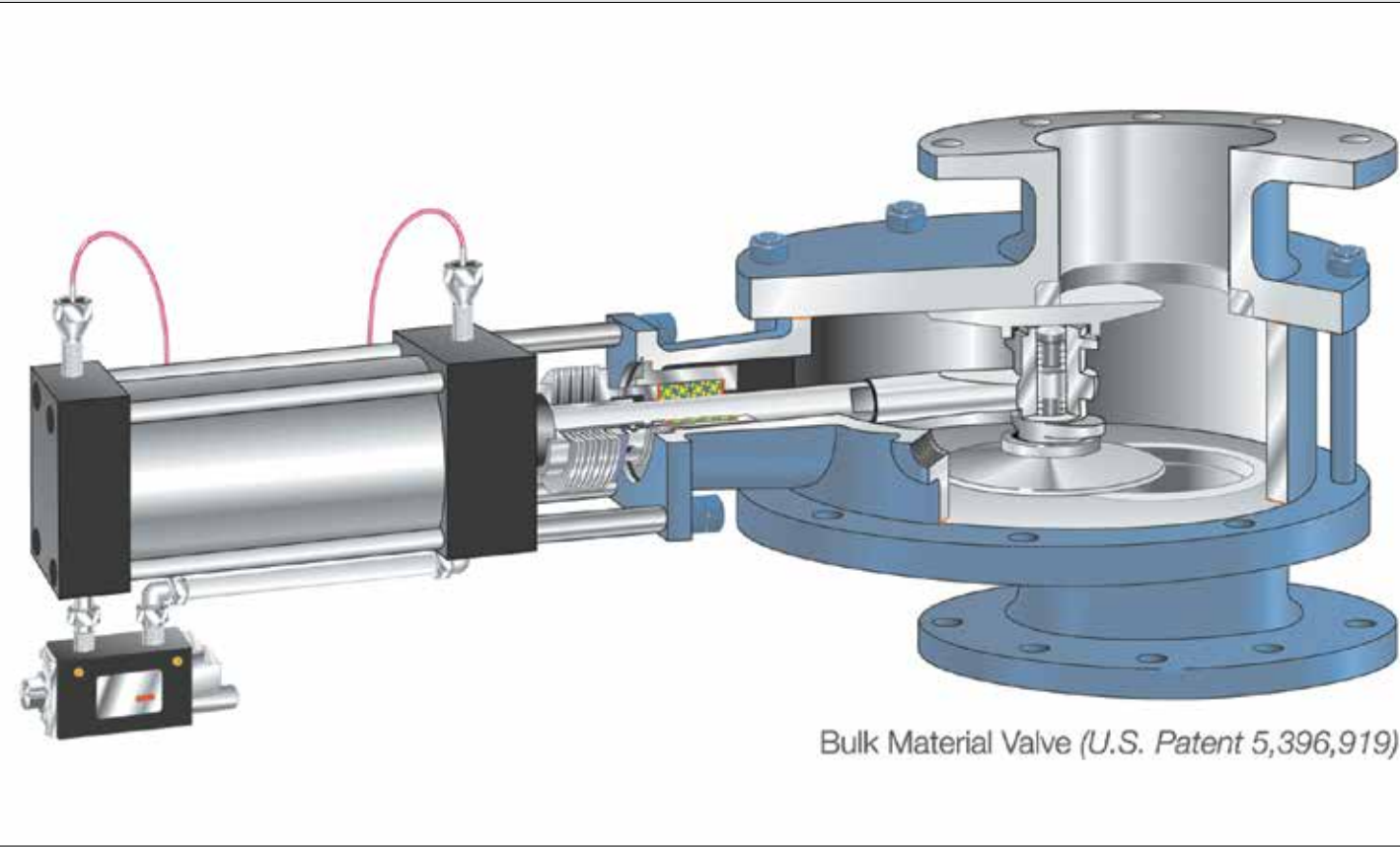
FOR those that have experienced poor life expectancy for Severe Service valves then, the valve design being used may not be up to the job.

Using a different design can deliver better outcomes and the Everlasting Valve design is just that – different.

Everlasting Valves

The Everlasting Valve is a proven concept, with a unique rotating shearing disc concept which had been the standard since 1906 – Used initially for locomotive boiler blowdowns it has evolved to the packaged boiler industry and severe service application.

The valves handle blowdown, scaling, high temperature, high pressure, flashing condensate, with an average life span of more than 16 years.



A new way to fix an old problem.

The Slurry valves are unique and found throughout the world in ‘Severe Service’ applications from abrasive and corrosive to high temperature and high pressure.

The self-lapping metal-to-metal seat design provides repeated tight shutoff in severe service, while the sealing improved with use.

How Armstrong Flow Control can help

Armstrong Flow Control is a privately owned Australian company that has been servicing the valve and steam and hot Water markets since 1972.

If readers have less that acceptable life from their severe service valves, Armstrong Flow Control invites them to contact Armstrong as it wants to help.

More information about Armstrong Flow Controls safe, cost-effective and technically correct solutions can be found at: www.armstrongflow.com.au.

Blasting solutions for any project

NATIONAL

PROTOBLAST is a family owned and operated Australian business that has been serving the abrasive blasting industry for more than 40 years.

While the company has a standard range of products, its forte is providing the customer with a facility that is custom designed to produce maximum efficiency for the product that uses the process.

The standard range included dust collectors that can be used to provide ventilation to existing blasting facility and the well-known and respected Protoblast Abrasive Recovery and Recycling system.

The Recovery system is one of Protoblast's advantages in the market as it is the most efficient to operate in power consumption, wear and tear and maintenance.

The company's current focus was providing a system that is easily portable.

The standard shipping container is a great option; Protoblast has developed this system to reduce set up and dismantling time and everything fits into the container for ease of transport.

From a single dust collector through to a turnkey large blast chamber installation, or from robotic blasting facilities to airless



Protoblast's design flexibility helps to streamline the abrasive blasting process for its customers.

blast machines, Protoblast can provide the solution.

The company's experience in providing equipment to surfboard manufacturing, torpedo launch tubes, building screws, mining dump trucks, turbines, gas cylinders, piping and more, means it has endless resources to draw from.

The team at Protoblast look forward to every new challenge and will not turn

down an opportunity.

In fact, Protoblast has just completed an automated blast machine for blasting 9kg gas bottles at a bottle swap plant in New Zealand.

This machine had to comply to Zone 1 hazardous area regulations.

This proved to be a challenge as blasting itself causes sparks, but the team came up with a bespoke ventilation system

that would prevent the concentration of gas from reaching a level that would be dangerous.

Protoblast has supplied equipment all over Australia and New Zealand as well as into Malaysia, Papua New Guinea, the US and the Middle East.

More information can be found by calling (02) 4677 2320 or emailing sales@protoblast.com.au.



SUPERIOR CORROSION PROTECTION

Cormac Metal Spray has been actively involved in the application and development of thermal arc spray (metal spray) throughout Australasia for more than two decades for use in the prevention of corrosion to steel and steel in concrete.

OUR SERVICES:

- Abrasive blasting
- Thermal Metal Spray
- Ultra High Pressure Water Jetting
- Protective coatings
- Cathodic protection (Thermally sprayed anodes)
- Powder Coating
- Non Skid/Slip - RMS approved coating



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MAGSPEC

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where discoveries begin..

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LAGSA

in f g+

Where discoveries begin

NATIONAL

LAST year was very busy for MAGSPEC Airborne Surveys.

The Perth-based geophysical service company clocked up more than 2 million line kilometres of data acquisition since it began operations more than five years ago.

MAGSPEC anticipates another good year ahead, with high-quality surveys already underway in WA and South Australia and planned projects in North America.

The light aircraft flown by the company collects and processes detailed

geophysical information, which is used by exploration companies to map and analyse the surface of the Earth and below; potentially locating areas for new mineral resources.

