

THE AUSTRALIAN MINING REVIEW

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POWER

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GEOSCIENCE
AUSTRALIA

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BLAZE A TRAIL

Image: Sheffield Resources.



Sheffield Resources' construction-ready Thunderbird project is one of the largest mineral sands discoveries in recent years and is set to supply a high-quality product out of northern WA for decades to come.

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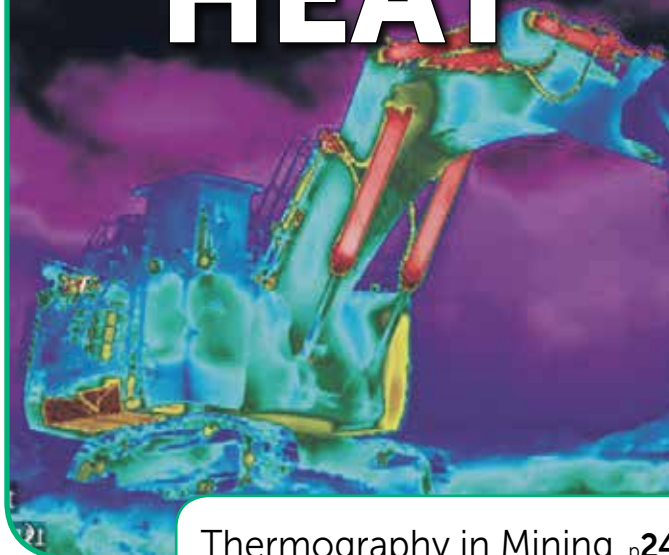
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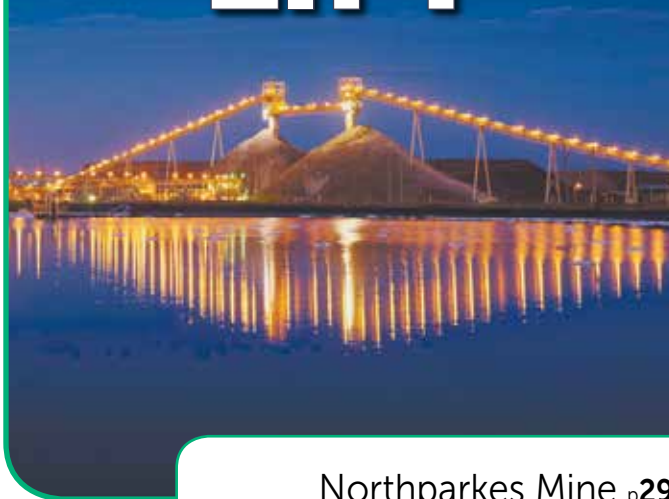
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THE HIDDEN LANGUAGE OF HEAT



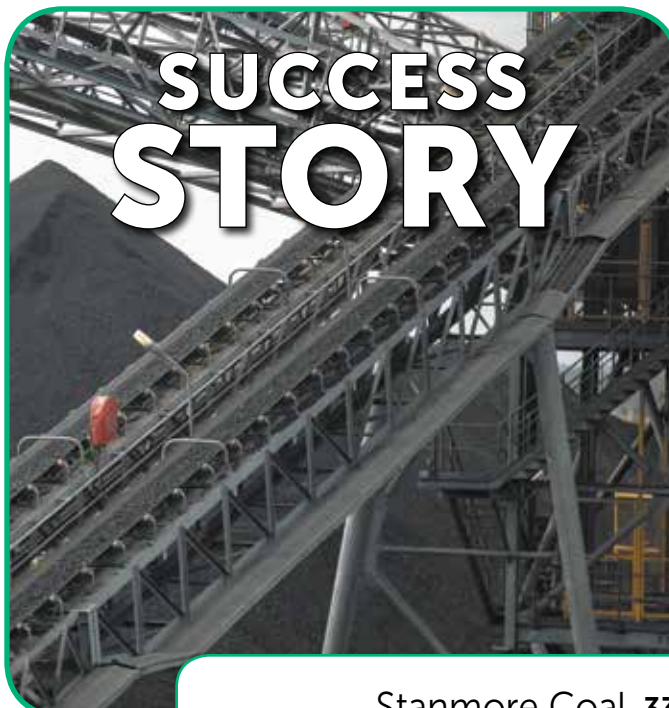
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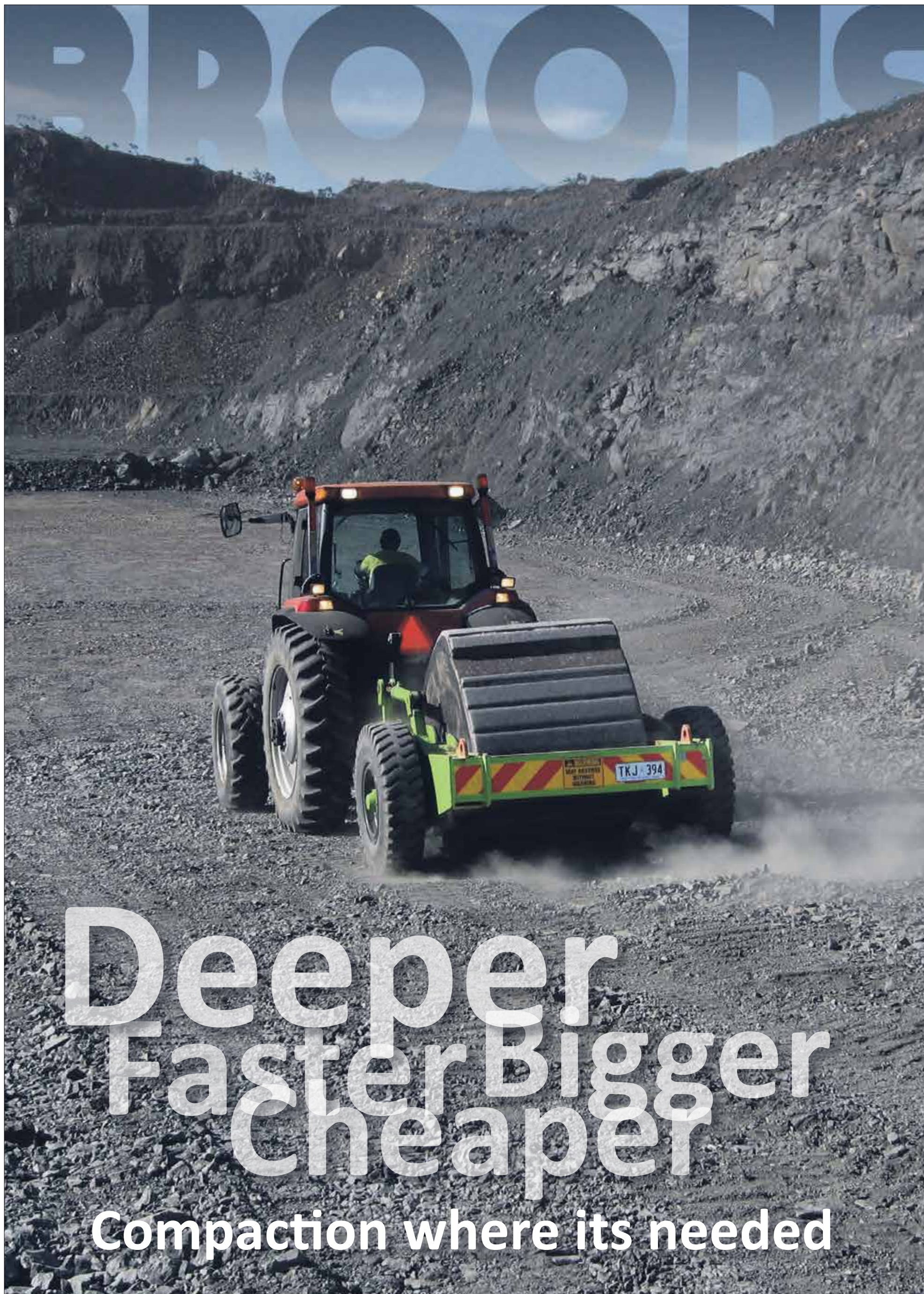
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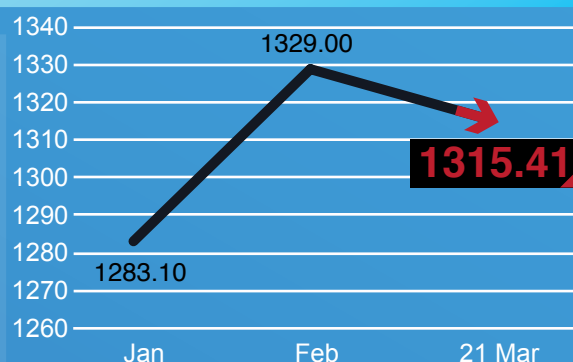
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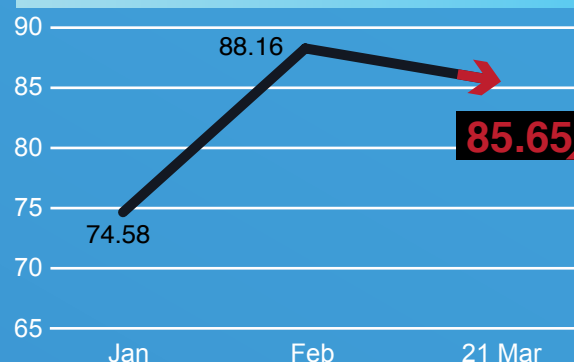
International uncertainty around Brexit has left gold investors uninspired, despite the US Federal Reserve's decision to issue a prolonged pause on its rate hike.



IRON ORE

\$US/t
62% Fe CFR China

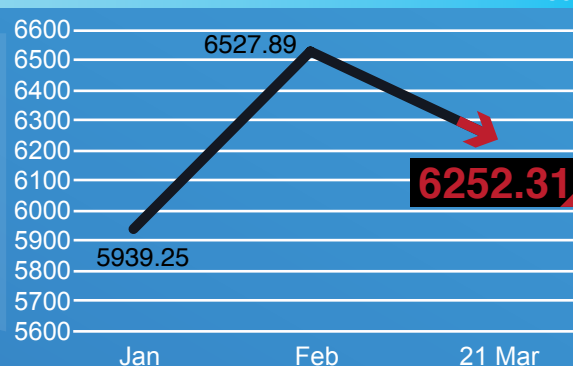
Iron ore prices remain relatively flat at \$85/t after reaching a two year high last month following Vale's Brazilian dam disaster.



COPPER

\$US/t
LME Price

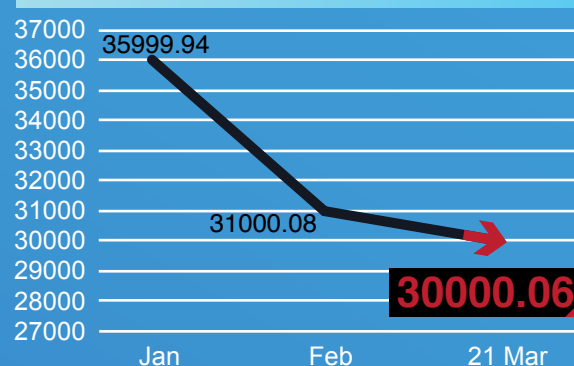
Copper has seen a strong start to the year however, like gold, it is heavily dependent on the resilience of the Euro as Brexit draws nearer.



COBALT

\$US/t
LME Price

Cobalt prices have continued to fall amid a supply surge in the Democratic Republic of Congo.



ALUMINIUM

\$US/t
LME Price

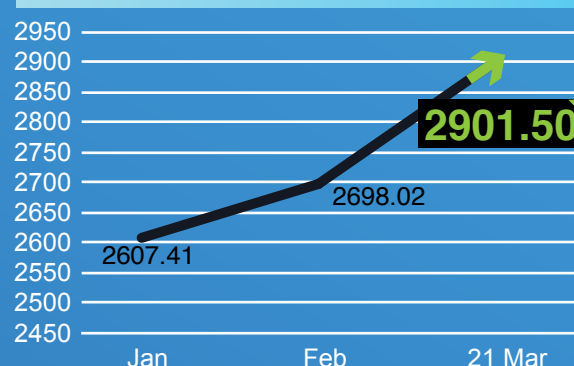
Aluminium prices soared to a three month high after a cyber attack crippled Norsk Hydro, shutting down its smelters and extrusion plants.



ZINC

\$US/t
LME Price

Zinc prices rose to a one year high due to low inventory and potential future demand for the zinc-air battery market.



LEAD

\$US/t
LME Price

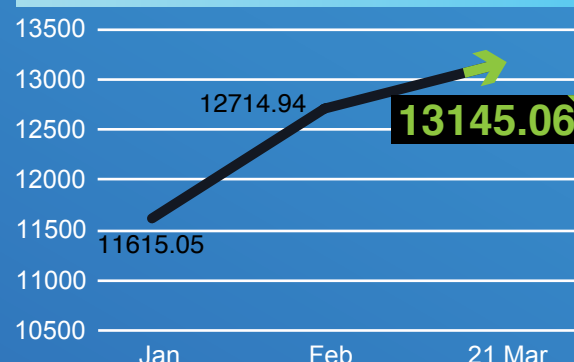
Lead may have had a slight resurgence, but it looks set to continue falling toward 2006 levels as supply deficits are plugged by existing stockpiles.



NICKEL

\$US/t
LME Price

Nickel prices hit a one year high during March as market inventories fell and demand continued to rise.



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IN BRIEF

Jupiter reviews iron ore projects

WA

JUPITER Mines has announced plans to review the strategic direction of its Central Yilgarn iron ore assets in WA.

The assets included the Mount Mason DSO hematite and Mount Ida magnetite projects.

Both projects had readily available road, rail and port infrastructure that could underpin a long-term supply.

The advanced nature, size and quality of the mineral resources indicated an attractive opportunity for production of high-grade DSO hematite and high-grade magnetite in a low risk, established mining region.

Westgold sells Higginsville gold operations

WA

TORONTO-listed RNC Minerals has reached an agreement to purchase Westgold Resources' Higginsville gold operations (HGO) in WA for \$25m in cash and \$25m in RNC shares.

The Higginsville plant was close to RNC's Beta Hunt project, which discovered numerous large-scale gold nuggets in late 2018.

"This is a sensible transaction that gives both RNC and Westgold solutions for their project needs," Westgold managing director Peter Cook said.

"The addition of the 'bonanza grade' gold discoveries and resource potential at Beta Hunt to the existing operation at Higginsville will provide enhanced gold output at lower costs, as well as security from ownership of substantial plant and infrastructure."

AuStar ready to sell its gold

VIC

VICTORIAN miner AuStar Gold has announced 1.07kg of dore gold was poured on Monday 11 March from the first two days of processing at the McNally ore body.

Clean up of material contributed an additional 214kg of dore which was assayed at 76 per cent gold with 14.8 per cent silver credit (reconciled to a grade of 7.43g/t gold and 1.44g/t silver from gravity processing).

A further 133.5 tonnes of material was processed and the company expects to release a production update for gravity recovered gold (poured to dore) in early April which would include a reconciliation for realised precipitate sales to date.