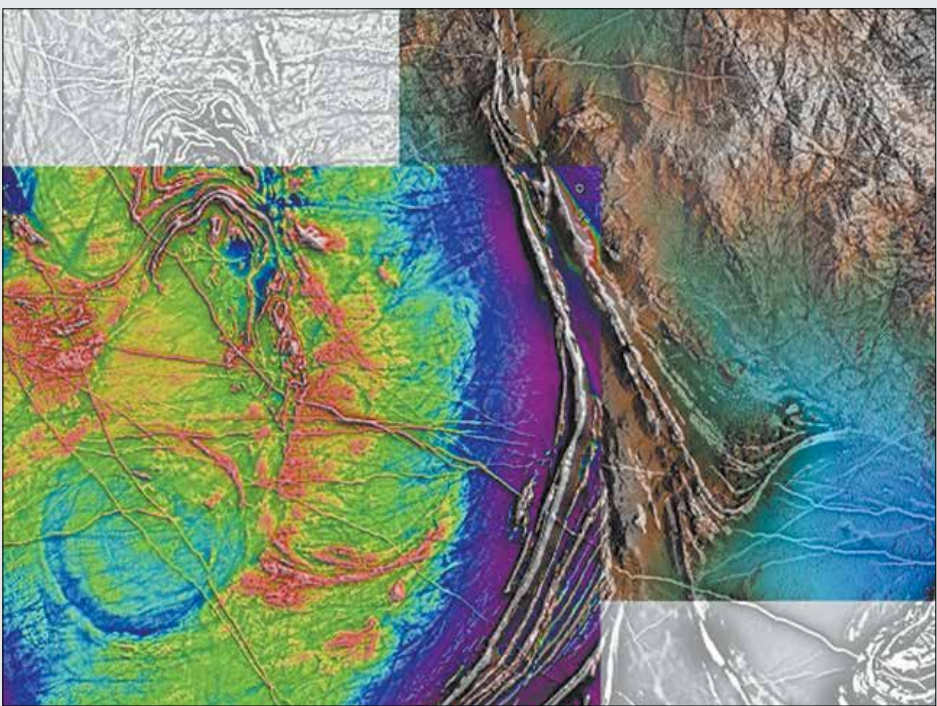
Airborne geophysical surveys such as these are typically undertaken at the early stages of exploration; across unexplored tenements, or prior to drilling.

MAGSPEC collects magnetic, radiometric and elevation data with surveys of all sizes, from low-level, ultra-detailed scale for junior explorers, up to state-wide regional programs for government departments such as Geoscience Australia.

As well as identifying promising targets for traditional resources such as gold, nickel, uranium and iron ore; MAGSPEC has recently assisted exploration companies in their pursuit of 'battery metals', including lithium, cobalt and vanadium.

Each survey is custom designed and can take as little as one day to complete, or over several months, using multiple aircrafts at the same time.

Safety, service and data quality are all paramount to MAGSPEC, with



Data from the Geological Survey of WA "Yalgoo" airborne survey, flown in 2015.

the company earning a reputation for delivering the highest quality geophysical services to its customers, within Australia and overseas.

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

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Continental 
The Future in Motion



Boom belt now lasts six times longer

Roy Hill is a margin focused iron ore business, aiming to maximise the return for each tonne produced from its mine. Their CVR030 Fixed Stacker boom belt had been giving unacceptably short wear life performance - sometimes as low as one month. Design changes were made to the chute to reduce direct impact and the belt was upgraded to

ContiTech FlexSteel™ with Monster Hide™ covers, selected for its ability to handle high impact energy without cutting or gouging. After six months the belt still had more wear life left. It exhibited the most consistent linear wear recorded at Roy Hill across all processing plant belts (see graph). Contact us now if you need better conveyor belt performance for your site.

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ContiTech

Customised crushing and screening

NATIONAL

MLG Oz is a privately owned and operated business headquartered in Kalgoorlie, WA with operations located throughout the Goldfields and regional Australia.

MLG commenced operations in 2000, as a small contractor providing silica mining and haulage services for BHP Billiton and has since expanded to include crushing and screening, quarry products, bulk transport services and fully integrated mine-site solutions.

From its family foundations, MLG Oz continues to work on the philosophy of ‘keeping it simple’.

“We strive to provide a high-quality of service with minimal fuss and we pride ourselves on our ability to fulfil our obligations to our customers on time, and in an economical, safe and efficient manner,” MLG Oz managing director Murray Leahy said.

The team at MLG Oz pride themselves on providing an industrial leading standard of operations across regional Australia.

“We strive to deliver services with zero negative impact on our customer operations, and provide an industry leading standard of service,” Mr Leahy said.

“We believe that productivity and safety are intrinsically linked and in order to achieve long term sustainability in one you need sustainability on both.”

MLG Oz has extensive experience in crusher feed services and run of mine crushing and screening.



With a growing fleet of crushing equipment, MLG Oz can provide cost-effective crushing and screening solutions on short-lead times.

“We conduct a myriad of mining services work, and logistic solutions and our crushing and screening division provides customers with mobile crushing services,” Mr Leahy said.

“We have a growing fleet of track and skid mounted crushing equipment, ensuring we are able to provide customers with all their crushing requirements on short lead times at competitive pricing.”

MLG Oz works in collaboration with clients to tailor and customise operational solutions. More information can be found at: www.mlgoz.com.au.



☎ 08 9022 7746
✉ reception@mlgoz.com.au
🌐 www.mlgoz.com.au



MLG Oz provides timely and cost-effective crushing services that include run-of-mine ore crushing, concrete aggregate production, road base production and general screening.

MOBILE CRUSHING SERVICES INCLUDE:

- Run-of-mine (ROM) ore crushing
- Concrete aggregate production
- Road base production
- General screening

Emergency services for remote locations

NATIONAL

SOUTH Australia-based Industrial Medic Services (IMS) and IMS Ambulance Service works across Australia and overseas delivering medical and emergency response personnel, clinic facilities and emergency ambulance vehicles.

The company is focussed on best practice pre-hospital care, emergency ambulance response and medical support in high risk and remote locations across Australia.

From its beginnings as a provider of Ambulance Services, IMS has become a respected supplier of services for remote site clients.

The company provides major site emergency response and medical services, four-wheel drive ambulance vehicles, fire and rescue equipment and onsite medical rooms with high-quality fittings and capabilities.

IMS field operations director Craig Harris said the company had built a significant portfolio featuring major clients in the oil and gas industry, providing a substantial service offering services to exploration and drilling, construction and production facilities.

"The last eight years has seen an impressive growth in our business through the delivery of specialised services, investment in our capability and infrastructure, and providing our customers with specific bespoke services," Mr Harris said.

"Our services are underpinned by a



Industrial Medic Services works worldwide to deliver medical and emergency personnel, equipment, facilities and vehicles.

professional team of registered paramedics/intensive care paramedics and registered nurses working each day in specialist roles and very challenging environments.

"IMS is pleased to be considered as a definite choice and the 'go to' provider of

site medical services for a range of major companies based on our competitive pricing, industry reputation for quality, and proven performance in service delivery."

IMS is also certified in Quality

Management, OHS, and EHS via SAI Global, as well as a licensed provider of ambulance services.

All IMS services are supported by 24-hour communications with emergency physicians based in Adelaide.

INDUSTRIAL MEDIC SERVICES (IMS)



INDUSTRIAL MEDIC SERVICES (IMS) is a professional provider of Paramedics, Ambulance, Emergency Response and Site Medical services dedicated to the provision of best practice emergency response and medical services within the Oil & Gas Industry sector.

Our experienced Paramedics, Nurses and Doctors specialise in managing workplace trauma and the provision of emergency response services on remote sites ranging from mobile drilling teams through to large scale mining and production facility operations.

IMS can rapidly deploy personnel and infrastructure anywhere in Australia, and overseas.

We can tailor services to meet your risk management, emergency response planning and work place health and safety needs, including:

- * Paramedics, Nurses and Medical Practitioners
- * Emergency Service Officers (ESO)
- * 4WD Ambulance and Emergency Response Vehicles
- * Fire Appliances/Equipment and Personnel
- * Site Medical Rooms
- * Aeromedical Retrieval Support Services
- * 24 hour / 7 day - Emergency Physician Communications & Doctor Support



When considering your site medical arrangements, or completing a risk management review of current emergency response planning on your project, we encourage you to consider joining IMS as a Quality Accredited, professional and proven provider of emergency medical response, site medical and rescue services to many of the top Oil & Gas companies in Australia.

For more information, please contact Craig Harris, Director - Remote Field Operations on (08)8162 9854 or email craig.harris@industrialmedics.com.au



REMOTE MEDICAL SPECIALISTS

Emergency response made easy

NATIONAL

CORPORATE Protection Australia Group (CPA Group) is one of the largest private safety and emergency response companies in the southern hemisphere.

Its key individuals and associates have a sound history of successfully negotiating rigorous, high-profile environments and situations.

CPA Group offered a wide range of services; encompassing security, health and medical, fire rescue, consultation and training.

It serviced major clients in the mining, oil and gas, energy, critical infrastructure, construction, and maritime industries – on time, and on budget.

The company's operational model placed safety at the forefront of all activities, with a strong safety culture that starts from the top.

CPA Group executive chairman Harley Sparke was dedicated to safety, and ensured this passion governed every undertaking, no matter how small; a commitment that went hand in hand with its exemplary safety record.

Through ongoing, proactive mitigation



More information can be found at www.cpagroup.com.au.

and management, CPA Group worked alongside its clients to tailor services to specific requirements.

The organisation was well-placed to provide highly efficient, cost-effective solutions, with cross-trained professionals that cover all appropriate combinations of security, medical, and emergency service skillsets.

CPA Group paramedics and nurses are trained in emergency rescue; emergency services officers are trained medics; and security guards could provide first aid and form part of the emergency response team.

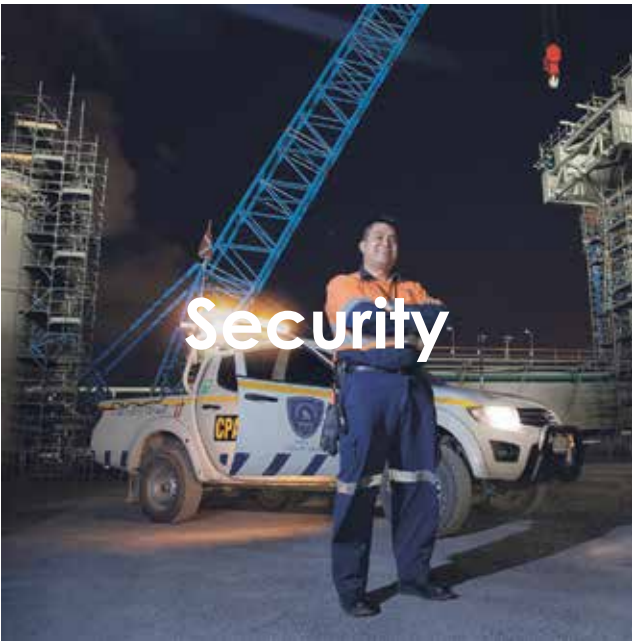
The chief point of difference was that, as well as offering a unique and all-encompassing suite of services, CPA

Group allowed its clients to select packages of services tailored to their specific needs, thus achieving high-quality solutions at the right price point.

This model originated from an analysis of best practices that have been developed by the company over years of working in some of the harshest, most remote environments all over the world.



Protecting your business, assets & people



EQUIPMENT HIRE

MINING CIVIL CONSTRUCTION

AXIS Hire is an industry-leading fleet hire company operating throughout Australia.

The highly experienced team at Axis understand client's long term requirements and provide a fully-customised fleet of light vehicles, trucks, civil and earthmoving equipment.

"Our close-knit team means we're more agile and better able to cultivate real, meaningful relationships with our clients," Axis Hire Chief Executive Kym Novak said.

"Put simply, we can remain flexible in delivering a custom solution that works."

Axis Hire's mission is to assist clients to achieve optimum efficiency by delivering the most responsive, customised and valuable fleet and

equipment hire solutions throughout Australia.

The company takes a collaborative approach, looking at the client's needs, where they'll go and what jobs they'll be on so that Axis Hire can provide equipment that will safely and reliably match client's requirements.

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

"Every project we undertake is unique and requires a tailored solution. Our focus is to save your business time, money and resources."

We pride ourselves on being a one point of call for all of your requirements. Ranging from light vehicles, the largest range of trucks in WA, to an earthmoving fleet ranging from rollers to D10Ts, IT's to 988's and an extensive range of excavators and graders.



South Western Australia

To the South West of the state, Axis Hire provides a selection of buses, earthmoving equipment, cranes, rollers and water trucks – all fully equipped to the site's specific requirements.

As this is a critical component of client's operations, Axis ensures the fleet is maintained to the rigorous standard required.



North Western Australia

In this region, Axis Hire provided light vehicles and coaches during the construction and operational phase of various projects and has become a major supplier of equipment to the general services and maintenance contractors.

Axis Hire is opening a new branch in Newman to provide additional support to its valued clients and is particularly proud of the relationship with its indigenous partners who support these operations.



Pilbara

In the Pilbara region, Axis Hire has provided a range of fleet to support EPCM and bulk earthworks contractors. The fleet covered light vehicles, to special-build off road bulk fuel tankers, welding, fitting, rail construction, service trucks and coaches as well as extensive earthmoving fleet for the construction of mine infrastructure.



Goldfields

In the South Eastern corner of Western Australia, Axis Hire is responsible for the supply of high-quality fleet vehicles to various sites throughout the region. The company's forte is specialist builds which meet the exacting requirements of clients. Axis Hire partners with manufacturers to provide equipment solutions for challenging conditions.



Northern Territory

Axis Hire provided bulk haulage fleet, earthmoving equipment, support trucks and light vehicles during its Northern Territory clients operations. The fleet was purchased specifically for the project, with significant input from the Axis Hire team to ensure the fleet met the specific requirements of the client. Axis Hire has also provided significant earthmoving and support fleet to several contractors involved in the construction of other projects across the region, and into the current operational phase.



Queensland

Throughout Queensland, Axis Hire is a supplier of light vehicles and trucks in the region. The fleet ranges from mine spec to specialist fleet, all tailored to meet the exact requirements of the operational environment.

Axis Hire is also the primary supplier of special-build drill and blast equipment for select projects across Queensland.



Axis Hire can meet your fleet requirements anywhere throughout Australia.

P. (08) 9791 8300

E. info@axishire.com.au

A. 10-12 Mummery Crescent East Bunbury WA 6230

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

AXIS
HIRE

MEGAJET



Mounted near the engine, the powerful actuator pulls a heavy duty cable throttle control. Increases and decreases engine speed incrementally in approximately 8 progressive stages. Wireless control also locks out accidental starter engagement after a 15 second start period. Safety buzzer and flashing light warn of ignition activation and imminent startup. Hour meter counts only from 'Run' signal with light indicator. Widely used on Water Tankers. Driver has full control of the engine, and therefore control of volume and pump pressure.



Wireless Remote Engine Control

Wireless control of:

- START ENGINE
 - THROTTLE UP
 - THROTTLE DOWN
 - STOP ENGINE.
- Key activation.
 - Incremental Speed Adjustment.
 - Buzzer Pre-Start Alarm.
 - Start lock-out timer.
 - Hour Meter Run Time.
 - Waterproof transmitters.
 - Easy to install & mount to any engine.

Australian Built



Remote start/ stop for pressure cleaning /spraying applications where hose lengths are necessarily long. Conveniently starting and stopping the engine during a cleaning process and reducing or increasing pressure/volume by changing engine speed....all done at up to 100 metres away from the machine.



The MEGAJET Wireless Remote Control includes installation instructions and settings. Custom throttle plates are also available for some engine brands. Wiring can easily be done by an experienced fitter.



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One size does not fit all.

At SCF, our engineers design camps to thrive in the harshest of conditions. Understanding that each project has unique requirements, we have three types of camps in our fleet ready to go.

- Breezeway camps** for medium to long term projects with limited moves
- Trailer camps** for projects on the go
- Skid mounted camps** for versatility suiting both long and short term

Talk to us, we'll find the solution.



For more information
visit us online
scfgroup.com.au
Or call Matthew Harris
General Manager - Camps
0423 776 176



Pippingarra Quarry (courtesy of North West Quarries)



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

Specialists in remote area contracts

NATIONAL

BASED in Mudgee NSW, Commercial Helicopters has more than 20 years' experience in providing specialist remote area helicopter support to the mining industry.

Having recently completed remote area contracts covering the Eucla Basin, the Flinders and Ollary Ranges in South

Australia, the Cooper Basin in the Kimberley region of WA, and far western and southern NSW, Commercial Helicopters with its fleet of 18 aircraft, has the capability and experience to satisfy the requirements of the most challenging projects.

Commercial Helicopters is part of a wider company group encompassing aircraft maintenance, specialist aviation refuelling, fixed wing and helicopter charter and survey services, and rotary flight training.

All these services in-house allow the company to provide full turn-key solutions for all remote area operations.

Aircraft maintenance is conducted in the field regardless of the location with Commercial Helicopters' team of dedicated engineers, utilising the company's fully equipped mobile engineering vehicles, acting to eliminate downtime.

The company also operates a twin

engine, pressurised, IFR aeroplane to assist with fast response engineering support if required.

In order to ensure ongoing improvement in all company systems and in its environmental performance, Commercial Helicopters is fully certified under ISO14001:2015 Environmental Management and the Basic Aviation Risk Standard (BARS) quality auditing program.



Providing professional helicopter services across Australia for over 20 years. Services include mining support, aerial survey, agriculture, firefighting, feral animal control, joy flight and more.



Helicopter services wherever they're needed

NATIONAL

WITH bases across all major Australian capital cities as well as Newman in WA, United Aero Helicopters can respond to helicopter needs promptly and efficiently wherever it is needed.