Lynas rejects Wesfarmers bid

Image: Lynas.



Lynas chief executive Amanda Lacaze.

GERARD MCARTNEY
NATIONAL

LYNAS Corporation has formerly rejected a \$1.5 billion offer from Wesfarmers to purchase the company.

On 26 March, the miner received an unsolicited, indicative non-binding conditional proposal from Wesfarmers at \$2.25 a share; a premium of 44.7 per cent to its last closing price and a premium of 36.4 per cent to its 60-day weighted average.

In a statement, Wesfarmers said it was uniquely placed to support Lynas' future through further capital investment to support downstream processing assets and realise the

full potential of its Mt Weld ore body in WA.

However, Lynas said it would not engage with Wesfarmers and advised shareholders to not take any action in relation to the proposal.

"In coming to this conclusion, the board has drawn on the company's extensive knowledge of stakeholder interests, and current market and operating conditions," Lynas stated.

"It has also consulted with advisers on terms of the proposal, and validated its view as to value."

At \$2.25 a share, the bid was well above Lynas' market price of \$1.55 at 25 March, but below its \$2.89 price in May 2018.

Lynas was currently the only company outside of China to process rare earths, but

had come into trouble recently after stringent environmental demands were made for its Malaysian processing operations in a review of its license.

In December 2018, Lynas' shares plummeted 31 per cent, from \$2.25 to \$1.55 amid a dispute between Lynas and the Malaysian energy and environment ministry for what it called "policy based on politics, not policy based on science."

The feud had caused ripples as far as Japan.

The Japanese embassy had lobbied the Malaysian government to renege on its decision as Japanese business received one third of its rare earths from Lynas, and both business and government relied heavily on rare earth minerals to power its economy.

BHP shows support for China's BRI

GERARD MCARTNEY
INTERNATIONAL

BHP chief executive Andrew Mackenzie has defended China's Belt and Road initiative (BRI), at the China Development Forum late March, claiming the \$US1.3 trillion infrastructure investment program would double the rate of local steel demand, and "revitalise" the ancient trading corridor.

In a keynote speech to delegates, Mr Mackenzie said he'd like to "down play" geopolitical issues associated with the initiative and raise up the economic importance of its agenda.

"In global terms, it is enormous and the contribution it can make to development, to trade, to employment and to poverty alleviation is quite immense," Mr Mackenzie said.

"It can achieve greater cross-border cooperation, and I think, obviate some of the protectionist forces that now threaten free flow of trade and investment, as well as promoting the associated cultural exchange and harmonisation that comes with this."

The BRI planned to expand on the historic Silk Road economic belt that linked China to central and south Asia, and Europe, and the Maritime Silk Road that linked China to South East Asia, the Gulf nations, North Africa and Europe.

According to the World Bank, the BRI would encompass 62 per cent of the world's population and 30 per cent of the world's GDP.



BHP chief executive Andrew Mackenzie.

As a large supplier of iron ore into China, BHP was set to benefit from increased steel demand required to build the infrastructure.

Mr Mackenzie said BHP's analysis showed BRI projects could generate up to 150 million tonnes of incremental growth in steel demand, which equated to about a 9 per cent increase in annual demand over a 10-year period.

However, Mr Mackenzie encouraged China to be attentive to the needs of smaller countries during the process.

"The development is going to have to be inclusive of local economies, and it has to be very supportive of imperatives like

employment and improving livelihood and environmental performance," Mr Mackenzie said.

"As I read it, China now believes that the Belt and Road initiative to succeed, must embrace three core principles; consultation, contribution and shared benefits.

"China has shown a willingness to listen, to adapt, and partner with many of the multilateral institutions, including the financing companies in order to help the large-scale projects, which are now emerging and underway to succeed."

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Aeris eyes CSA takeover

ELIZABETH FABRI
NSW

AERIS Resources has confirmed speculation it is considering buying Glencore's CSA copper mine in the Cobar region, NSW.

In a statement to the ASX on 20 March, Aeris said it had made an offer to purchase the mine, and late stage negotiations around the offer were ongoing.

Its \$US575 million offer for the asset, comprised about \$US525m in cash and about \$US50m in Aeris shares, plus a royalty payable to Glencore.

The company said funding for the offer had not yet been finalised, but it proposed to fund the acquisition through a combination of debt, an equity capital raising and silver stream.

"The final sizing of, and participants in, the relevant components of the raising are yet to be finalised," Aeris stated.

"However, Aeris is in late stage discussions with major shareholder Special Portfolio Opportunity V Limited, a subsidiary of a fund managed by PAG, Orion Mine Finance and others.

"The equity component of the raising is being managed by RBC Capital Markets and

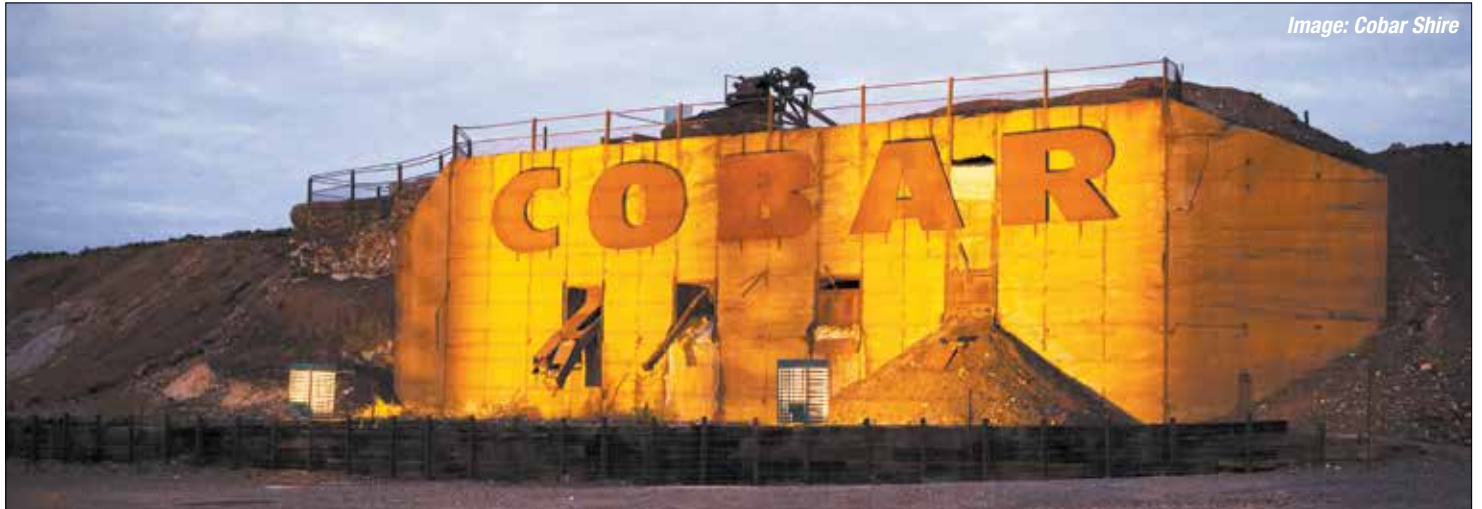


Image: Cobar Shire

The CSA mine has a long history in Cobar in Central Western NSW.

Macquarie Capital."

CSA was the highest grade underground copper mine in the country, which started production in 1871.

In 2018, the mine produced 48,000 tonnes of copper in concentrates compared to 53,400t in 2017.

It also produced 495,000 ounces of silver in concentrates, down from 564,000oz in 2017.

Aeris' current production source was its Tritton copper mine, also in NSW, which was

anticipated to produce 24,500 tonnes in FY19.

The company also recently recommenced drilling at its Torrens project in South Australia with JV partner Argonaut Resources.

Aeris executive chairman André Labuschagne told *The Australian Mining Review* in December that the company was focussed on growing its business beyond Tritton and Torrens.

"We always said we want to be a

multi-mine, mid-tier company, focussing on operational excellence, because that's our strength, so we're now more focussed on, mergers and acquisitions," Mr Labuschagne said at the time.

Aeris noted that there was no guarantee the acquisition would proceed.

However, if successful, the bid would be a huge win for the Brisbane-based copper producer, which reported \$236 million in revenue and a \$55 million profit in FY18.

Pilgangoora Stage 3 a step closer

EMMA DAVIES
WA

AUSTRALIAN lithium producer, Pilbara Minerals, has revealed positive results from its Scoping Study into a Stage 3 expansion at its Pilgangoora lithium-tantalum project in the Pilbara, WA.

The proposed expansion would see the project's processing capability expanded to 7.5 million tonnes per annum (mtpa) for a capital cost of \$225.83 million.

This would deliver about 1.2mtpa of 6 per cent spodumene concentrate and about 1.1 million pounds per annum of 30 per cent tantalite concentrate over a 15-year mine life.

Pilbara Minerals managing director and chief executive Ken Brinsden said the results reinforced the company's position as a globally significant lithium raw materials producer.

"As the electric vehicle and battery storage sector grows, so does the opportunity for Pilbara Minerals to become a player in the lithium raw materials supply chain," Mr Brinsden said.

The Stage 3 expansion also supported Pilbara Minerals' participation in downstream lithium chemicals facilities.

In March, Pilbara Minerals declared commercial production at Pilgangoora effective from 1 April 2019, and also announced it had exercised its option to enter into an incorporated Joint Venture with POSCO to develop a 40,000tpa lithium carbonate equivalent capacity downstream facility in South Korea.

POSCO and Pilbara Minerals would aim to complete construction of the chemical conversion plant in late 2020, with commencement of production in early 2021.

Boston Shaker underground approved



Image: AngloGold Ashanti.

Access to the Boston Shaker underground will be through the Tropicana open pit.

GERARD MCARTNEY
WA

ANGLOGOLD Ashanti and Independence Group (IGO) have given the green light for development to begin at their Tropicana JV Boston Shaker underground mine in WA.

After completing a pre-feasibility for the project in December, the company determined the mine was technically and financially viable, with robust economics.

The \$105 million Boston Shaker underground mine would produce about 100,000 ounces of gold per year once the mine is at full production capacity, which would grow Tropicana's production to between 450,000 and 500,000 ounces over its five year

mine life.

The JV said construction was set to begin in the June 2019 quarter, with first production expected in the September 2020 quarter.

AngloGold Ashanti chief operating officer Ludwig Eybers said expanded ore production from the mine would capitalise on investments made at the Tropicana processing plant commissioned in November 2019, which included a second ball mill.

"Underground mining at Boston Shaker will leverage further value from this high performing operation, achieving pay-back in just over three years," Mr Eybers said.

IGO managing director Peter Bradford said although Tropicana was not aligned with IGO's strategic focus on metals that were critical to clean energy, it was a high-quality

asset for the company delivering strong free cash flow.

"The Boston Shaker underground development is an important step in the continuing value enhancement at the Tropicana gold mine, which remains one of the lowest cost gold operations of scale in Australia," Mr Bradford said.

On 28 March Macmahon, which held the current Tropicana open pit contract, was awarded a \$30 million underground mining contract for Boston Shaker.

Macmahon said it would begin work in May, and expected contract documentation to be finalised in the coming weeks.

The proposed mining fleet would include two jumbos, two production drills, three loaders and four trucks.



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IN BRIEF

Stavely buys Beaconsfield plant

TASMANIA

STAVELY Minerals has purchased the 350,000tpa capacity Beaconsfield gold processing plant and associated infrastructure, property, rights, leases and permits for \$2 million.

Stavely had no intention of reopening the underground mine which collapsed on 25 April 2006, killing one worker and trapping two others underground for two weeks.

It would instead focus on the shallow exploration potential that remained on the mining lease.

"The opportunity, for very little cost, to acquire the building blocks of an integrated high-grade gold asset in Tasmania was simply too compelling to resist," Stavely executive chairman Chris Cairns said.

Newcrest enters Greatland farm-in

WA

NEWCREST Mining has inked a farm-in joint venture agreement with Greatland Gold over its Havieron exploration tenement in the Paterson region, WA.

Newcrest has agreed to spend a minimum of \$US5 million over an initial 12-month period and can earn up to 70 per cent of the project by spending \$US65 million over a six-year period.

"It is becoming more and more evident that the Paterson region is highly prospective for under-cover discoveries," Newcrest chief development officer Michael Nossal said.

The company believed the tenement had potential to deliver high-grade ore feed to Telfer.

Northern Minerals raises \$20m

WA

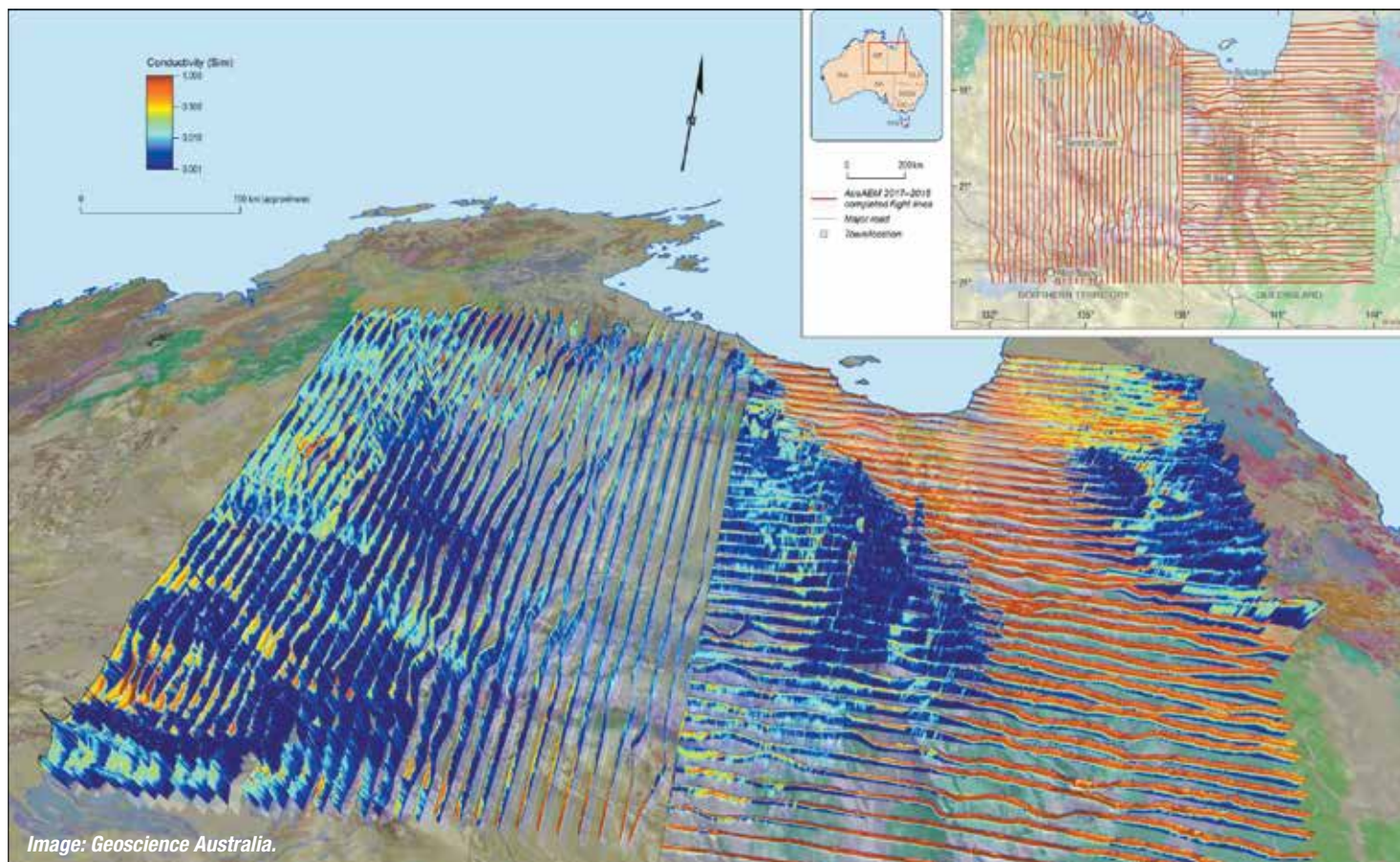
RARE earths producer Northern Minerals has tapped investors for \$20 million to put towards exploration and strengthening its balance sheet.