Throughout Australia and South East Asia, the company specialises in aerial work operations, such as supporting mining exploration in remote desert locations in WA to lifting construction material onto high-rise buildings in the Sydney CBD.

A significant part of United Aero Helicopters' work is low level long line operations, including airborne geophysical surveys and aerial firefighting.

Whether it is slinging equipment in support of drilling programs, towing airborne electromagnetic systems for geophysical surveys, or conducting accurate water drops with long line buckets on bushfires – United Aero Helicopters flies many thousands of hours on long line operations per year.

Thanks to this focus, it has on its team some of the most experienced long line pilots in Australia, ensuring its customers receive the highest quality service.

United Aero Helicopters' AS350 B3 is based at Newman and available for charter, aerial work, general exploration support, geophysical surveys, drill rig support, and emergency response.

The helicopter can be reconfigured to suit clients' needs, be it an external cargo basket, water bucket for firefighting, or



United Aero Helicopters provides a range of services across all parts of Australia and South East Asia.

medical stretcher kit.

Other aircraft types available at short notice from any of its bases, include the ambulance-equipped IFR twin engine BK117-C1.

Beyond its aircraft and extensive coverage area, it is the people working within United Aero Helicopters that set it apart; starting with company owners Jim

Norrie and Sam Borg, who have more than 30 years' experience in managing remote area helicopter aerial work operations.

"Our task-oriented and highly skilled pilots are carefully chosen for their ability to get the job done effectively and safely, even in tough conditions," Mr Norrie said.

Mr Norrie said they are supported by a close-knit team of engineers who

travel to remote areas when required and diligently perform complex maintenance tasks to ensure aircraft are continuously airworthy – minimising downtime.

In addition to the field crew, a team of motivated and dedicated professionals support flight operations and engineering from behind the scenes, including administration, accounts, maintenance control and every role in between.

Aerial work specialist with remote area helicopter and fixed-wing operations across Australia and the Asia Pacific region



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PERTH | NEWMAN | SYDNEY | MELBOURNE | ADELAIDE | BRISBANE



Skyhook Helicopters has an emphasis on safety, professionalism, efficiency and flexibility.

No job too remote

WA

AUSTRALIAN-owned and operated, Skyhook Helicopters offers a broad range of helicopter services across Australia, including within the mining sector.

Its highly experienced team is well-positioned to supply its clients with an individually tailored service and an emphasis on safety, professionalism, efficiency and flexibility.

While Skyhook Helicopters head office is based in NSW, it conducts services in Australia and overseas.

No job is too remote, too big, or too small for its motivated team of professionals whose services include mineral exploration, mining support, aerial firefighting, aerial surveying, flood relief, ship and offshore operations, aerial photography and film, and transport.

More information can be found at www.skyhookhelicopters.com.au.



Skyhook Helicopters are highly experienced in a broad range of helicopter services and well positioned to supply its clients with an individually tailored service.

Our company is an Australian Charter and Air-work operation authorised to conduct services in Australia and overseas.

Our services include but are not limited to:

- Aerial Crane/Construction
- Aerial Fire-fighting
- Flood Relief
- Aerial Survey
- Ship/Offshore Operations
- Search and Rescue
- Mineral Exploration/Mining Support
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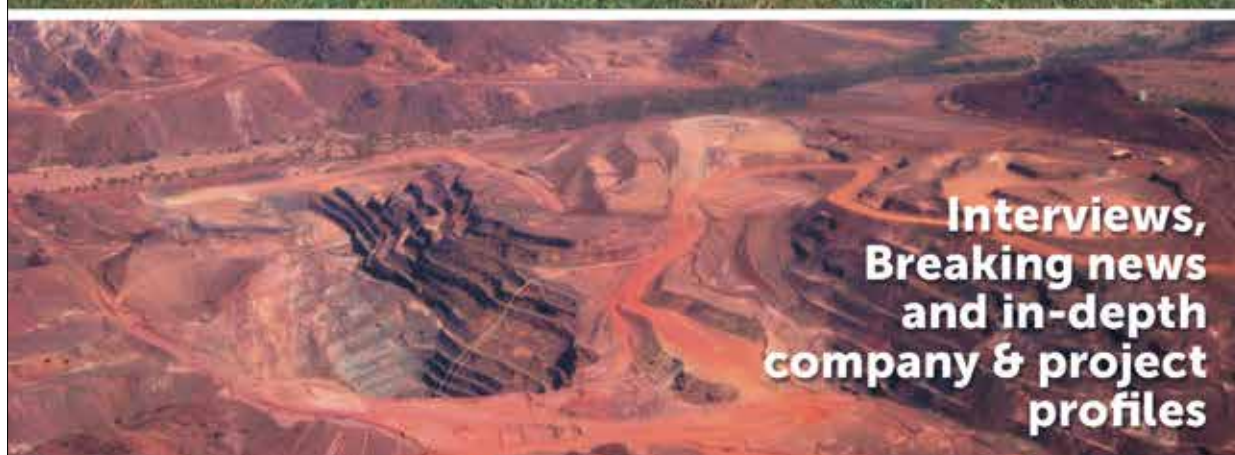
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THE AUSTRALIAN
MINING REVIEW

One stop Huck shop

NATIONAL

RECEIVING the right Huck gun and fasteners from one source is easy when going through Huck Aerobolt.

Huck bolts and rivets work differently to most fasteners, as they are installed via a tool that provides a permanent result.

Taking the hassle out of Huck, Aerobolt has an extensive range of quality rental equipment and fasteners available in one delivery, drawing on more than 25 years' experience in the Huck tool hire industry.

The team is uniquely placed to offer a professional and personal service that is second to none, supplying Huck tools and equipment to a wide variety of markets, including mining and resources, manufacturing, rail, building construction, motor body builders, and Government.

Its comprehensive range of mining rental equipment includes hydraulic tools to install Huck Bolts from a ½ inch diameter through to 1-1/8 inch diameter; offset and right angle Huck tools; hose set (3.6 and 8 metres); and Huck power rigs (hydraulic pumps).

Huck Aerobolt ensures the sales process



The HG-507 hydraulic tool has a capacity C50L 1 to 1-1/8.

is as smooth as possible, with no account required – just an official purchase order, and is flexible with hire choices (daily, weekly, weekend and monthly options).

The team also offer Australia-wide delivery through an extensive transport network; equipment consignment tracking, on time delivery; 24/7 support,

and comprehensive technical mechanical support.

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

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NATIONAL

AS one of Australia’s largest suppliers of specialised fasteners to a wide range of industries, including transport, railways, engineering and construction, Profast is the industrial fastening solutions expert.

Profast has warehouse facilities in Brisbane and Perth, with distribution via its sister company, Boltmasters, in Melbourne and along the east coast of QLD.

It has a strong, established history of supplying manufacturing industries with a comprehensive range of high-quality, exceptionally strong, and labour saving fasteners in a range of materials.

The company’s two warehouses also stock a range of industry accepted, reliable, heavy-duty installation tools including FAR, Gage Bilt, Huck, Avlock and Honsel.

Profast has also become a distributor for Boelhoff and Asphalt Anchors in Australia.

The company endorses tooling support, employing in-house repair technicians in both Brisbane and Perth, and stocking a virtually complete range of spare parts of all the tools it represents.

Profast guarantees fast turnaround times for tooling repairs and, in the event of extended repairs, the company can provide tooling on a for-hire basis.



Profast now offers a wider range of specialised fastening products than ever before.

Dealing directly with the manufacturers keeps its pricing competitive with larger propriety companies and their distributors.

Profast’s team of dedicated technical staff have a reputation for providing sound advice on fastener solutions for use in even the most demanding

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More information about Profast can be found at: www.profast.com.au.



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The QCR system is helping to make the workplace safer.

Revolutionising tyre and wheel maintenance

NATIONAL

TITAN Australia is a market leader in the design, development and manufacture of wheels to the 'off-highway' industry.

Supplying the world's most respected original equipment manufacturers like Caterpillar, Volvo, Komatsu and Liebherr meant that its product, service and delivery must consistently meet the high standards set by these companies, not only in performance, but also safety.

Off-highway tyre and rim assemblies were often subjected to loads and inflation pressures at their maximum capabilities.

Construction and mining operations by their very nature could result in variations of the terrain, where higher than normal loading of individual wheel positions occur.

Haulage vehicles loaded unevenly, downhill hauls with high speed turns, running a vehicle with one tyre of a dual assembly under inflated, or even flat, are examples of conditions that produce periodic high stresses in rim assemblies and subsequently reduce fatigue life.

The effects of corrosion and fretting between mating parts of a rim assembly could also produce surface irregularities that may result in crack initiation sites and ultimate fracture of a rim part.

Because inflated tyre/rim assemblies

were pressure vessels with high potential energy, it was extremely important to exercise great caution in servicing these assemblies.

When this energy was released instantaneously, via a tyre blowout or fracture of a rim section, the results could be fatal.

Titan Australia chief operating officer Adam Oakenful said inspections and planned maintenance was vital for mine site vehicles.

"Given the serious nature of such an occurrence, the variables in operating conditions and potential for premature fracture of rim parts, it is important to include a rim inspection program in a planned maintenance and inspection program," Mr Oakenful said.

"It is all part of a procedure to minimise the risks associated with off-highway tyre/rim assemblies and at the same time, produce the least cost of operation through maximum tyre and rim life and of course, increase overall safety."

The first step in the inspection process, following tyre removal, was to visually inspect the rim base and rim components (flanges, bead seat band and lock ring) for cracks, bending or distortion, pitting and excessive wear.

"The key areas of concern are the 'high-stress' areas and areas of weld (both circumferential and transverse butt

welds)," Mr Oakenful said.

"If nothing is found visually, the rim and rim components should then be cleaned. This is best accomplished by abrasive blasting per AS1627.4 and then visually re-inspected."

One of Titan Australia's major points of difference is its patented Quick Change Rim (QCR) System.

Providing longer rim life, reduced downtime and lower maintenance costs, combined with improved safety for tyre personnel, the QCR system was specifically designed to meet strict specifications and performance requirements under the demanding loads of large mining trucks.

Compared to the standard fitment five-piece rims currently offered, the QCR provided an increased crack test interval, longer rim life, improved safety and fewer rim based removal/fitment procedures during tyre changes — meaning less opportunities for errors resulting in significant injuries.

The QCR was available as an attachment option for most makes and models of large mining trucks.

Not only would the QCR system reduce downtime by greater than 50 per cent on tyre change-out times when compared to the standard five-piece rims, it also greatly enhanced safety for the personnel working on site by

reduced manual handling and fatigue on tyre maintenance personnel.

With the need for tyre service personnel to use impact guns dramatically reduced, improved ergonomics of the tyre change process were a result.

A quicker tyre change process encouraged more frequent and effective tyre rotations and inspections resulting in improved tyre life.

The product also increased crack test intervals compared to standard five-piece rims and reduced potential damage to wheel retaining bolts, studs and hubs.

It could also minimise stud and wheel station damage due to improperly tightened wheel nuts.

Machines could have the rear tyres (both inner and outer positions) vertically mounted in the same manner as the front tyres without the need to return to the service bay to have the wheel nuts retightened (as long as rims have not been removed) with minimal level of rim base inventory required.

More information on how Titan Australia was increasing safety and productivity for tyre and wheel maintenance can be found at www.titanaustralia.com, by emailing sales@titanaustralia.com or calling 1300 791 672.

Maintenance made easy with TED



Nivek Industries' TED takes the weight out of many maintenance jobs.

INTERNATIONAL

THE benefits of utilising a Tracked Elevating Device (TED) are extensive, according to Nivek Industries operations manager Jeff Merchant.

TED was initially designed as a safe way to remove and replace Belly Guards in the field, but with an ever-evolving range of smart attachments, safe belly plate removal was just the tip of the iceberg.

Recounting the years of pushing cumbersome air and spider jacks under machinery while working as a maintainer on mine sites, Mr Merchant said TED was a game-changer.

“TED is so much easier than using the old foot pump jacks; TED has the power, range and freedom to take the weight and the back-busting manpower out of so many maintenance jobs,” Mr Merchant said.

“Using TED, you no longer need spider jacks, block and tackles, lever blocks, and

air hoses under machines.”

Although TED has provided life-saving safety gains, it has been the day-to-day ease of operations that many fitters most appreciated.

Mr Merchant said he particularly appreciated aspects such as not having to wait around for a forklift, not having to do a pre-lift assessment and book a crane, and the flexibility of having TED available in the pit and not needing an air compressor.

He also appreciated the ability to lift

and lower components almost anywhere, and not relying on rated lifting points to attach overhead lifting gear in the field.

Savings on the body by not having to lift, push, and pull heaving components under machinery, especially while crawling, has had immeasurable short and long-term benefits for workers' health, which also resulted in productivity gains.

More information and the range of versatile attachments can be found at www.nivekindustries.com.au.

TED's your best mate for shut downs, rebuilds and more...

With an increasing range of versatile attachments, TED can help remove and fit most mechanical components from a wide range of plant machinery. With a SWL of up to 800kg, TED can help take the weight of:

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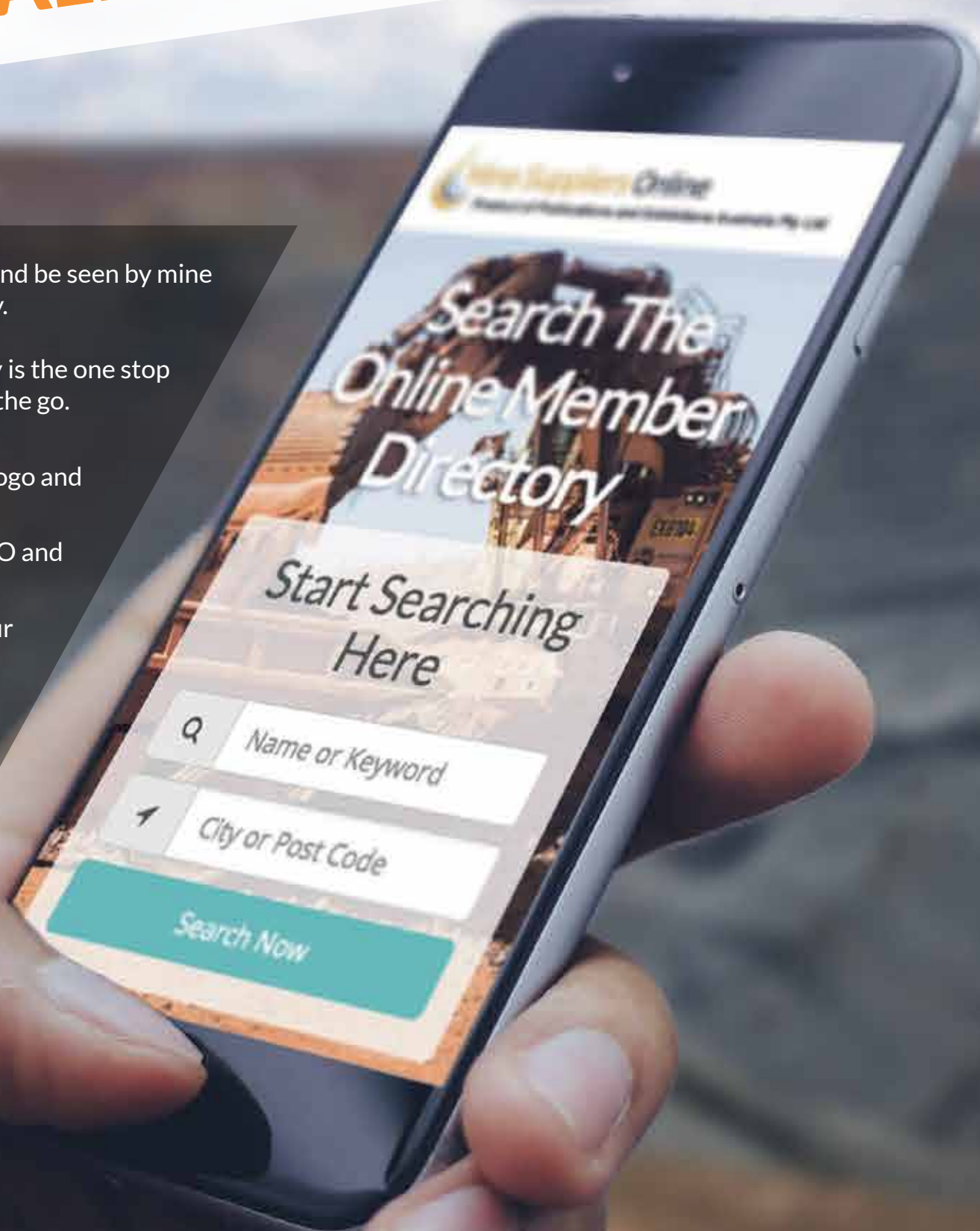
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*Conditions apply. For details, visit www.madergroup.com.au/madercleanteam



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Mader breaks into mobile plant equipment washing



Mader Group is now offering more services than ever before.

NATIONAL

MADER Group has launched mobile plant equipment washing services in Western Australia's Pilbara region.

Beginning work with new clients in 2019, the company's Mader Clean Team is a new service designed to complement its existing shutdown services.