Northern Minerals managing director George Bauk said the support for the placement from investors was "excellent".

"The placement will allow us to ramp up exploration at the high-grade Dazzler and Iccan prospects, and strengthen the balance sheet for working capital purposes," Mr Bauk said.

The company proposed to hold a general meeting in late April to seek shareholder approval and remained confident shareholders understood the important role heavy rare earths played in the electric vehicle sector.

Aerial survey shows promise



Map of the airborne electromagnetic survey with the conductivity sections projected above the survey area in Northern Territory and Queensland.

EMMA DAVIES NORTHERN AUSTRALIA

THE world's largest airborne electromagnetic (AEM) survey data results recently revealed potential new mineral and groundwater resources in the Northern Territory and QLD.

Part of Geoscience Australia's *Exploring for the Future* program, in partnership with the Northern Territory and Queensland Geological Surveys, the data was collected using aircraft-mounted equipment to map the electrical conductivity below the Earth's surface to a depth of several hundred metres and contained about 60,000 line kilometres of data.

"This provides a detailed 3D picture – similar to a CT scan – that is used to map potential resources beneath the Earth's surface in the prospective area between Tennant Creek and Mt Isa," Federal Resources and Northern Australia minister Matt Canavan said.

"When integrated with other datasets such as gravity, magnetic and radiometric maps of Australia, the AEM can reveal potential broad-scale groundwater resources to support communities, industries and the environment."

The survey indicated potential for new mineral deposits including gold, copper, nickel, lead, zinc and manganese, as well as critical minerals such as cobalt, platinum-group elements and rare-earth elements.

"This is great news for Northern Australia, offering enormous potential for the next generation of resource discoveries," Mr Canavan said.

"13 exploration companies already signed up to participate in infill flying during the next survey, which would be acquired across an equally large area of the west of the Northern Territory and into WA."

The airborne survey would take place between March and September 2019, with more information to be released soon.

Geoscience Australia said it involved a helicopter or fixed wing plane flying low, less than 150 metres above ground, and the flight path would involve flying in parallel lines spaced widely, about 20km apart.

Podium increases Parks Reef target

EMMA DAVIES WA

PODIUM Minerals has announced a revised exploration target for its Parks Reef reserve in the Weld Range complex in mid-west of WA.

The exploration target at Parks Reef was estimated to contain between 3.1 and 5.8 million ounces of combined platinum, palladium and gold – compared to the previous estimate of 1.2 to 3.5 million ounces.

The target increase was based on recent drilling programs with the resultant mineral resources estimate containing about 740,000 ounces of platinum, palladium and gold.

Podium chief executive Tom Stynes said the exploration target was important in setting the goal posts for the next stages of the company's drilling programs.

"It also provides some metrics for understanding the potential scale and life of a development and is a further indicator of the opportunity in Parks Reef," Mr Stynes said.

"Our plan is to extend our resource drilling along the full strike length of the identified mineralisation with an initial objective of defining inferred resources



The Parks Reef reserve could contain up to 5.8 million ounces of platinum, palladium and gold.

in-line with the near surface portion of the exploration target.

"We use the historical surface drilling to target our drilling locations and it is easy terrain so it is efficient and cost-effective drilling."

Mr Stynes said that 9000 to 10,000m of drilling was required to extend the inferred mineral resources along the full strike length of Parks Reef.

In addition, the company had engaged with the WA School of Mines at Curtin University, which would undertake metallurgical testwork on drill samples to investigate the potential for a leach process route to maximise payable metal recoveries.

Mr Stynes said the testwork would also help to identify a preferred process route for the next key step in defining a mine development.

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IN BRIEF

Monadelphous secures South Flank deal

WA

BHP has awarded Monadelphous its second contract at the South Flank project in the Pilbara, WA, valued at \$104 million.

The contract would bring Monadelphous' work on the project up to a total value of \$212m, and included structural, mechanical, piping, electrical and instrumentation works on the project's inflow infrastructure.

"We are pleased to secure further work on this significant project and look forward to continuing our long track record of successfully working with BHP," Monadelphous managing director Rob Velletri said.

Work was expected to start immediately and be completed by March 2021.

BIS receives innovation award

NATIONAL

MINING services provider Bis Industries won the *Future of Mining 2019 Innovation* award for its revolutionary new REXX mining haul truck.

Bis recognised a problem in double handling product when it was being moved from pit to processing and the solution was a 20-wheeled, long range, out-of-pit hauler that would combine the distance capacity of a traditional off road haulage solution with the ability to go out of pit.

"We are constantly searching for better ways to deliver safe, efficient and flexible solutions for our customers, all while being at the forefront of innovation," Bis chief executive Brad Rogers said.

Mondium scores MRC graphite contract

WA

ENGINEERING firm Mondium has won the early start engineering (ECI) contract for Mineral Commodities' (MRC) Munglinup graphite project near Esperance, WA.

Mondium would undertake front-end engineering and design (FEED) for the project, which was in the final stages of its definitive feasibility study.

"MRC is very pleased to have formed this relationship with a highly regarded engineering and construction firm," MRC executive chairman Mark Caruso said.

"This will enable MRC to undertake significant value-add for the Munglinup graphite project through ECI and FEED stages, leading into construction later in the year, subject to approvals and a decision to mine."

BGC nabs \$30m gold contract



Image: BGC Contracting.

BGC Contracting completed works at Atlas's Wodonga iron ore project.

GERARD MCARTNEY
WA

BGC may be looking to sell off the contracting arm of its business, but BGC Contracting has shown no signs of slowing, securing its first WA gold project in 10 years.

The contractor recently secured a \$30 million contract at Northern Star's Ramone gold greenfield project, 35km south east of the Jundee gold mine.

The 18-month contract began in March and would include the installation of site facilities, drill and blasting, load haul mining and dewatering services.

Additional site services included internal haul roads, setup and establishment of the site workshop, set up of the explosives compound and magazines, earthworks and site preparation.

BGC Contracting chief executive Greg Heylen said the contract award put it in good stead to secure further gold mining opportunities.

"We are very excited to secure this project opportunity with BGC Contracting, growing its projects, both in commodity and geographical diversification," Mr Heylen said.

"Two years ago, we embarked on a strategy to grow the business, grow our national footprint and to increase our

commodity diversification.

"The Ramone contract is a major achievement for our diversification strategy and allows us to extend our expertise in gold whilst providing new job opportunities for some 50-60 people on this greenfield project."

In late February, BGC announced that it was "exploring options" for the possible sale of the contracting arm of the business.

BGC chairman Neil Hamilton said while this review was ongoing it would be "business as usual" for its customers and staff.

"The focus of BGC Contracting will continue to be on delivering excellent services for our customers," Mr Hamilton said.

GR Engineering wins Mardie work

ELIZABETH FABRI
WA

GR Engineering has been named a lead engineer for BCI Minerals' Mardie salt and potash project definitive feasibility study.

Under the contract, GR Engineering will coordinate and integrate the process and engineering design packages for the ponds and crystallisers, salt plant, SOP plant and port facilities.

The company would also be responsible for preparing and verifying the DFS level capital and operating cost estimates, and undertake the design and supervision of pre-final investment decision site works and supporting infrastructure.

BCI said site works included a 135-hectare trial pond, seawater intake pumps, a 20km upgrade of access roads, an initial accommodation camp and power generation.

"GR Engineering is pleased to be involved in this high profile WA project," GR Engineering managing director Geoff Jones said.

"We look forward to working closely with BCI to deliver high-quality results in alignment with the planned schedule and cost."



Image: BCI Minerals.

Salt naturally forming on Mardie mudflats.

BCI managing director Alwyn Vorster said the company hoped to be in a position to make a final investment decision by the first quarter of 2020.

"GR Engineering's technical ability and project management strengths will make them a valuable partner to BCI as Mardie is progressed towards full project construction," Mr Vorster said.

BCI was also in funding discussions with the Northern Australia Infrastructure Fund, and advancing briefings with potential investors and offtake partners.

Once developed, the Mardie project was expected to produce up to 4 million tonnes of salt per annum and up to 100,000 tonnes of sulphate of potash (SOP) per annum over a 50-year project life.

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University of Technology Sydney executive director data science Dr Fang Chen, FMG deputy chief executive Julie Shuttleworth, FMG autonomy lead Paul Lucey and City of Karratha mayor Peter Long.

Tech centre planned for Karratha

EMMA DAVIES
WA

A NEW research and development centre will be based in Karratha, WA, that will explore opportunities for autonomous mobility technology in an urban environment.

Established by Fortescue Metals Group (FMG), the Fortescue Future of Mobility Centre would leverage the company's success in using autonomous technology across its operations.

FMG chief executive Elizabeth Gaines said that innovation and emerging technologies, like autonomy, presented an opportunity to work closely with the community to bring about mutual benefits.

"We are at the forefront of this technology with our mine operations set to become the first in the world to be fully autonomous and our fleet having safely travelled over 26 million kilometres since the first autonomous truck was introduced in 2012," Ms Gaines said.

"The emergence of autonomy is one aspect in which our world is changing rapidly, and we intend to be part of the opportunities that it will represent for the mining industry, local communities such as Karratha, and beyond.

"By establishing the Fortescue Future of Mobility Centre in Karratha we will have the ability to develop, test and trial this technology, further contributing to Western Australia's position as a world leading autonomous hub."

The centre would work in partnership with technology and research partners such as the University of Technology Sydney as and the City of Karratha.

"I am delighted that of all the potential locations around Australia, Fortescue has selected Karratha as its base to develop this exciting and innovative new technology," Karratha mayor Peter Long said.

The centre would explore all facets of the future of mobility including software, hardware and various forms of mobility solutions such as autonomous light vehicles.

CSIRO launches robotics hub



Image: CSIRO.
Photography: Navinda Kottege

The robotics industry was expected to be worth \$23 billion globally by 2025.

ELIZABETH FABRI
QLD

CSIRO's digital innovation arm, Data61, has opened a robotics research centre in QLD that aims to develop autonomous robotics systems that can be deployed in industries such as mining.

The 600sqm workshop housed the largest motion capture system in the Southern Hemisphere, which could be used to validate data collected by robotics systems; a 13x5m pool for testing aquatic robots; field deployable UAVs and UGVs; legged robots; high accuracy robot manipulators; and sensors and telemetry systems.

Data61 chief executive Adrian Turner said the centre was "a national asset that combines internationally recognised

robotics and machine learning research with deep domain expertise from CSIRO.

"Robotics and autonomous systems technologies, underpinned by machine learning and artificial intelligence, will unlock new value in all manner of sectors including manufacturing, agriculture, healthcare and mining," Mr Turner said.

"By creating a cohesive approach to robotics R&D through closer collaboration, supported by world-class facilities like the Robotics Innovation Centre, we can ensure Australia is well placed to benefit from Industry 4.0 and help to protect and accelerate our nation's ongoing economic success."

Data61 Robotics and Autonomous Systems group leader Fred Pauling said the centre would expand its research infrastructure and enable national

and internationally recognised robotics and machine-learning researchers to collaborate.

"Our robots are already being used to safely inspect and create 3D maps of underground mines, monitor biodiversity in the Amazon Rainforest and navigate difficult terrain in emergency situations," Mr Pauling said.

The Robotics and Autonomous Systems group invited interested parties to utilise the infrastructure, which included dedicated mechanical and electronics engineering laboratories, several high-end rap prototyping machines, large sheds for indoor system testing, an open-air UAV flying area and outdoor testing areas such as a forest and a creek.

Research to advance cave mining

EMMA DAVIES
NATIONAL

THE University of Queensland's Sustainable Minerals Institute (SMI) and research organisation Mining3 have joined forces with four mining companies to form industry consortium Cave Mining 2040.

The initiative between SMI and Mining3 aimed to build cave mining expertise, and included participation from Newcrest Mining, Vale, OZ Minerals, BHP and PT Merdeka Copper Gold.

As part of the international consortium, the miners would work on projects to develop new and improved cave mining methods to meet future demands for minerals.

The group would also create solutions that could reduce lead times and capital investment, while simultaneously improve viability, safety, cost, production, and societal and environmental acceptance.

"We are working collaboratively with industry to unlock complex orebodies that occur at depth and require advancements in cave mining technologies," SMI director Neville Plint said.

Mining3 chief executive Paul Lever said he was looking forward to seeing what improvements could be made to cave mining from the collaboration between academia and industry.



Left to right: Professor Neville Plint, Professor Gideon Chitombo, SMI Advisory Board chair Charlie Sartain and Professor Paul Lever.

"Involving researchers, industry and government will accelerate the required innovations and information to transform cave mining, ensuring its longevity through viable and sustainable methods," Mr Lever said.

The first phase of Cave Mining 2040 — Horizon 1 — was underway and would comprise eight research areas; total

deposit knowledge, cave engineering, cave establishment, mine design for new and emerging technologies, high stresses and major seismicity, macro-block design and sequencing optimisation, sublevel caving and open automation platform.

The consortium invited interested parties to contact SMI to get involved.

Mine Timber Technology

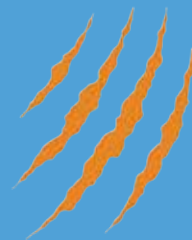
SPECIALISTS IN UNDERGROUND MINE TIMBER ROOF SUPPORTS

The CribLoc is an enhanced version of the system used for some time in the industry and features sustainably managed long-term government and private forest sourced, timber that is processed and graded to Australian standards for consistent quality, and precisely sized components which provide a structure that provides a secure fit and a structure that is solid, stable and easy to assemble.

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IN BRIEF

Kalium scores
German offtake

GERMANY

SULPHATE of Potash producer Kalium Lakes has announced a 10-year offtake agreement for its Beyondie project in WA.

The agreement with German fertiliser producer and distributor K+S was worth \$650 million, and included the purchase of up to 90,000 tonnes of SOP per annum.

Kalium Lakes managing director Brett Hazelden said Kalium Lake aimed to be the first commercial SOP production facility in Australia, supplying both Australian and overseas farmers.