Mader already has extensive experience

executing heavy mobile equipment shutdowns, having successfully executed more than 400 shutdowns in WA alone.

New equipment washing services were expected to deliver high-quality, safe and efficient cleans, and were designed to help mining companies reduce their environmental footprint and achieve machine availability targets.

The company's recent high level of growth has seen it double its workforce in

12 months, and expand to operate in all states of Australia.

Mader Group has now also expanded to work across the globe, deploying more than 1000 highly skilled and dynamic employees throughout the major mining regions of Australia, Asia, Africa, and the Americas.

This was not the company's first venture to diversify its services.

Mader recently launched a new Rapid Response Team, capable of delivering a team of highly skilled tradespeople to site within 72 hours, as well as a dedicated Drill Support Team.

With more services than ever before, Mader Group has been able to help mining companies add more value to maximise productivity.

More information can be found at www.madergroup.com.au.

AUSTRALIAN VANADIUM MANAGING DIRECTOR

VINCENT ALGAR

Australian Vanadium (AVL) has confirmed the economic viability of its Gabanintha project near Meekatharra in WA as one of the world's most significant new vanadium operations.

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SAFER

The higher impact resistance ensures that if damaged the 226 will not splinter. Similar to safety glass the 226 under extreme impact conditions will shatter and remain intact, eliminating the potential for hand injuries.



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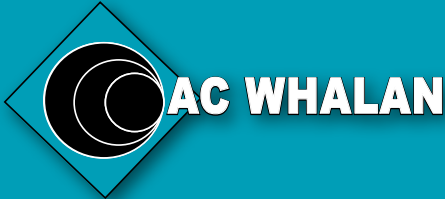
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VICTORIA

WORKING within a range of industries including mining, RPS has a pumping solution for every application, such as its horizontal split case and end suction fire pump systems.

Capable of being specially designed on request, RPS' fire pump systems were ideal for oil and gas onshore and offshore platforms; manufacturing and chemical industries; power stations; commercial centres; and high rise buildings.

Featuring single stage double suction impellers, the split case design allowed service without disturbing the piping, while the dynamically balanced double suction impeller reduced thrust loads.

Clockwise or counter-clockwise rotation viewed from the coupling side were available, as was completely packaged fire pumps skids.

Diesel engine starting was also available, as well as electrical, pneumatic or hydraulic systems.

Vertical turbine fire pumps included single suction, enclosed impellers and column lengths in accordance with applications.

The large bowl shaft sizing provided a longer life, while the column pipe threaded construction and open line shaft construction was standard.

Beyond its broad range of products,



Containerised sets RPS built for Roy Hill.

RPS offered services and repairs for products across a number of popular brands.

The company's services included vacuum and liquid pumps, pump upgrades, general machining and welding repairs, and emergency breakdown repair.

RPS also provided guaranteed pumps and spare parts, maintenance kits

and on-hand spares, engineering field service and assistance, and tailor-made service contracts.

The company was established in 2009 following the merger of regional businesses, Ruhrpump Australia and SIHI Australia.

The merger created many synergies for both business units with an expanded portfolio of liquid and vacuum

pumps and systems.

As well as its own manufacturing capabilities, RPS was serviced by ISO 'quality assured' manufacturing plants in Europe and the Americas.

The company guaranteed the highest quality products backed by superior sales and service support from its highly experienced and motivated staff.

Wet prime pumps win in mining

NATIONAL

MINES, quarries and construction sites deploy portable diesel-powered trash pumps to handle excess dirty water.

There are two types – wet prime pumps, where water is added to the pump chamber to prime the unit; or dry prime units, which use a vacuum pump to assist with pumping.

The huge advantage wet prime trash pumps have over dry prime units is their simplicity.

They do not require fancy priming apparatus in the form of complex compressors or vacuum pump systems.

Conventional dry pumps use an induction-style system, not designed for trash handling.

Wet prime trash pumps are one of the easiest pumps to set up, use and maintain.

With fewer moving parts, they are also the most reliable.

To transfer typical mine site or quarry water, experts recommend pumps capable of handling silt and sand-laden water without 'choking.'

Wet prime trash pumps are designed to handle solids in suspension, which means big open 'non-clog' styled impellers.

The ability to handle solid-laden liquids including flood water, slurry, and even effluent with solid concentrations up to 25 per cent of the liquid volume differentiates them from the rest.

They can deliver flows of up to 6000 litres per minute (lpm) and heads as high as 47 metres.



Aussie's wet prime MQ600 in action.

Aussie Pumps manager Brad Farrugia said a lot of dry pumps are used for site dewatering because operators do not understand how simple the wet prime principle is.

Wet prime pumps require the pump cavity to be filled prior to starting for the first time.

The pump will subsequently self-prime as long as there is water above the impeller.

"Trash pumps have a lower investment cost and lower maintenance costs compared to vacuumed primed pumps," Mr Farrugia said.

Wet prime pumps can last between 20 and 30 years with regular maintenance.

Dirty water is extremely abrasive, but Aussie's range of trash pumps have hard-wearing internal components.

They feature high-grade SG cast iron impellers and volutes, plus silicon carbide mechanical seals for abrasion resistance.

Aussie Pumps produce an Aussie Pump Smart Guide that not only provides full technical information, weights, and dimensions on the full range of engine drive pumps, but also shows performance curves that enable the right pump for the job to be selected.

More information on Aussie's wet prime range of Mine Boss transfer pumps and free copies of the Aussie Pump Smart Guide are available at www.aussiepumps.com.au.



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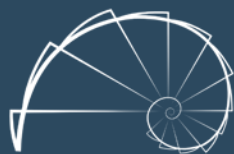


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Cutting-edge communication

NATIONAL

AUSTDAC was founded in 1983 to provide intrinsically safe telephone systems and communications equipment to the Australian coal industry.

Austdac is driven to utilise leading-edge technologies and manufacturing techniques to help clients with safety and production concerns.

It supplies advanced communication solutions, environmental monitoring systems, safety equipment, safe lighting, power supplies and conveyor control equipment worldwide.

The mining industry is continuously evolving, and as a result Austdac products utilise the latest technology to help facilitate continued growth.

The principle focus is the design and manufacture of rugged and hard wearing

reliable products designed to operate in extreme outdoor and underground hazardous areas – improving the ability to communicate, monitor and control equipment in the mining industry.

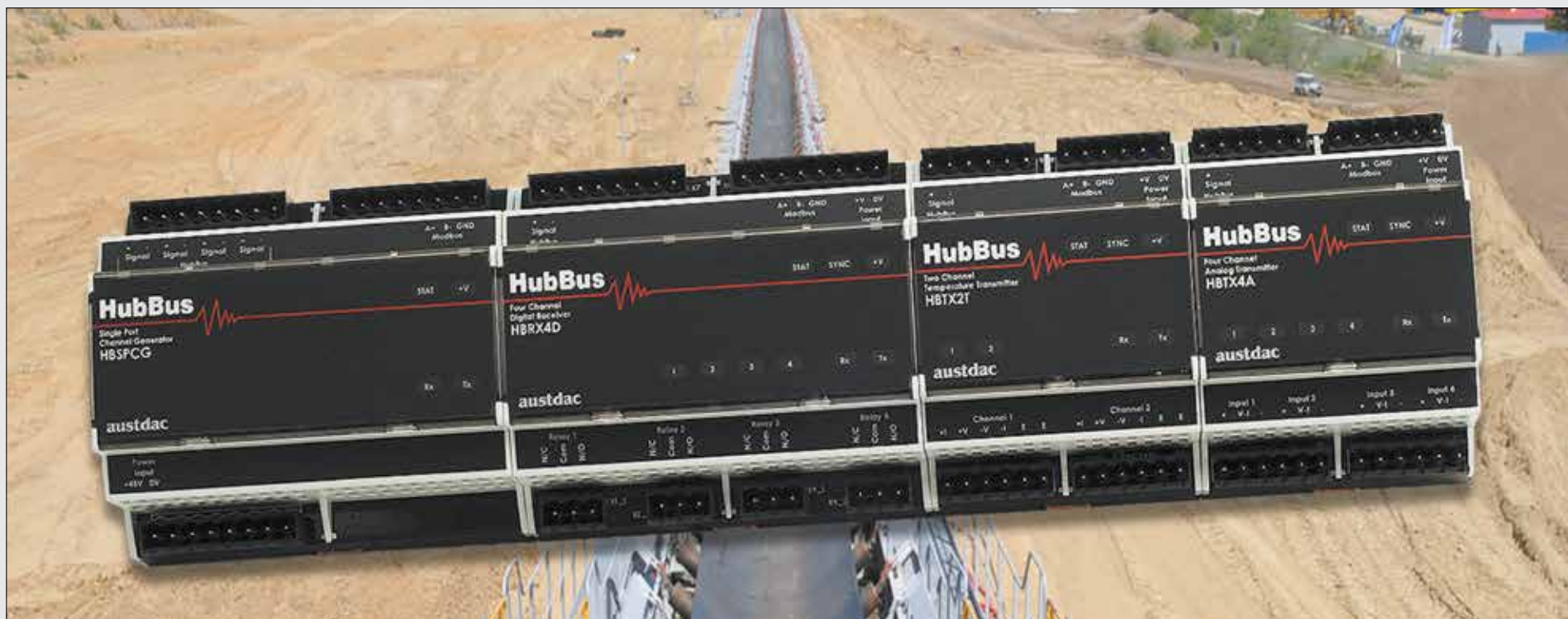
Austdac now offers the ability to monitor and control equipment in the field from the control room and vice versa with the introduction of HubBus.