"K+S offers unparalleled access to extensive expertise in design, construction and operation of SOP facilities, which will assist Kalium Lakes during the critical commissioning and production ramp up phase of the project," Mr Hazelden said.

White Rock and
Sandfire join
forces

US

WHITE Rock Minerals has teamed up with Sandfire Resources to fund the exploration and development of new high-grade zinc and precious metals volcanogenic massive sulphide deposits at Red Mountain in central Alaska.

Sandfire could earn up to 51 per cent of White Rock's interest in the project by spending \$20 million on exploration over four years.

A minimum of \$6 million was required to be spent on the project in 2019 and Sandfire could elect to increase its interest to 70 per cent by sole-funding a further \$10 million and by delivering a pre-feasibility study with an ore reserve within an additional two years.

Golden Rim
acquires
additional permits

BURKINA FASO

GOLD developer Golden Rim Resources has announced its aim to acquire two exploration permits along the border of its 100 per cent owned Kouri gold project in West Africa.

The Goueli and Margou permits have the potential to increase Kouri's current 1.4 million ounce gold mineral resource and once finalised, Golden Rim managing director Craig Mackay said the company would hit the ground running.

"We are excited about moving towards completion of the acquisition as the Goueli and Margou permits will provide a further 24km of highly gold prospective shear zone for us to explore for additional gold resources," Mr Mackay said.

Barrick agrees to JV deal

ELIZABETH FABRI
US

AFTER making an unsolicited takeover bid for rival Newmont Mining in February, Barrick Gold has decided to withdraw its offer and AGM proposal and form a joint venture over Newmont's Nevada assets.

On 11 March, both companies inked a binding JV agreement, which would see Barrick own 61.5 per cent of the Nevada gold operations, leaving Newmont with a 38.5 per cent stake.

Newmont and Barrick had operated independently in Nevada for decades, but had never agreed to terms for cooperation.

Barrick said a joint venture would enable the entities to unlock an estimated \$500 million in annual pre-tax synergies; an estimated \$5 billion pre-tax net value over a 20-year period.

"We are finally taking down the fences to operate Nevada as a single entity in order to deliver full value to both sets of shareholders as well as to all our stakeholders in the State, by securing the long-term future of gold mining in Nevada," Barrick president Mark Bristow said.

"It also puts us in a position to invest more capital in our collective mines and projects, complete more focussed exploration with an unconstrained district-wide approach, and ultimately ensure that the full potential of Nevada's unequalled mineral endowment can be realised for all stakeholders.

"Barrick will be the operator of the joint venture and will be advised by a technical committee and exploration committee with equal representation – experienced Newmont and Barrick personnel."



Gary Goldberg (left) and Mark Bristow (right) signing the JV agreement in March.

Newmont chief executive Gary Goldberg said Newmont had been operating in Nevada since 1965, and Barrick since 1986.

"During that time our teams have been good neighbours, helped each other out during emergencies, and more recently worked together to make our joint venture, Turquoise Ridge, a success," Mr Goldberg said.

"After more than two decades of looking at opportunities for further cooperation, we've reached an historic agreement to harness the power of both companies' assets here in Nevada to create an even more efficient business in one of the richest

gold districts in the world."

The JV assets included Barrick's Goldstrike, Cortez, Turquoise Ridge, Goldrush and South Arturo mines, as well as Newmont's Carlin, Twin Creeks, Phoenix, Long Canyon, Lone Tree mines and associated infrastructure.

"We will create the world's largest gold mining complex and the third largest gold company here with world-class orebodies and processing facilities in one of the most favourable mining jurisdictions," Mr Goldberg said.

The JV agreement was subject to regulatory approval, which was expected to be completed in coming months.

Newcrest gains majority stake in Red Chris

ELIZABETH FABRI
CANADA

NEWCREST Mining has agreed to purchase a 70 per cent joint venture interest in Imperial Metals' Red Chris mine in Canada for \$US806.5 million.

The Red Chris project is an operational open-pit mine with a mineral resource of 20 million ounces of gold, and 13 billion pounds of copper in the prospective 'Golden Triangle' of British Columbia, Canada.

Newcrest said the acquisition of the mine was "a measured entry into North America" and aligned with its values of building a portfolio of tier 1 orebodies.

"We are delighted to add this asset into the Newcrest portfolio," Newcrest managing director and chief executive Sandeep Biswas said.

"The geology of Red Chris is similar to our Cadia orebodies in Australia and we will be applying our considerable experience in exploration, open pit mining, caving and processing to maximise the value of Red Chris and the opportunities in the surrounding region.

"We look at this opportunity in the same way as we do with Cadia, where we have proven we can create significant value from deep underground porphyry orebodies.

"We are pleased to be establishing a joint venture with Imperial and look forward to building a collaborative relationship with the Tahltan Nation and the Government of British Columbia."



The Red Chris project in Canada.

The company said it had a two-stage plan to unlock value from the project; applying a transformation approach to the open pit and processing plant, including debottlenecking the plant, improving concentrate quality, mine optimisation and supply chain cost reduction; and applying new technologies it had successfully deployed at other operations.

Technologies included block caving whereby necessary drilling and studies would be completed; coarse ore flotation; mass sensing and sorting; and deep underground brownfield and greenfields exploration.

The Red Chris property spanned 23,142 hectares, and comprised 77 mineral tenures of which five included mining leases.

Canadian company Imperial Metals president Brian Kynoch said selling a 70 per cent interest in the project to Newcrest, would enable it to strengthen its balance sheet and further develop the resource.

"We believe that this joint venture partnership will enable Imperial to unlock significant value at Red Chris by leveraging Newcrest's unique technical expertise in block caving operations," Mr Kynoch said.

"With a stronger financial position and highly actionable path to exploiting the underground mining potential of Red Chris, Imperial will be in a much stronger position to create value and opportunities."

The sale was expected to be finalised by August 2019.



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THE LONG HAUL

Increased supply in the Democratic Republic of Congo (DRC) has seen cobalt prices nosedive in recent months. But analysts remain optimistic for the commodity's long-term fundamentals.

Image: Glencore.

ELIZABETH FABRI

THE Democratic Republic of Congo is currently the world's largest supplier of cobalt, producing more than 90,000t of the metal per annum, which is essential to EV battery production.

In early 2018, cobalt was one of the best performing commodities, tripling its value and tipping over the \$US90,000 per tonne mark in April.

However, the sky-high prices were short lived, beginning a downward trend mid-2018 to current lows of \$US29,000/t.

Darton Commodities director Andries Gerbens, an industry authority in cobalt market research and analysis, said while the market correction in prices was to be expected, the downturn was a lot steeper than industry predicted.

"In Q1 2018 it became clear that prices had probably overshot on the upside, driven by speculative (fund) purchases and future demand expectations, rather than actual EV related consumption growth," Mr Gerbens said.

"A price correction was therefore inevitable and the downturn that commenced Q2 2018 was therefore anticipated by most.

"However, I don't think anyone in the industry had foreseen the depth and duration of the correction that followed (cobalt has lost close to 70 per cent of its value since it peaked in April 2018)."

He said the primary drivers behind the downturn had been rising prices in 2017/2018, which led to strong supply responses in mined and refined production; higher cobalt prices which led to a rise in the availability of scraps, impacting demand for primary materials; and mined production in the DRC had increased some 20 per cent in 2018, partly driven by higher artisanal mining activity.

Glencore – which operates the Mutanda and Katanga mines in DRC – had a

Image: Darton Commodities.



"Cobalt has lost close to 70 per cent of its value since it peaked in April 2018."

Darton Commodities director Andries Gerbens.

significant increase in output during 2018 as a result of the restart of its Katanga operations.

But, the miner faced some hurdles come November when it was forced to suspend sales at Katanga after low levels of uranium were found in the cobalt produced.

The discovery meant Katanga could no longer export cobalt from the country, since the level of uranium "exceeded the acceptable limit allowed for export of the product through main African ports to customers".

In a recent release, Glencore's Katanga said cobalt hydroxide exports remained suspended, and it was working with its partner Gécamines on a long-term technical solution in the form of constructing an ion exchange plant.

All going well, the ion exchange plant was expected to begin commissioning in Q4 2019 if approved by the Government.

Glencore's troubles didn't end there either. In February, news circled that the miner

would be cutting expatriate jobs to lower costs at its Mutanda mine, which was the largest cobalt project in the world.

Meanwhile, mining royalties in the DRC had also seen a significant increase from 2 per cent to up to 10 per cent following the Government's decision in November to declare cobalt a "strategic" substance.

Mr Gerbens said the decision to increase the royalty was "having a significant impact on the cost structure of the industry and is becoming a major issue for miners at these lower price levels".

"It inevitably deters new investment in the sector," Mr Gerbens said.

He said given 72 per cent of mined cobalt production originated from the DRC, this was a distinct and significant challenge in itself.

In 2018, cobalt output in the DRC was 98,300t; up 21 per cent from the 81,500t recorded in 2017; artisanal mining accounted for between 15,000 and 17,000t.

However, artisanal mining was not without its issues – often linked to child labour, creating a cloud of uncertainty over the responsible and ethical sourcing of cobalt.

Darton Commodities estimated there were 120,000 diggers, sorters and washers working in artisanal mines around Kolwezi, who used basic hand tools to extract cobalt rocks (heterogenite) from hand dug underground pits and tunnels.

Another perceived roadblock was on the demand front, with various research projects underway examining cobalt battery alternatives or ways to reduce the amount of cobalt used in batteries; global science and chemicals company, Johnson Matthey, was one example.

Mr Gerbens assured this was no threat, and said the developments were already incorporated into the demand estimates.

"Some of the battery cathode chemistries used today already contain significantly less cobalt," Mr Gerbens said.

"We are seeing an industry wide switch from 111 (20-21 per cent cobalt) to 622/523 (12-13 per cent cobalt) and ultimately to an 811 chemistry (6-7 per cent cobalt), although the latter still seems to be four to five years away from commercialisation.

"Considering that even the lower cobalt chemistries still require a minimum percentage of cobalt content and given the sheer growth in EV battery volumes means that demand projections from the battery sector are still enormous."

With this in mind, there were a number of new sources of cobalt at various stages of development, including Australian Mines' flagship Sconi project in north QLD; Cobalt Blue's Thackaringa project in NSW; Artemis Resources' Carlow Castle in WA; Clean TeQ's Sunrise project in NSW; Aus Tin Mining's Mt Cobalt project in QLD; and Collierina Cobalt's namesake project in NSW.

"There is a long list of potential cobalt projects in Australia, however we only see a small number of them actually moving towards the production stage in the foreseeable future," Mr Gerbens said.

"When these are commissioned (2021 and/or beyond) we do expect the market to be in better shape than it is today on the basis that demand growth is likely to start outpacing actual supply growth."

Mr Gerbens added he was "optimistic for cobalt in the longer term".

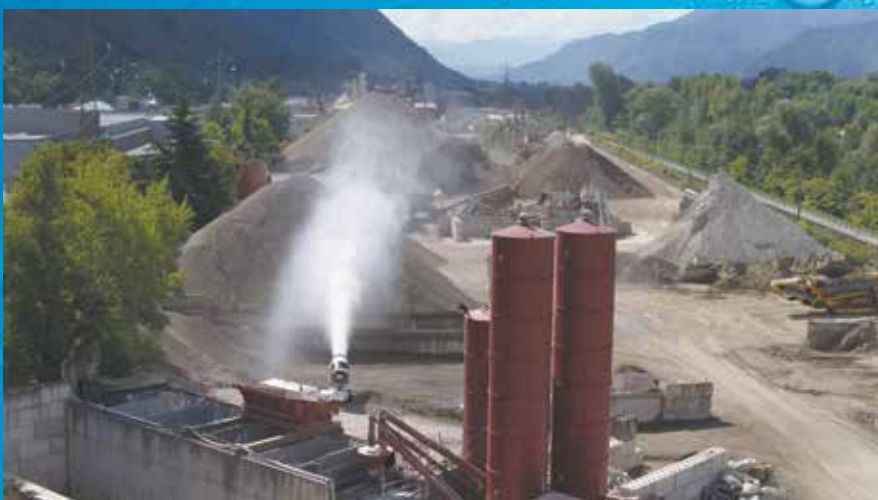
"Our estimates suggest that the market may be in surplus until 2021, after which it is likely to shift into deficit territory from 2022 onwards," he said.

"The forecasted surpluses for the 2020-2021 period are to some extent hypothetical as actual supplies are likely to be more aligned with real demand.

"Furthermore, a significant share of the surplus tonnages is likely to be pre-emptively booked by automakers who, in anticipation of longer-term deficits, are looking to take advantage of short-term market weakness."

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SPECIAL FEATURES

MINING IN SOUTH AUSTRALIA

OZ Minerals' Carrapateena copper mine site.
Image: OZ Minerals.

ON THE RISE

South Australia's mining industry is seeing a renaissance with numerous new projects and the completion of several major developments.

EMMA DAVIES

WITH more than \$1 billion committed to the development of mining and associated infrastructure across South Australia, the mining industry is continuing to be an important economic contributor.

South Australia Mineral Resources and Energy minister Dan van Holst Pellekaan said that mining was one of the key pillars of the State's economy.

"The resources sector already supports jobs and business opportunities in this State and increasing the number of mines through exploration and expanding the ability of existing mines to increase production and mine-life will further broaden the critical role the sector plays in the South Australian economy," Mr van Holst Pellekaan said.

"Our State has a strong pipeline of projects building on substantial existing investments in the resources and minerals processing sector."

Olympic Dam

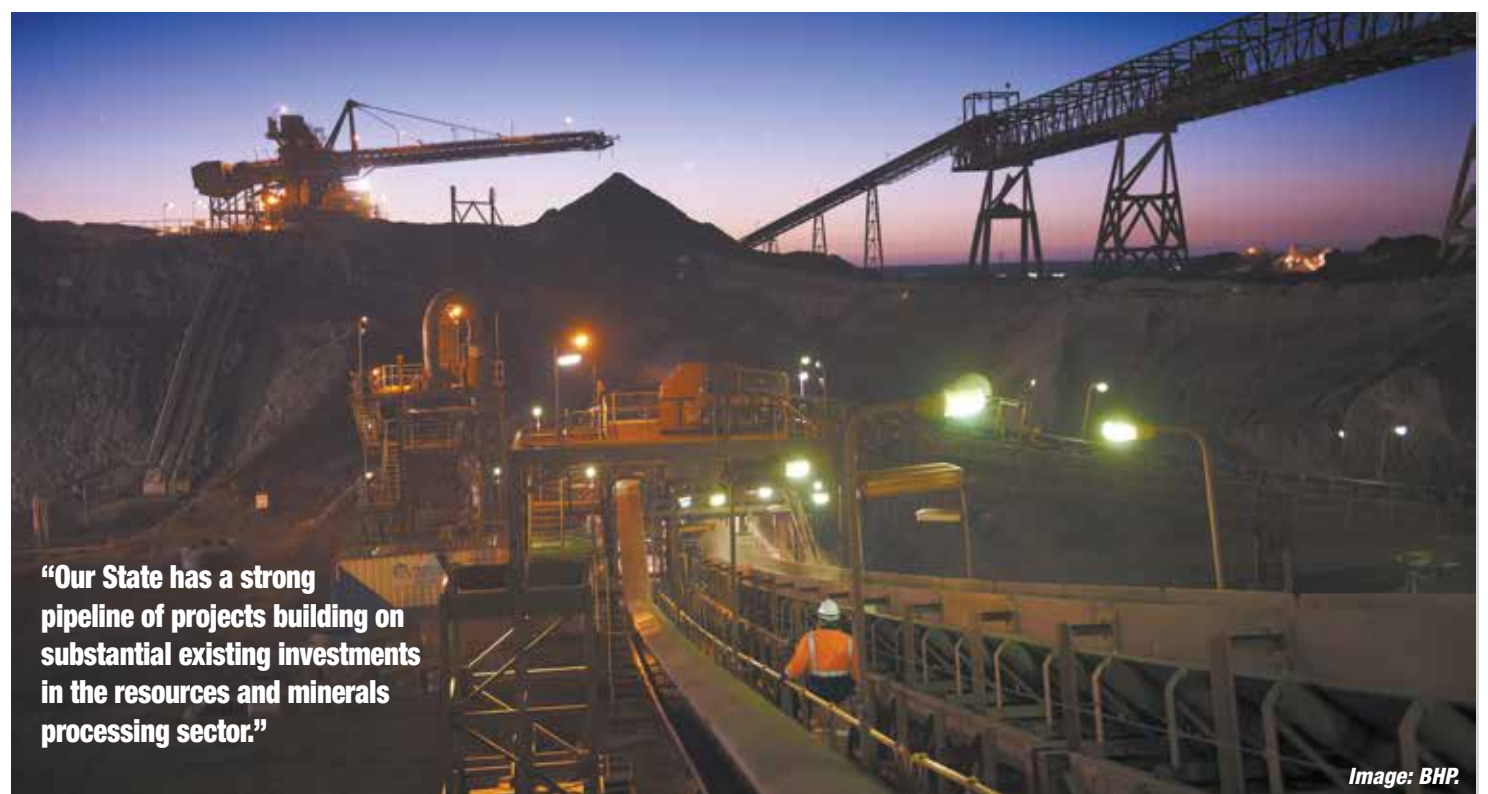
On 14 February the Marshall Liberal Government declared the proposed 75 per cent increase in annual copper production at Olympic Dam a major development proposal.

The \$3 billion proposal would increase Olympic Dam's annual copper production from 200,000 tonnes to up to 350,000 tonnes and increase the level of gold, silver and uranium production.

"Declaring BHP's proposed expansion of Olympic Dam a major development is a key milestone in this important project," Mr van Holst Pellekaan said.

"Olympic Dam is already the State's largest mining operation, providing jobs, investment and royalties for South Australia.

"BHP's proposal could potentially create up



"Our State has a strong pipeline of projects building on substantial existing investments in the resources and minerals processing sector."

BHP's Olympic Dam mine at dusk.

to 1800 construction jobs with an additional 600 ongoing positions in operational roles.

BHP welcomed the Government's decision as an important step towards lifting its Australian copper production.

"Olympic Dam is a world-class resource with the potential to deliver value to BHP and South Australia for many decades to come, especially given our positive outlook for global copper demand," Olympic Dam asset president Laura Tyler said.

"We are pleased the South Australian Government has declared Olympic Dam's growth plans a major development, recognising our significance to the State.

"Our team continues to refine the scope for targeted underground development in the

Southern Mine Area, strategic investment surface processing facilities, new technology and supporting infrastructure."

BHP continues to progress growth studies for Olympic Dam as it works towards seeking board approval for a capital project in mid-to-late 2020.

Carrapateena

OZ Minerals' Carrapateena copper mine was also almost ready to enter production.

"We have a target of tripling SA's copper production by 2030 and Carrapateena together with BHP's Olympic Dam, OZ Minerals' Prominent Hill and Hillgrove Resources' Kanmantoo mines are vital to

achieving that objective," Mr van Holst Pellekaan said.

"Carrapateena is yet another example of just how prospective South Australia is. The mine is also providing opportunities for businesses in the region, indigenous communities and is part of a growing confidence in the future for the Upper Spencer Gulf.

"The current project is expected to generate 65,000 tonnes of copper a year and 67,000 ounces of gold during a 20-year mine life, processing 4.25 million tonnes of ore a year and generating an average annual cash follow of \$265 million."

(CONTINUED ON PAGE 22)

Leading supplier of valves and piping systems

NATIONAL

SINCE 2003, FC Mechanical and Mining Services has supplied high-quality valves and piping systems to the mining and fire protection industries in South Australia and the Northern Territory.

The company is a subsidiary of family owned business Firecorp; a one-stop-shop for all facets of fire protection.

Featuring the right knowledge and expertise, FC Mechanical and Mining Services has established a wide range of mining related products from some of the best manufacturers and importers in Australia.

Its partners and suppliers included big brand names such as Victaulic, BFI, Presto, Viking, Promat, Emerson, Ridgid, Wolf and Bermad, which were associated with providing high-quality valves, piping systems, and fire protection products.

Each product, such as the new range of Victaulic “Refuse to Fuse” HDPE couplings, included advanced testing and carried all relevant Australian Standard approvals, technical data and manufacture support.

Fully stocked warehouses centrally located in Adelaide and Darwin contained more than 5000 products, which could be delivered to any location within Australia.

“The Refuse to Fuse product joins HDPE pipe and fittings together in a 10th of the time compared to the standard welding and fuse systems,” FC Mechanical and Mining Services managing director Jerry Tanner said.



FC Mechanical and Mining Services have offices in South Australia and the Northern Territory.

“The flexibility this product now brings to installing HDPE pipe and fittings is remarkable.”

FC Mechanical and Mining Services stock a complete range of valves, RG couplings, and pipe-fittings, cabinets,

hanging equipment, risers, adaptors and pipes.

It also supplied pipe fire rating and pipe fire penetration sealing material and collars.

Other services included high-quality

stainless steel and mild steel pipe fabrication.

A 24-hour call in service was also available as well as professional local advice and tailored customer services to suit individual business needs.

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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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(CONTINUED FROM PAGE 20)

On 6 March OZ Minerals reported a scoping study on the Carrapateena block cave expansion, which showed that converting the lower portion of the Carrapateena sub level cave to a block cave would optimise value and further unlock the Carrapateena life of province plan.

OZ Minerals chief executive Andrew Cole said annual throughput would increase from 4.25mtpa to between 10mtpa and 12mtpa from 2026.

“A block cave expansion of the lower portion of the current Carrapateena sub level cave has the potential to increase average life of mine copper production from 65,000 tonnes per annum to about 105,000 – 125,000 tonnes per annum and reduce life of mine all-in sustaining costs to about US 90 – 95 c/lb,” Mr Cole said.

“Transitioning from a Carrapateena sub level cave to the block cave expansion would allow us to extract the higher-grade ore at the top of the orebody via the sub level cave (mining from the top down) and the higher-grade material from the bottom of the resource via the block cave (mining from the bottom up), and prioritise these over the lower-grade central section.”

Mr Cole said the Carrapateena block cave expansion pre-feasibility study was expected to be completed by mid-2020 with first production from Carrapateena on track for Q4 2019.

Whyalla Steelworks

GFG Alliance was pouring millions into new iron ore, steel and renewable operations, signing contacts in December 2018 worth more than \$600m; with Danieli for a new, world-leading, state-of-the-art rail and structural heavy section mill, and CISDI Engineering, for a Pulverised Coal Injection



Port Augusta in the Spencer Gulf of South Australia.

(PCI) plant.

GFG Alliance executive chairman Sanjeev Gupta said the contracts would play a key role in securing Whyalla's long term future producing 1.8 million tonnes of high-quality, high-end steel per year.

“This transformation will vastly improve the operational, financial and environmental performance of the operations, paving the way for Whyalla to become an enticing, global hub for innovative industry,” Mr Gupta said.

Mr van Holst Pellekaan said GFG's investment in the Whyalla steelworks, the regions mines and its plans for renewable energy had delivered a massive boost in confidence in the Upper Spencer Gulf.

“GFG Alliance currently produces magnetite for the Whyalla steelworks and exports haematite. Its acquisition of the former Centrex iron ore assets on the Eyre Peninsula and its due diligence with Havilah Resources re its iron ore resources highlight the opportunities that exist in the region,” he said.

The Marshall Government was working through the Steel Task Force to understand and facilitate GFG Alliance's ambitions for Whyalla, and supported the take-up of

renewable technologies through a power purchase agreement with SIMEC Zen Energy.

In addition, GFG Alliances' SIMEC Mining had also extended due diligence at Havilah Resources' Maldorky and Grants iron ore projects.

“SIMEC Mining's decision to extend its exclusivity is a positive development for the potential commercialisation of Havilah's iron ore projects,” Havilah chief executive Walter Richards said.

“We are encouraged by the recently completed diamond drill hole into the Grants Basin which intersected 486 metres at 24 per cent iron.”

Port Augusta

CU-River Mining was in the process of transforming the former Port Augusta power station in the Spencer Gulf with the proposed the \$250 million port facility capable of handling iron ore, grain and other commodities.

It was expected that the facility would have an initial capacity of up to 15mtpa with a multi-stage development allowing future

export potential in excess of 50 mtpa.

More than 150 people would be employed during construction and up to 100 permanent positions created once the facility was operational.

CU-River external affairs manager Shelaye Boothey said the retention of key infrastructure at the site, including a 5km rail loop and unloading systems, made the site an attractive proposition for CU-River.

“The purchase of the site is a significant, strategic decision that allows CU-River to secure a direct export pathway for the 15 million tonnes of high-grade iron ore magnetite it plans to mine each year from 2026,” Ms Boothey said.

“However, it is our intention to develop the port as a multi-user facility, providing Spencer Gulf and far-north industry with further export opportunities.”

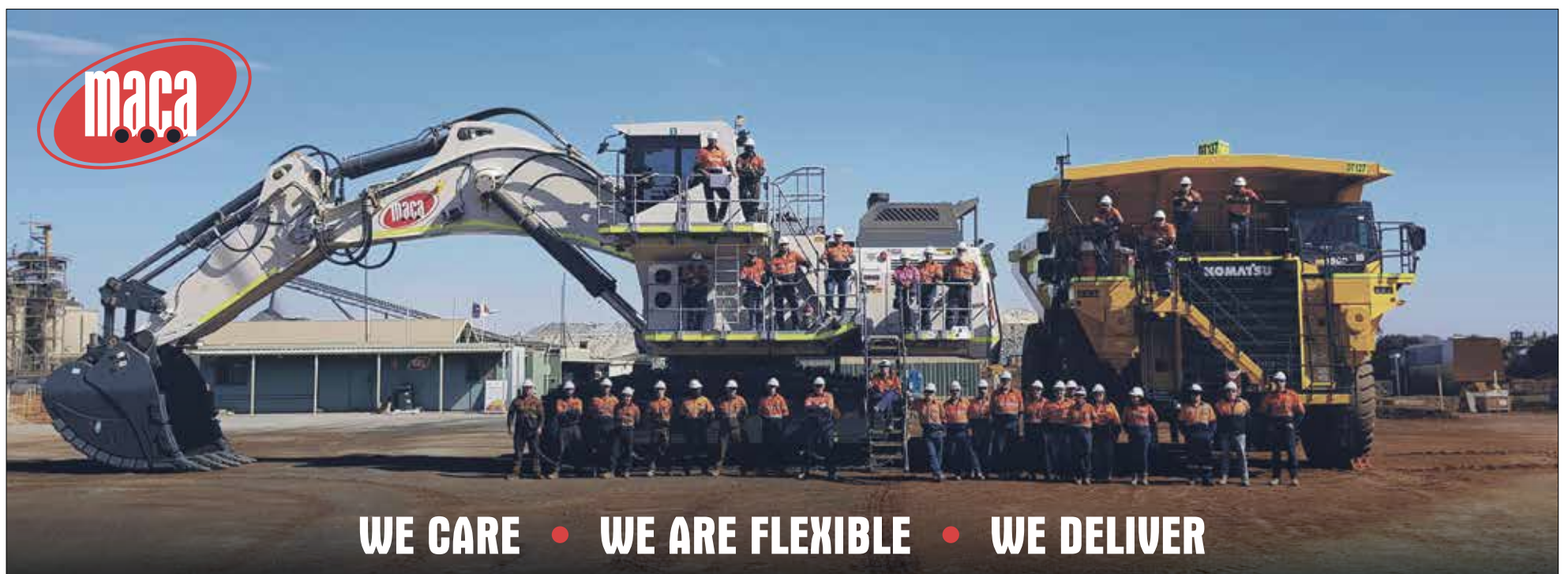
Since the power station ceased generation in May 2016, Flinders Power had been responsible for the decommissioning and demolition of the power station and rehabilitation of the site with sale of the site expected to be finalised in early April 2019, once remediation was complete.

“We are focussed on a successful transition to a new and exciting future for this significant infrastructure site,” Flinders Power chief executive Peter Georgaris said.

“I believe the transition of the site into a port facility is an outstanding opportunity for Port Augusta and the region.”

Mr van Holst Pellekaan was delighted that CU River and Flinders Power Partnership had been able to reach an agreement on a sale that offered jobs and investment for Port Augusta.

“CU River's proposal would re-establish Port Augusta as an international transport hub, using advances in ‘trans-shipping’ to access deeper water in the Upper Spencer Gulf to ship commodities such as iron ore,” he said.



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The way we do things is underpinned by our **CAN DO** spirit.



Image: New Hope Group.

STAYING POWER

Demand for coal fired power is expected to increase in the coming decades, both at home and abroad. Emma Davies spoke with New Hope Group managing director Shane Stephan about its Bengalla mine, flow on effects of Stage 3 at New Acland and his outlook for coal exports to Asia.

Q. What steps did you take to achieve a 5 per cent increase in production in FY18 to 9 million tonnes?

It was really due to a 10 per cent increase in the production out of Bengalla in NSW.

Multiple things drove the production improvements from Bengalla; investments were made in 2016 in improving pit room which enabled great throughputs to be achieved; also a new large excavator was put into the fleet in FY18.

While the increase is only moderate at 5 per cent to 9 million tonnes we will progressively increase that production significantly over the next couple of years and we will move to 80 per cent [ownership] of Bengalla before the start of April.

The transaction has already been agreed with Mitsui for its 10 per cent interest so we expect that will stabilise the ownership structure of Bengalla and we will progressively take a much more active role in the management of Bengalla than what we have done in the past.

Q. What did you see in Bengalla that made you decide to increase your stake?

We are believers in high-quality thermal coal demand out of Asian markets, and we believe that that demand will continue for many decades to come.

Bengalla is a long life asset, it's fully approved through to 2039 and it is a high-quality asset which is the key attraction to us.

We purchased our original 40 per cent off Rio Tinto in 2015, and subsequently Taipower and ourselves have purchased Wesfarmers interest in the joint venture - so we have been a willing acquirer for willing sellers.