HubBus is a long range (10-20km) data bus system for analogue and digital

I/O with the unique feature of devices being powered downline from the one signal line.

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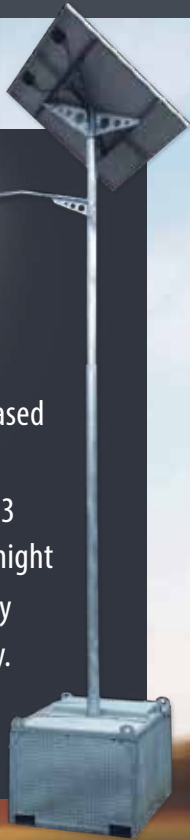


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Repair and rebuild services

NATIONAL

PPK Group is a leading original equipment manufacturer (OEM), and maintenance, repair and overhaul provider of plant and equipment, tooling and consumables to the mining and other related industries in Australia.

PPK Mining Equipment is designed to give high performance, long service life and low operating costs.

There comes a time when it becomes necessary, more economical or environmentally beneficial to repair, overhaul or re-build the equipment in order to improve performance.

With this in mind, PPK offers efficient, cost-effective repair and rebuild services that make maximum utilisation a reality today.

PPK Mining Equipment designs, manufactures, and services the industry renowned range of COALTRAM flame proof and explosion proof diesel Load Haul Dump (LHD) utility vehicles.

PPK Group mining general manager Brendan Noake said the company's Tomago manufacturing and service centre in NSW operates to world-class, large-scale, lean manufacturing standards that meet the most stringent global export specifications.

"PPK Mining Equipment also has a market-leading service and support centre at Port Kembla, Wollongong," Mr



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

Noake said.

"This facility is dedicated to servicing existing Illawarra Basin coal mine clients who own a large proportion of the existing COALTRAM fleet and has also been designed to cater for the service and support of a wider range of underground flame-proof vehicles that are situated in the wider Wollongong/Illawarra region."

PPK Mining Equipment Tomago and Port Kembla facilities have the capability and expertise to complete major plant overhaul, repair and maintenance on all production plant and Ex DES diesel plant to the OEM standard.

With a commitment to professional and prompt service, the Tomago and Port Kembla Customer Service Centre's

provide aftermarket service and repair across all PPK product ranges and customer requirements.

PPK Group is dedicated to building an expanding world-class technology, safety and automation based mining products and services group that provides a high-quality end product and premium service.

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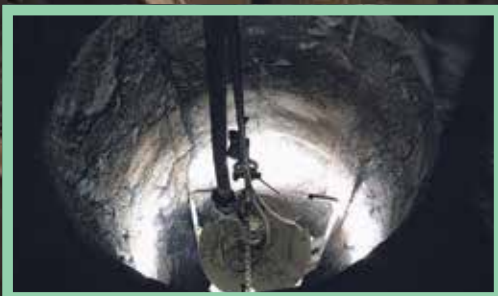
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A black and white photograph of a worker in a hard hat and safety vest, working on a yellow safety railing. The railing is made of a mesh material and is installed on a staircase or platform. The background is dark and industrial.



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. An ISO accredited company, Jetcrete operates 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 via resin injection.



Shaft Lining

- Capability of delivering remote application of shotcrete of up to 400m depths and up to 6m diameter shafts such as vent shafts, escape ways, ore passes and more.
- Capability of pre and post shotcrete application camera surveys
- State of the art shaft lining unit developed for Coal Mining Operations:
 - An industry first EX d Group I equipment
 - Continuous CH4 safety monitoring and end of line protection units
 - Remote speed control of lining applicator
 - Compliance to AS/NZS 4871 standard for electrical equipment for mines and quarries



Civil Construction

- Delivery of construction and civil services to both surface and underground operations in remote locations
- Commitment to first class standard in quality and safety
- Client benefits in terms of cost savings and timely completion
- Construction partner for:
 - Heavy Duty Workshops
 - Mine Site Offices
 - Machine Foundations and Slabs
 - Drainage and Culverts
 - Earthworks
 - High wall stabilisation



Specialist Ground Support

- Delivery of alternative ground support systems to underground mining projects
- Strata Consolidation via Resin Injection
 - An alternative active rock support system for underground mining
 - Stabilisation of convergence
 - Stabilisation of rock, sand, gravel, concrete, and caved material
- Cable bolting
 - An alternative active or passive rock support system for underground mining

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RIX

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GROUND ENGINEERING

RIX offer effective ground engineering solutions, often in extremely difficult and limited access areas. Our specialist drilling and ground engineering teams can provide:

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- Permanent ground anchors
- Removable ground anchors
- Sand anchors
- Micro piles
- Soil nails and rock bolts
- Shotcrete
- Capping beams
- Jet grouting
- PUR Grouting
- Water pressure testing (Lugeon Test)
- Various types of pressure grouting
 - Dam grouting
 - Curtain grouting
 - Chemical grouting
 - Permeation Grouting



PILING

RIX offers a comprehensive range of services within the piling sector, to supply the most appropriate and cost-effective type of pile for a particular site condition, including:

- D&C of shoring walls and foundation piles
- Bored piles
- Temporary/permanent cased bored piles
- RMS spec piles
- Continuous flight auger (CFA) piles
- Secant pile wall
- Pendulum drilling
- Pile testing
- Complete shoring wall packages, to include, piling, capping beam, anchoring and shotcrete, providing one point of contact to the Client for the design, management, supply and installation



SHOTCRETING

RIX has established itself as the largest ground engineering shotcrete applicator in Australia and our multi skilled teams spray in excess of thirty thousand cubic metres of shotcrete across the Asia Pacific each year. Typical shotcrete applications include:

- Retaining/shoring walls
- Slope stabilisation
- Road & rail embankments
- Mine box cuts, portals, high walls
- Mine & tunnel underground roof support
- Dam spillways
- Detention tanks
- Sea walls
- In ground drain channels & culverts
- Wet & dry shotcrete hand sprayed
- Wet & dry shotcrete robotically sprayed
- Tele remote shaft lining
- Swimming pools
- Ponds and water features
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SLOPE STABILISATION

With years of experience in a wide range of slope stabilisation methods, RIX delivers safe, efficient, quality solutions for all types of commercial, mining and construction projects including:

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- Attenuator barriers
- Erosion control matting
- Blasting
- Scaling / rock removal
- Rock splitting
- Rock bolting
- Shotcrete
- Guniting (dry spray shotcrete)
- Soil nailing
- Rope access
- Grouting

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Leading transportable building solutions

NATIONAL

LOCALLY established, owned and operated, Northern Transportables is the NT's award-winning transportable building manufacturer.

As a registered building contractor at the forefront of the NT's transportable manufacturing industry, the company designs and manufactures transportable buildings for both sale and hire Australia-wide, across a wide range of industries.

Over the last year, the company has delivered quality transportable building solutions in mining, resources and government projects.

Recent projects include mining offices and site facilities for South 32's Groote Eylandt Mining Company (GEMCO), accommodation for Jemena and McConnell Dowell on the Northern Gas Pipeline, and a range of educational facilities for the NT Government.

Northern Transportables has also completed projects for Heron Resources in Kalgoorlie, BHP in WA's Pilbara region, and Xstrata Zinc at Mount Isa Mines in QLD.

From single and multi-level modules, to complete mining camps, Northern Transportables' professional team works with clients to develop building solutions to meet their needs, ensuring clients get the right transportable the first time.

The company's professional design team includes qualified structural drafters and



Northern Transportables ensures customers get the right transportable the first time.

building information modellers to capture the unique vision of each client.

Northern Transportables' production team consists of skilled tradesmen, apprentices and trainees – including welders, carpenters, roofers, plumbers, electricians, mechanics – as well as transport and logistics staff.

Its production team is supported by qualified professionals in accounting and finance, contract and project management, human resources, work health and safety, governance and risk management.

In addition to Northern Transportables' customisable buildings, the company provides a full range of services from design through to certificate of occupancy.

These services include customised structural design and building information modelling, building transport, site installation and certifications – including building permits, site inspections, certificates of compliance and permits to occupy.

Northern Transportables operates under a triple Certex accredited Quality, Safety and Environment Integrated

Management System and has a fleet of road trains that are accredited under both the National and Western Australian Heavy Vehicle Accreditation Schemes.

Northern Transportables' fabrication and manufacturing facility is fully equipped, with more than 3000sqm under one roof, allowing all construction to be completed onsite and in a short time frame.

For further information Northern Transportables can be contacted on (08) 8995 6500 or 0408 856 687.

THE AUSTRALIAN
MINING REVIEW

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Australian Potash

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Darwin Port

Echo Resources

Future of Coal

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Northern Transportables specialise in the design, manufacture, delivery and installation of turn-key transportable building solutions.

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More information can be found at www.ntlink.com.au.

Australia’s transportable building provider

NATIONAL

FAMILY-owned and operated since 1983, NT Link specialises in design, manufacturing, transportation and installation of modular transportable buildings throughout Northern and remote Australia.

Covering a full range of transportable buildings from single dwelling housing projects to large camp facilities, NT Link provides everything from project management to turnkey solutions and high level customer satisfaction.

Previous camp projects included a 400 person camp on Christmas Island; 140 person camp at Red October mine; a 250

person camp in Cue; an 800 person camp out of Darwin; and a 200 person camp at the Taloona gas plant on the East coast.

Other projects included the installation of more than 200 offices, lunchroom and site facilities for the Ichthys LNG project at Bladin Point in Darwin.

With more than 30 years’ experience, NT Link is committed to delivering

quality in a productive, safe and healthy working environment for all employees, contractors, customers and visitors.

NT Link is also an ISO 9001:2015 certified builder and manufacturer, its HSEQ management system was certified to AS/NZS 4801:2001 and its environmental management system is certified to ISO 14001:2015.



Camp Solutions

NT Link provides high quality temporary and permanent transportable building solutions throughout Northern and remote Australia. We specialise in providing building industry solutions from small to large commercial and industrial projects.

Our turnkey camp solutions are customised to meet the requirements of our client’s project. Our building rental fleet has in excess of 1,200 buildings; we have a purpose built manufacturing facility in Darwin and an extensive plant & equipment fleet to handle all transport and installation.

Not only can we provide all the buildings and facilities required for a large accommodation camp but we are able to provide relevant services to ensure a fully operational camp. Our strong and experienced team based in both Darwin and Alice Springs work closely with our clients to deliver complete turnkey solutions. From end to end, including design, manufacture, transport, install and after mark services.

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All Images: Australian Vanadium

AUSTRALIAN VANADIUM MANAGING DIRECTOR

VINCENT ALGAR

Australian Vanadium (AVL) has confirmed the economic viability of its Gabanintha project near Meekatharra in WA as one of the world's most significant new vanadium operations. Emma Davies spoke with Australian Vanadium managing director Vincent Algar about growing demand for vanadium and where it fits in.

Q. What is the next step for the company now Gabanintha's Pre-Feasibility Study was completed?

The results of the PFS have provided a confidence in the economic viability of the project, which enables us to push forwards towards development.

We are starting the year with a diamond drilling program to extract material to scale up the test work to a pilot plant scale and prove the processing route.

Alongside this work we are continuing to drive the environmental approvals, native title approvals and analysis of the different options for project improvement that we uncovered during the PFS stage.

The completed PFS also allows us to confidently engage with strategic partners in 2019, at a time when vanadium supplies are very much in demand.

Q. When do you expect the site to be operational?

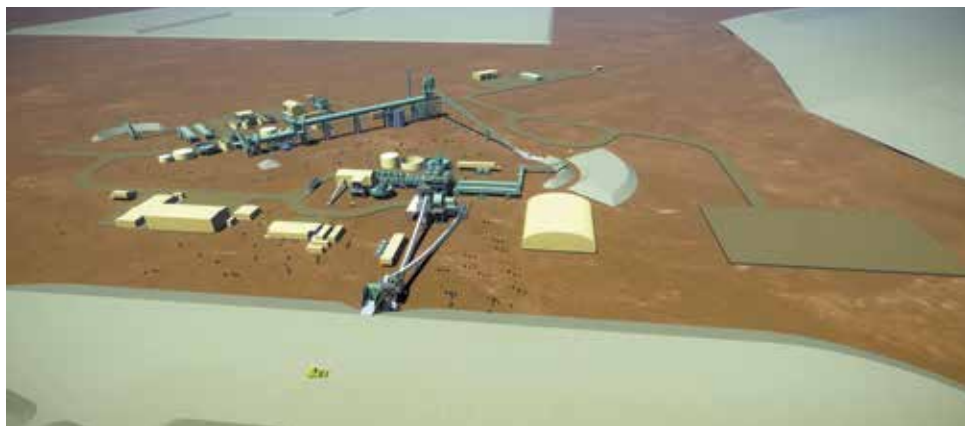
Timelines are hard to provide as there are so many external factors that you can't control, for example the environmental and native title processes - both of these are important and we respect the need for them.

We can be optimistic with our timelines and assuming all proceeds without complication we could be mining as soon as 2021. AVL's plan is to develop the project as quickly as possible, but achieving a quality mine site with longevity built in.

Q. Describe how the high-grade nature of the project lends itself to low cost production?

Grade is king! In vanadium, as in many projects. The bulk grade in AVL's case is high (more than 1 per cent vanadium oxide), compared to many deposits globally.

We use magnetic separation to



Proposed vanadium pentoxide refinery at the Gabanintha project.

'concentrate' the ore. This mass recovery in the case of AVL's project is very high (60 per cent), possibly the highest in the world.

These two factors affect many costs, they reduce the amount we have to mine and the size of the equipment we have to use to get the amount of metal we want out. This is one of the reasons we expect to be among the lowest cost producers globally.

Since each extra tonne that needs to be mined and processed adds to the cost of production, it explains why low-grades and low mass recovery projects will always struggle to stay viable through low vanadium market price points.

Q. What will the planned vanadium pentoxide refinery look like and what are the benefits of processing on site?

It's important to AVL that we add value to the commodity here in Australia and generally the lowest cost method of doing that is to process it near to where it's mined.

Through the DFS stage we will be looking at what the refinery will look like and how it will be incorporated into the mine site plans.

Q. Take us through the complementary market in the steel sector?

Steel is actually the main market for vanadium and currently consumes the vast majority of the globally produced material.

Adding vanadium to steel makes the steel stronger, but at the same time lighter. Applications range through structural steel (rebar), titanium alloys, aircraft, surgical instruments and tools.

The vanadium redox flow battery market is the complementary market and we've been advancing the knowledge of this through our 100 per cent owned subsidiary VSUN Energy.

Q. Where do you see the Gabanintha project fitting into this vanadium battery market?

AVL's Gabanintha project will be able to produce products for both steel and energy storage.

VSUN Energy was launched as part of a supply chain initiative for AVL to provide the vanadium, process it into vanadium electrolyte and either purchase batteries from existing manufacturers or manufacture our own.

Q. What kind of economic impact will the mine have on the Meekatharra region and the State?

AVL is engaging with the local community and interested parties in the Meekatharra area and the company is keen to have a positive impact.

We are looking at upcoming roles that will be needed for the project and where we can offer training paths for local people to adopt the skills we will require. We are working with the Stephen Michael Foundation and are hoping to broaden this engagement over the coming years.

The message we hear from the people of Meekatharra is that they want jobs and they want companies to spend money in the town, not just ship people and products in.

They're seeking some support for what is a vibrant town with a great future and a lot of good people wanting to make that happen.

For the State, with the right input from the Government, which is being driven at the moment from ministers such as Bill Johnston at a State level and Linda Reynolds at a Federal level, the battery metal market should be able to do what the iron ore industry failed to do - keep some of the value of these minerals in the State and in the country.

Q. Where do you see AVL in the next five to 10 years?

We want to be a vanadium producer feeding both the steel and battery markets, integral to the State's battery metal structure and also an advocate for renewable energy.

Q. Is there anything else you would like to add?

Vanadium is a very different metal to others and getting it into production is not a trivial process.

We have built a team of experts and are engaged with external consultants who bring even more expertise. Even some of the experts have expressed surprise at the quality and size of the AVL Gabanintha project and as we analyse it further we become more and more confident of a successful outcome.



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- The WingtraOne PPK system with **42 MP camera** produces brilliant resolution images with down to 0.7 cm/px GSD.





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