Q. What is the expected development timeline of Stage 3 at New Acland?

We're working towards achieving the

Stage 3 mining lease grant for New Acland and recently achieved our environmental authority which is a good step forward. There's a number of quite stringent environmental conditions attached to that authority but we are certainly happy to progress through that step.

Then there are three remaining steps. Firstly, there's a court of appeal decision to be granted. Our opponents appealed against the results of a Supreme Court case and so we've had a hearing in the court of appeal (which is the highest court in the State of QLD) and we're awaiting the results of their appeal.

Secondly, we need what's called an associated water license (AWL). We've had an application in to the Department of Natural Resources and Mines for a long period of time and the next step is the AWL will go to public consultation - and we believe that will be the critical item to us achieving the approvals.

Finally the key approval we need next is the mining lease from the QLD Department of Natural Resources and Mines.

We need those approvals around the middle of this calendar year otherwise we face a gap in production between the end of the Stage 2 mining lease and the start of Stage 3.

If we're not able to achieve an orderly transition between the stages, jobs will be lost and our customers will not be able to be supplied.

It's very important that people are aware that we don't just support the export market, we have more than 25 small domestic customers with a large number of those in the meat processing industry.

In the meat processing industry they need to produce steam to sanitise the workplaces every 24 hours and to do that they need coal.

If they have to use gas it's more than three times more expensive and we're the best local supplier of coal to those customers.

That industry is actually the largest manufacturing industry in QLD; it employs more than 6000 people and a lot of people

aren't aware of that fact.

If we can't have an orderly transition from Stage 2 to Stage 3, there are potential flow on effects.

Q. What activities are progressing this year?

We've actually had some exploration done in and around Acland to see if we can chase down every scrap of coal that is available within the Stage 2 mining lease area.

We've also been actively exploring our four projects in and around Glencore's Wandoan project where we have a billion tonnes open cut resource.

Our strategy is to drill those projects up so we can bring that resource into a measured and indicated JORC standard progressively over time.

We believe that when you look at the supply of thermal coal out of Australia, unless new supply is brought on, there will be a deficit in the mid-2020s - which is when our resources could potentially be available.

Over the last 12 months we've also done a fair amount of exploration work at Burton, which is right next door to the New Lenton project, and has its own mining lease already, so we're looking to ultimately progress it into production.

Q. What does 2019 look like for New Hope?

Our focus is on Stage 3 approvals for Acland, and on integration and optimisation activities with Bengalla.

Bengalla has an excellent management team, and for us it's about aligning business systems to get the best approach between our existing operations and the operations at Bengalla.

Access to port capacity for the Burton-Lenton project is also essential this calendar year because that's the key enabler to us moving forward with Burton.

At Jeebropilly, our aim is to finish well. The end of the life of a mine can be a difficult time for the workforce and sometimes, unfortunately, that reflects on safety and performance.

We are very focussed on finishing well, which means finishing with a positive workforce. We also want to make sure that we leave behind a well rehabilitated site that actually has an economic future going forward.

Q. Where do you see New Hope positioned in the next five to 10 years?

I see us managing close to 17-18 million tonnes of production, which will come from Bengalla, New Acland Stage 3 and Burton-Lenton - which is not just thermal coal but also metallurgical coal.

We are fundamentally a coal producer and exporter in Asian markets and a growing organisation. We've been growing and we will continue to grow because the opportunities are there - and we believe the market is there.

We are believers of the long term future of thermal coal in Asia because the building of ultra-super critical, latest generation technology, and thermal coal power stations are multibillion dollar investment decisions by our customers - and they are 40-year investment decisions which gives us the confidence to invest to be able to supply those power stations.

Q. Is there anything else you would like to add?

We're exporters and generators of thermal coal and with some of the media commentary one would think that we're producing a toxic product - we're not - we're producing a product that is in great demand both domestically and in Asia.

We supply the energy that provides electricity to millions of people and I think people need to understand that that's actually for a great social good.



Thermography gives mine operators the ability to diagnose a multitude of problems; from a crack in a conveyor roller to the heat escaping from a poorly insulated pipe. In recent years the price of the technology has plummeted causing the industry to explode, but it hasn't come without growing pains along the way.

A thermal imaging camera detecting the heat radiation from the hydraulic arms of a loader.

Image: Infrared Inspections and Technology.

GERARD MCARTNEY

OVER the last 30 years, thermography, or thermal imaging, has become a regular part of the maintenance, predictive diagnosis and condition monitoring on most mine sites around the world.

Thermal imaging technology could detect problems invisible to the naked eye, and therefore would be able to save time, money, and create a safer environment for workers by ensuring mine equipment is not jeopardised by faulty components.

A lot has changed since the 1990s, when a thermal imaging camera would cost in excess of \$250,000.

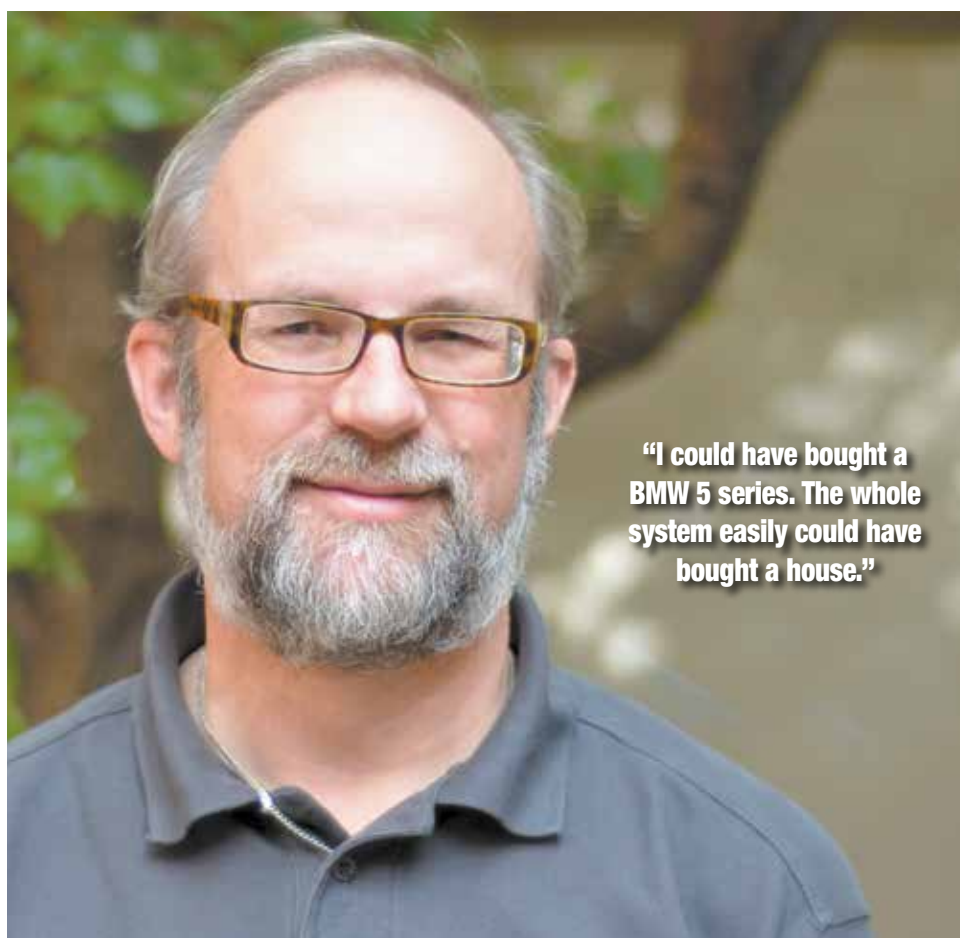
Today, a powerful camera could cost as little as \$10,000 and perform all the functions and operations required of thermography on a mine site.

With a research grant from the Australian Government, Dr Alan Smith started his research in 1990 when thermography was in its infancy in Australia.

For the lens alone, "I could have bought a BMW 5 series. The whole system easily could have bought a house," Dr Smith said.

The prohibitive price of the equipment kept it on the fringes for many years, but it also led Dr Smith and a team of four others to explore the functions and capabilities of the technology that would later be adopted by Ansett, which Dr Smith helped train.

"As with anything in aviation, they needed certification but there was nothing



Dr Alan Smith.

"I could have bought a BMW 5 series. The whole system easily could have bought a house."

Image: University of Melbourne.

around, so we developed the course for them," Dr Smith said.

"22 years ago, we set up thermography training, and it was straight out of industry need."

Since then, the price and size of the cameras had decreased significantly, with

a very capable piece of equipment now costing about \$10,000, and having an attached monitor that could give real time readings.

The technology has improved to allow the lower end cameras to provide fantastic resolution and benefits to those operating

them on a mine site.

Today, thermography is used on mine sites all over the world to diagnose heat spots on truck tyres, faulty or rusted bearings on large conveyors, defective or broken hydraulic rams, faulty pins in railway tracks and a multitude of other applications that have potentially avoided safety hazards, cut labour costs, saved down time on machine inspection and pre-empted costly repairs.

But the simultaneously shrinking cost of the cameras, and advancements in technology that made it readily available and made the industry expand has experienced a few hiccups along the way.

Dr Smith said that when complicated variables were involved in the imaging, unqualified operators could make costly and untimely mistakes.

"What we see with the camera is not only the temperature of the thing we're looking at, but all of the other factors involved," Dr Smith said.

"It is a matter of being able to interpret correctly and this [proper interpretation] is, in some ways, the biggest challenge in thermography."

Thermal imaging cameras worked off two inputs, the emissivity and the reflective temperature.

Emissivity indicated how well a surface gives off its own energy or thermal radiation.

Reflective temperature indicated how much heat was coming off the surface, which could be much harder to correct.

(CONTINUED ON PAGE 26)

Leading the way with UAV monitoring

NATIONAL

ACROSS Australia and around the world, utilities own, manage and maintain a vast array of infrastructure.

To prevent faults, service interruptions and significant accidents and damage, assets should be inspected regularly to detect issues as early as possible.

Manually inspecting assets is time-consuming and labour intensive, and could comprise a significant percentage of a utility's operating costs each year.

With a combined total experience of more than 50 years in mining, oil and gas, Altitude Imagery had a team of professionals capable of understanding the specific needs of clients and providing tailored solutions.

Altitude Imagery invested into UAV drone technology that assisted it in areas that previously had been prohibitively expensive and time consuming.

The company could inspect solar farms, tanks, boilers, structures, bridge conditions and all containments with limited access to side walls or roof sections, not only from the outside but also from the inside of the units.

Once inside, the drone relied on a system known as LIDAR that was mounted on top of the unit, and a sonar sensor that provided accurate altitude control.

All outside flying relied on GPS.

The drone featured a front mounted



Altitude Imagery's UAV inspection drone.

Image: Altitude Imagery.

Sony RX100VI 20.3MP (or optional 42MP camera if required) camera on a pitch gimbal that allowed the camera to view straight up and down, and powerful Bright Cree LEDs mounted on the gimbal to light up exactly where the camera was pointed.

While completing any flying contract, Altitude Imagery provided a second remote screen for a live feed client review

to ensure what data is needed is captured.

Altitude provided fully qualified pilots and professional, experienced project personnel that were able to deliver a unique solution.

Unmanned aerial systems have been employed for asset inspection by a growing number of utilities throughout the world.

Using either a high tech commercial drone or a fixed wing unit, Altitude Imagery could also provide for monitoring of dam wall conditions using infrared, pipeline inspections, 3D mapping, environmental applications – including weed mapping, habitat/vegetation communities mapping – erosion monitoring, change over time monitoring and tree/weed identification.

The company had extensive experience in the detection of structure defects, surface coating degradation and hot spot identification on components.

Each area of the business, and each job, whether assessment, I.R condition monitoring, HD photography solar, came with a detailed report.

Using drones for inspection provided a number of substantial improvements over traditional inspection methods, including benefits to safety and data quality.

The company was capable of condition monitoring vessels and tanks, and infrastructure (without labour, scaffolding or EWPs), surface coating degradation and sludge and sediment build up.

“Altitude Imagery is about understanding your specific needs and providing Drone Aerial Services to meet them. Fully qualified pilots and professional experienced project personnel will provide a unique quality solution with HSE and cost our priorities,” managing director Robert Mills said.

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Altitude Imagery is a team of professionals with a combined total of over 50 years' experience in the Oil/Gas, Mining and Construction industries. We can supply a commercial hexacopter drone, or a fixed wing application, and can provide 3D topographic models.



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- Senior welding inspector
- NACE 2 coatings inspector
- Radiographic interpreter
- Certified thermographer



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- Dam wall condition monitoring
- Structure analysis
- Weed mapping
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- Habitat/vegetation communities mapping
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- Post fire or flood damage assessment
- Tree counts
- Changeover time monitoring
- Hand held electrical applications
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(CONTINUED FROM PAGE 24)

When making complex assessments, each pixel would be assigned a temperature and if the numbers were entered incorrectly for the two inputs, the camera would give a false reading.

“A lot of what you see when you’re looking at a camera is not what you’re actually looking at, it is a reflection,” Dr Smith said.

“These reflections can give very misleading images and, unless you’re an expert at interpretation, you can come to some very wrong conclusions.”

Reflecting on the state of the industry, Dr Smith said that the lack of training could be detrimental to the reputation of the technology and to the thermography industry as a whole.

In the past, there were fewer people with access to the technology and, due to the prohibitive price tag of the equipment, those with access would almost always gain certified qualifications and become experts in image interpretation before operating the cameras.

“There were always cowboys in the industry, and that’s what we’re seeing more of – that’s the downside,” Dr Smith said.

“There were always cowboys in the industry, and that’s what we’re seeing more of – that’s the downside. The upside is that it has opened up the market to companies who previously would not have considered the technology.”

“The upside is that it has opened up the market to companies who previously would not have considered the technology.

“Whoever’s looking at the images needs to be properly trained and whoever’s setting it up needs to be properly trained.

“It gives the whole industry a bad name if people misuse it.”

The technology itself – the size of the camera and the resolution of the lenses – would appear to have plateaued over the last 10 years.

As with smart phones and other devices, the quality of the display has actually seen slightly larger units being released, and while the resolution of thermal imaging cameras remain years behind the resolution in a smart phone camera, it does not affect the functionality of the technology in condition monitoring or predictive maintenance.

Dr Smith said that one area where thermography needed innovation and improvement was in the standardisation of the software available to customers.

One of the challenges facing trained thermographers, and the people who train them, is that each camera manufacturer used its own specific software, and each software used a different image format.

Sometimes images could only be viewed on an iOS or Windows operating system, some that could only be viewed on a tablet.

Essentially, this rendered the images ineffective to thermographers who could not share images and manipulate them to give a useful reading.

“Pretty much every manufacturer has their own software, it’s part of the problem. Part of the reason for that occurring is that they often have their own formats for the images themselves.

“You can’t take one manufacturer’s image and view it with another software, and it is incredibly frustrating,” Dr Smith said.



High-quality thermal imaging cameras have never been more affordable.

Automation ready

As mines move towards 100 per cent automation, there were some exciting prospects for the applications of thermography.

The lower cost and small size of the cameras could offer round-the-clock solutions to condition monitoring.

The applications of non-destructive predictive maintenance and condition monitoring were readily available and, with the right software, fully autonomous thermographic operations could see mines fix cameras to expensive equipment and monitor it continually in a non-destructive and non-disruptive way.

One of the biggest concerns with autonomous haul trucks was that the tyres can develop hot spots and blow out, causing major disruptions to the operation.

Thermography was already used to detect these hot spots, but by a hand held camera from a safe distance away.

“What you could do is have a camera

permanently fixed to a position where trucks drive past as part of their routine, and pass those images back to the command station and say ‘yes we need to fix it,’ or ‘no it’s fine to keep driving.’

That way the truck doesn’t have to stop – it could be fully loaded and keep driving while being monitored,” Dr Smith said.

The maintenance and monitoring of long conveyors had used a hand held thermal imaging camera as a worker drives up and down a belt to detect faults in the line.

But this too, with some effort, could be replaced and completely autonomous with the existing technology.

“Conveyors have a pair of rollers every 300mm, the rollers have bearings and if those bearings seize the rollers stop turning and the belt keeps on driving, which generates heat and wears out the rollers,” Dr Smith said.

“Because they’re hollow, the worn out rollers create a knife sharp edge that will tear the belt.

“We could put an infrared camera on

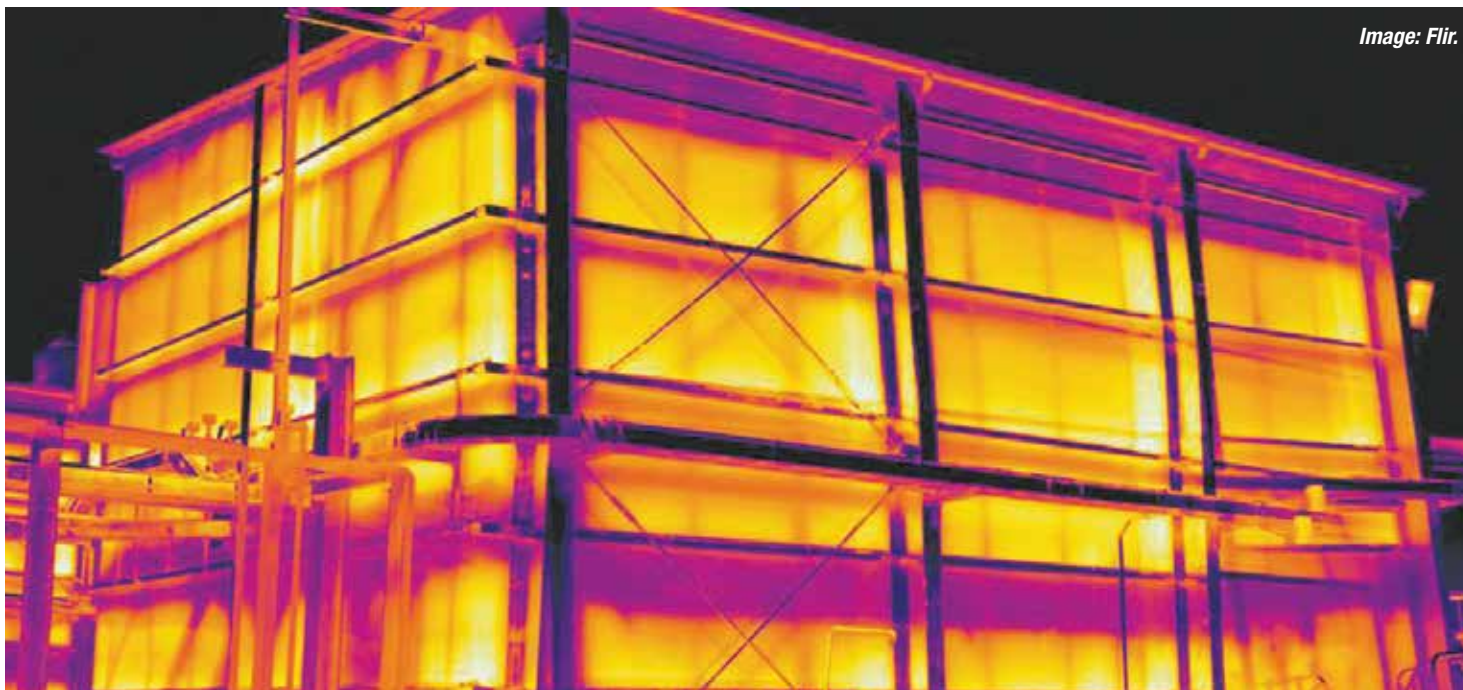
some sort of rail and have it travelling up and down doing the same thing that the cars do, these things can be autonomously done.”

The hydraulic rams used in many machines could potentially have a fixed camera that monitors 24/7 and flags a problem to a technician.

“Compared to what these machines are worth the price of a thermal imaging camera is nothing, and there’s really no reason why you couldn’t build one into each piece of mobile equipment,” Dr Smith said.

One thing rarely considered when discussing the 100 per cent automation of mine sites is what happens when there was no one on site to keep out unwanted guests.

One of the traditional uses for thermography has been night time security, and Dr Smith said that this is another area the cameras could be used in.



FLIR adds new T-series thermal camera

NATIONAL

FLIR's newest edition to its T-series, the T840, offered a high-resolution, brighter display and an integrated viewfinder to help thermography professionals find and diagnose failing components in any conditions.

The T840 featured the same award-winning design of the FLIR T-series platform, but came with an ergonomic body, a vibrant LCD touchscreen and a viewfinder that made thermal imaging in bright conditions much easier.

The 464x348 resolution camera incorporated FLIR's vision processing technology that included MSX image enhancement, Ultra Max and proprietary adaptive filtering algorithms that provided customers with enhanced measurement accuracy, and image clarity with reduced image noise.

The T840 offered an optional six-degree lens that allowed for more accurate temperature measurements on smaller targets at further distances, such as connectors on overhead distribution lines.

The advances in on-camera measurement tools that were unique to the T-series such as the one-touch level/



Image: FLIR.

The T840 is FLIR's newest edition in its award-winning T-series cameras.

span function and the laser assisted autofocus helped users to quickly and easily find problems and make decisions.

Wi-Fi streaming allowed the FLIR

T840 to communicate in real time and offered rapid reporting features for technicians in the field, while the built in GPS automatically tagged image files

with geolocation data that simplified identification and precise documentation.

For more information, please visit www.flir.com.au/T840/.

FLIR T840

High Performance, No Glare

The New FLIR T840 infrared camera is for customers who needs to carry out thermal surveys in bright, sunny conditions.

With a built in viewfinder, thermal surveys are now made easier outdoors and with the addition of the new long-range 6° telephoto lens, the T840 provides a lower cost solution for customers needing to measure and find faults over long distances.

- 180° rotating optical block and vivid 4" capacitive touch screen
- Build in viewfinder
- Up to 161,472 points of non-contact temperature measurement
- Stay flexible and use lenses with intelligent, interchangeable AutoCal™ concept
- FLIR's industry-leading 2-10 warranty

Please visit www.flir.com.au/t840 or call 1300 729 987 for more information



Experience makes the difference

NATIONAL

BEFORE founding Infrared Inspections and Technologies (IIAT), Jeff Erichsen spent six years developing and implementing standards around the inspection of heavy mobile equipment with high-end infrared technology.

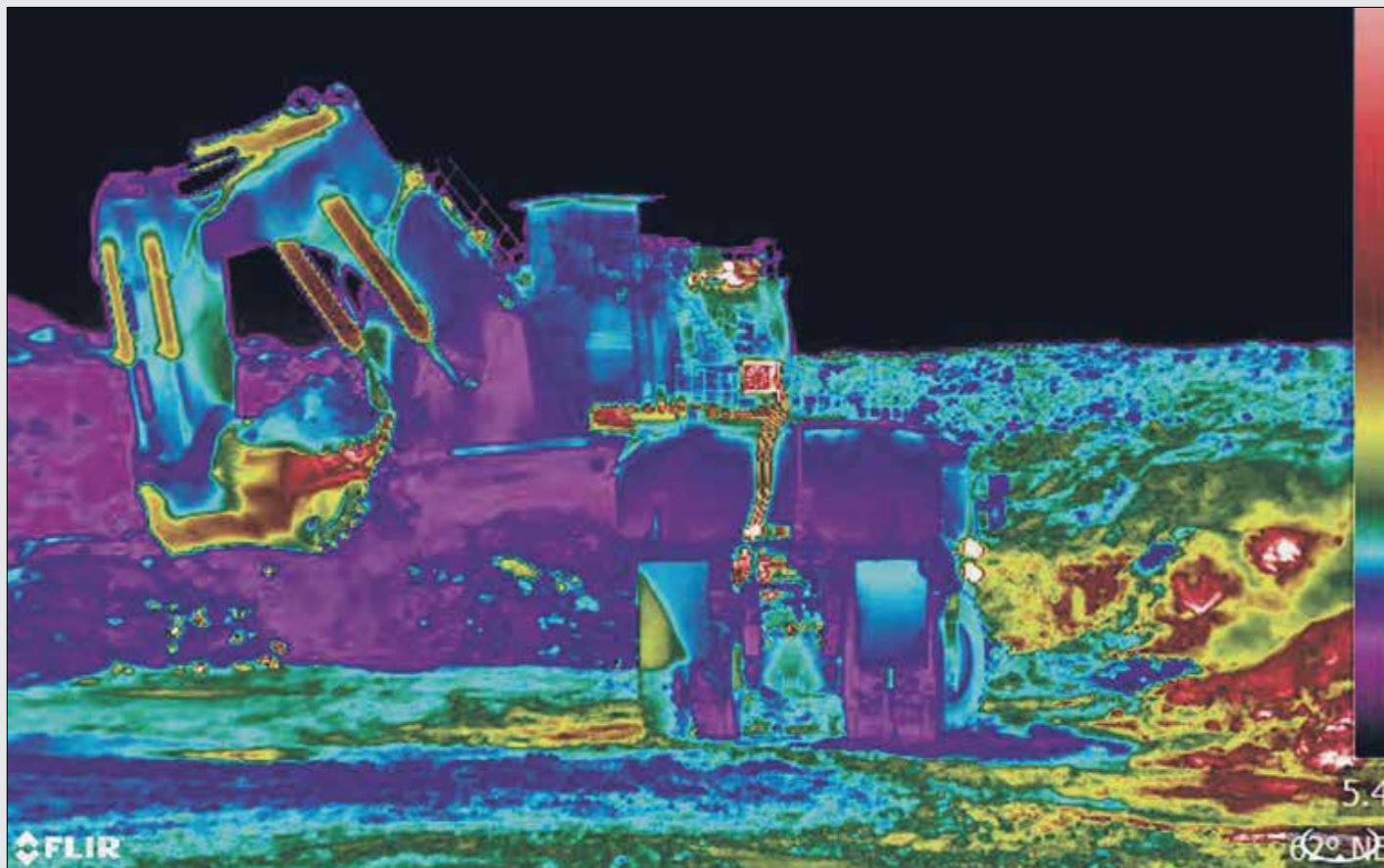
Mr Erichsen is now a category three thermographer and a committee member of the Australian Professional Thermography Association, where he and his team had regularly presented ground-breaking new methodologies.

As the only company in Australia that specialised in the mechanical and electrical inspection of mining equipment, IIAT were in a unique position in the mining and maintenance inspections services and training.

IIAT developed condition monitoring software and machine specific training packages that enable the users of the technology to understand and utilise procedures, Delta T criteria, and to understand the trending of results over time.

The company had the most comprehensive machine inspection program on the market – as a service provider, right the way through to an in-house program – the company could create tailored solutions to business needs.

IIAT's seven experienced thermographers range from category one



With the correct interpretation, thermographic cameras can pick up faults the naked eye could never detect.

Image: Infrared Inspections and Technologies.

to three.

Five of the thermographers were trained in airborne/structure-borne ultrasound, one was a highly qualified and experienced drone pilot, and IIAT's condition monitoring expert had 26 years'

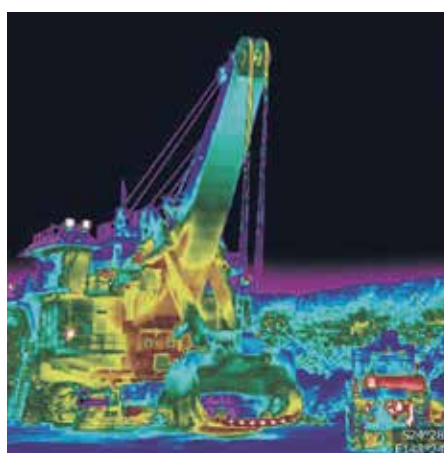
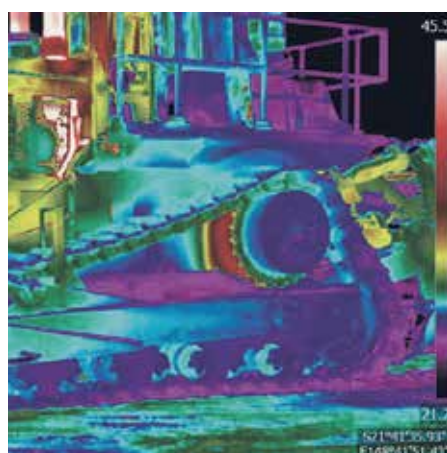
experience and was a category three vibration analyst.

The company specialised in the implementation of holistic condition monitoring programs for heavy mobile equipment and fixed plant in the mining

and quarry industries.

IIAT combined the highest quality infrared inspections with in-house tried and tested Delta T criteria for all types of machinery.

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Vibration analysis and ultrasonic bearing analysis

Condition monitoring software and machine specific training packages

Oil analysis and data interpretation

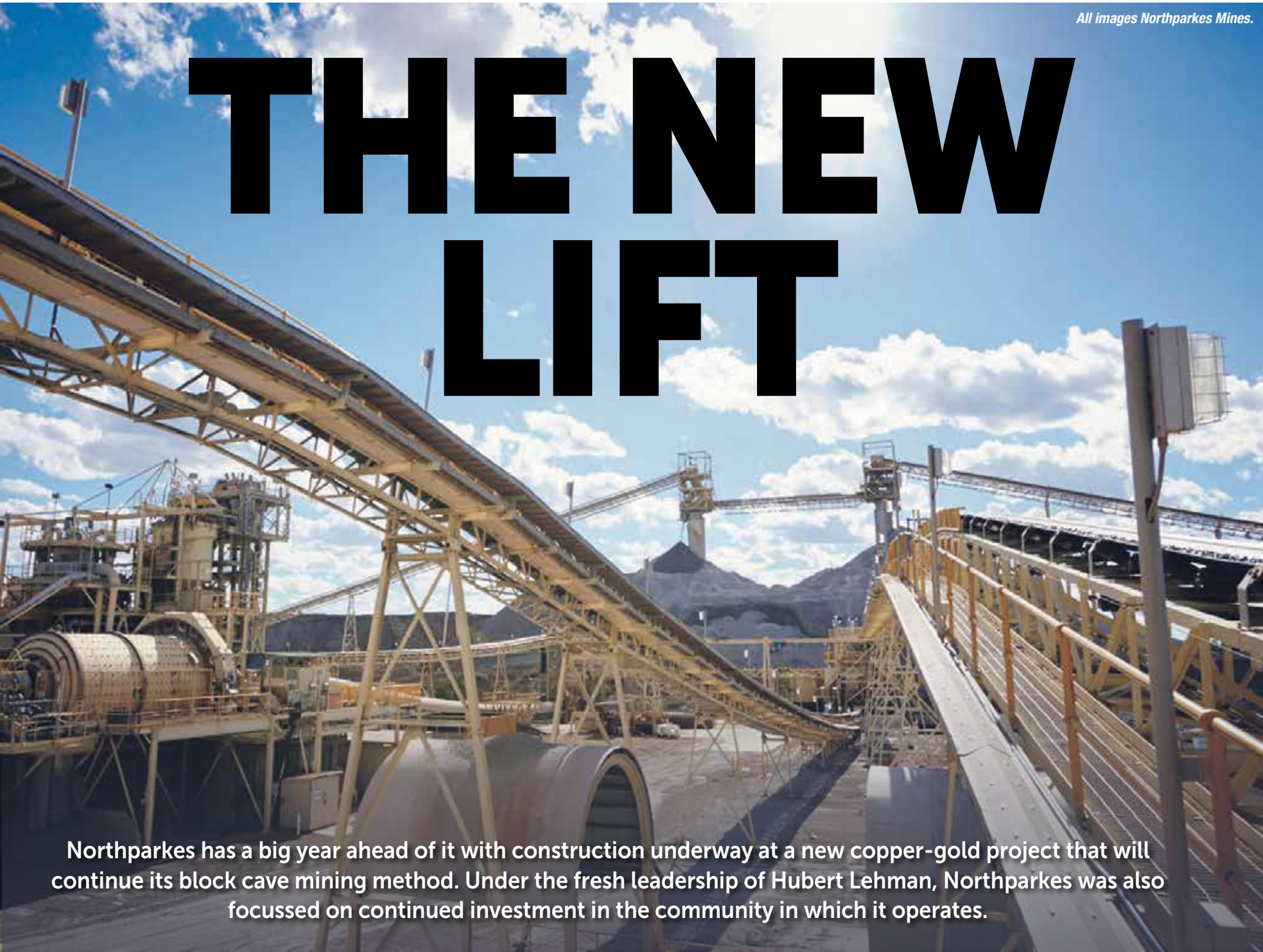
Reliability engineering services

Infrared Inspections and Technologies can help you move from the reactive to the predictive and proactive space in machine maintenance.

- Australia's leading mining mechanical and electrical infrared inspection services
- Market leader in condition monitoring services
- Specialists in Infrared Inspections of heavy mobile equipment and fixed plant
- Expertise in the introduction of holistic condition monitoring programs to all equipment types

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All images Northparkes Mines.

THE NEW LIFT

Northparkes has a big year ahead of it with construction underway at a new copper-gold project that will continue its block cave mining method. Under the fresh leadership of Hubert Lehman, Northparkes was also focussed on continued investment in the community in which it operates.

GERARD MCARTNEY

NORTH PARKES Mines started 2019 on a high, with the green light for a new project, and a new managing director appointed to lead it through its next growth phase.

In early January, the joint venture (JV) between China Molybdenum Company (CMOC) and Sumitomo announced that its new \$200 million block cave project, E26 Lift 1 North (E26L1N), had received final approval, and would begin construction immediately – with full production expected by mid-2022.

The project would deliver about 40 million tonnes of ore over a 10-year period, and comprised 11km of underground development, an underground primary crusher, conveying systems and associated infrastructure, and an upgraded ventilation system to provide the mine with sufficient airflow to support development and production activities.

CMOC chief executive Steele Li said the JV was “really excited to see this project come to fruition” and to watch Northparkes continue to grow.

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

The Northparkes’ project, previously owned by Rio Tinto, was about 27 kilometres north of Parkes in NSW and sat on 6000 hectares with a 1630 hectare mining lease.

Interestingly, the site also comprised a farm, which planted canola, wheat, barley, chickpeas and lentils.



Northparkes was the first mine in Australia to use the block cave method.

Newly appointed managing director Hubert Lehman said Northparkes’ new E26L1N mine would be designed to utilise an increased level of automation and digitisation to help deliver a safer and more productive mine.

“Northparkes plays a pivotal role in our strong and long-term presence in Australia.”

“This is a major investment in the future of our business and a very exciting time for Northparkes,” Mr Lehman said.

Mr Lehman was officially appointed managing director of the company in February, after taking over from Jim Fowler in August last year when Mr

Fowler was appointed chief executive of CMOC’s Tenke Fungurume mine in the Democratic Republic of Congo.

Mr Lehman joined the company as manager asset management in 2011, and as a member of the leadership team was responsible for overseeing the planning and execution of key elements associated with Northparkes’ strategic plan, and had been instrumental in the lead up to its new project at E26L1N.

Mr Lehman said the new E26L1N mine required up to 180 new staff at peak construction, and the additional personnel would largely be a mixture of Northparkes mine workers and central west contractors.

In a January newsletter, the

company said employment opportunities included mine surveying; drill and blasting; crushing and conveyor package engineering; mine technician and hydrofracturing monitoring; document controlling; underground training advising, and more.

The Block Cave Method

As the world’s easily accessible copper and gold deposits continued to be exhausted, Northparkes said mining companies increasingly turned to the block cave method as a simplified and more systematic way to mine and process large, low-grade ore bodies.

The method relied on gravity and natural rock stresses to fragment and recover the ore using minimal explosives.

Northparkes was the first mine to utilise the method in Australia, which was deployed in 1997.

And in 2015, Northparkes’ E48 Lift 1 block cave mine became the world’s most automated underground mine with 100 per cent of its production to come from automated loaders.

According to Northparkes, its block caving method began by digging an access ramp and a vertical extraction shaft to gain access to the ore body.

Then, a series of parallel extraction drives would be developed from one side of the ore body to the other, and between the extraction drives, a series of draw bells would be developed, while an undercut level would be developed at the same time.

(CONTINUED ON PAGE 31)



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Raisebore Australia introduced the concept of down reaming in 1992 at Mount Isa Mines and also introduced the concept of box holes in 1996 at Peak Gold Mines.

Raisebore Australia also introduced technology that is now regarded as industry standard such as 'burn out rings', 'catch ropes', drill rod propagation alarms and more.

Raisebore Australia was proud of its safety achievements, reaching a milestone of nine years without an LTI and proud that it was a finalist in the *Australian Mining Prospector Awards 2016: Excellence in Mine Safety – OH&S 'Blood Lead Level Exposure'*.

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The project will produce about 40 million tonnes of ore.

Drill holes would then be charged and fired from one side of the ore body to the other, and the draw bells would be drilled and blasted to create a series of funnels to feed ore into a draw point.

The blasting would leave a large unsupported area that would cave under its own weight.

Once the ore was removed from the draw bells, the ore body becomes unstable and collapses into the funnels that continues to feed ore into the draw point.

From then on, the mining process was relatively simple.

The ore was collected and processed underground into smaller rocks before being transported to the surface for processing in the mill, and the blasting process was repeated.

The method would eventually process

the whole ore body that would leave a deep depression from the top as the mine slowly caved in on itself.

Northparkes said the block cave mining method was “highly efficient” and had a number of advantages over conventional mining methods, such as greatly reducing the footprint by minimising waste mining; reducing greenhouse gas emissions through minimising ore re-handling; and minimising the use of explosives to fragment the ore.

In addition to its block cave mines, Northparkes also operated the E26 sub level cave, which began production in August 2016.

A Century of Mining Together

In 2018, Northparkes continued to



Northparkes has approved development consent to mine until 2032.

invest in the local community in which it operates.

“We look forward to continuing to contribute to the local community in which we live and work for years to come,” Mr Lehman said.

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

While E26L1N would directly provide new jobs for the community, the company also provided events and social opportunities for local residents and workers, such as the Parkes Show, the Central West Pride March, the Boy’s Night In and the Central West Met Fest.

Northparkes also provided scholarships to students, sponsored the Mental Health Month, R U Ok? day and a Women in Mining event.

The company’s mine rescue team also performed strongly in the Victorian Mines Rescue Competition.

“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,” Mr Lehman said.

Good news continued with recent development consent approval to mine until 2032.

“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.

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Proudly supporting Northparkes

NSW

C & M Civil Earthworks has had a strong working relationship with Northparkes Mine since taking on the site civil services contract in July 2017.

Owned and operated by Cameron Smith and Michael Bolam, C & M Civil Earthworks is locally based in Parkes, NSW, and offer a comprehensive range of services to the mining industry.

“Since commencing at Northparkes we have completed a number of projects on site,” C & M Civil Earthworks co-owner Michael Bolam said.

“We upgraded 1.5km of the site access road as well as road construction and maintenance of haul roads and producing of road base material.”

The company offers a wide range of services, which C & M Civil Earthworks co-owner Cameron Smith said included extensive stockpile management at Northparkes.

“Our work has included stockpile management, tails dam spillways, pond upgrades and enlargements plus constructing exploration drill pads, and any affiliated civil earthworks on site,” Mr Smith said.

“We can also provide support for mine shutdowns.

“C & M Civil Earthworks look forward to providing ongoing support and services to Northparkes mine in the future.”



Stockpile management by C & M Civil Earthworks at Northparkes mine.



C & M Civil Earthworks have a strong working relationship with Northparkes Mines and since taking on the Site Civil Services contract in 2017, have completed a range of projects on site:

- Site access road upgrade – 1.5km, including drainage and pavement
- Stockpile management
- Tails dam spillways
- Site retention pond upgrades and enlargements
- On site road construction and maintenance, including haul roads
- Producing roadbase material
- Construction of exploration drill pads
- Mine shutdown support



All images: Stanmore Coal.

SUCCESS STORY

Stanmore Coal's grand plan to turn its \$1 Isaac Plains mine into a 15-year mega project is beginning to pay off, with its share price reaching an eight-year high during March on the back of strong half-year results and timely acquisitions.



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ELIZABETH FABRI

STANMORE Coal has risen from the depths of the coal downturn, to a company that stands today with a healthy cash flow and portfolio of long-life assets.

The miner's renaissance began in July 2015 when it nabbed Peabody subsidiary Millennium Coal's undeveloped Wotonga (Isaac Plains East) project for \$7 million.

And then – the deal everyone remembers – its \$1 purchase of Vale SA and Sumitomo Corp's nearby Isaac Plains mine and infrastructure.

By February 2016, Stanmore had restarted mining at Isaac Plains, with first production in April and first shipment in May that year.

Flash forward to June 2018; Stanmore completed a \$30 million acquisition of Millennium Coal's Wotonga South coking coal deposit, which was renamed Isaac Downs.

With production now underway at Isaac Plains East, Stanmore shares have been on an upwards spiral surging to \$1.23 in March compared to \$0.70 a year prior, and a depressed \$0.08 in early 2015.

And with a line-up of promising development assets, the Stanmore board was optimistic this rally would continue.

Rising Production

Over the last 12 months, mining had begun at both the two-year Isaac Plains mine and new Isaac Plains East prospect.

However, Isaac Plains East had to wait until December last year to receive the dragline from the depleting Isaac Plains open pit, which would now enable it to achieve a lower strip ratio and a

significant reduction in waste removal costs.

In 2018, the miner produced a record 978,000 tonnes of coal, and achieved record sales of 882,000t.

In FY19 this was set to ramp up to 2.15 million tonnes, and include a higher ratio of the more profitable coking coal (90 per cent) to thermal coal (10 per cent).

Port accessibility had also improved following the company's deal last year to secure additional capacity through the Dalrymple Bay Coal terminal, which would open up options to fill its CHPP to nameplate capacity.

Stanmore Coal managing director Dan Clifford said the group would continue to pursue high value coal sales opportunities, and was taking advantage of the increased production and coal quality from Isaac Plains East to expand its customer base.

Currently, about 50 per cent of sales contracted were exported into Japan and Korea, with customer diversity expanding into Europe and India.

Stanmore also had limited exposure in China through spot sales.

"Stanmore continues to confidently capitalise on the current market conditions and operational performance by embedding strong planning and cost controls into its operations," Mr Clifford said.

"The relocation of the dragline from Isaac Plains to Isaac Plains East represents a significant milestone for the company in meeting its objectives of generating substantial growth in returns and strong cash flows for our shareholders given the improved cost structure and product mix at Isaac Plains East.

"This progression of the Isaac Plains complex, has put the company in a great

position for substantial growth in returns as we head towards the objective of 3.5mt ROM for the complex."

Mr Clifford said coking coal demand continued to be strong.

"It's our view in the long term it will remain that way, giving Stanmore, with the right fundamentals in place, the perfect opportunity to become a key participant in the sector," he said.

Development Projects

In addition to Isaac Plains East, work was ongoing at Isaac Downs to fast track the project into development.

Since acquiring Isaac Downs in 2018, Stanmore commenced base line environmental studies; initiated exploration; submitted a declaration in accordance with the JORC Code of maiden coal reserves; and developed a life of mine plan, which was currently being reviewed by an independent expert.

The project had a current maiden coal reserve of 24.5mt and resource of 33mt.

Stanmore also flagged potential to extend the Isaac Plains mine underground, to produce a further 1 million tonnes of ROM coal per annum.

In February, the company said it expected to make an investment decision on the underground mine by the end of FY19, and a Bankable Feasibility Study (BFS) was undergoing final review by third-party technical experts.

Exploration planning had also commenced at Isaac Plains South.

Unsolicited Takeover Rejected

On the back of the company's success, investors were pouring more money into

the business, and eyeing takeovers of their own.

On 19 November 2018, Singaporean company Golden Investments – which held a 25.47 per cent stake in Stanmore shares – launched an unsolicited off-market takeover bid.

The offer was at \$0.95 per share, which was immediately snubbed by the Stanmore board, which claimed it undervalued the company that had a stock price of \$1.00 per share in October.

Stanmore Coal chairman Stewart Butel said he wrote to shareholders on 26 November advising them to reject the offer.

"The offer price of \$0.95 is materially inadequate and does not provide an appropriate control premium to Stanmore shareholders," Mr Butel said at the time.

"The offer is clearly inadequate against a range of comparisons and does not account for the positive outlook for Stanmore and the company's pursuit of strategies and initiatives to maximise shareholder value.

"Stanmore is positioned to deliver its forecast FY19 underlying EBITDA guidance of \$130 million to \$150 million and enhanced operating margins over time.

"Our capital light strategy provides the company with the flexibility to rapidly respond to cyclical movements in coal prices."

On 22 January, the Golden Investments offer expired, to which Stanmore responded by thanking its shareholders for their support during the takeover process.

Stanmore said the company remained focussed on managing its operations and advancing the Isaac Plains complex.

A PROUD HISTORY

This year marks 85-years of business for CIMIC mining services contractor, Thiess. With an order book brimming with new contracts and extensions, 2019 looks set to be another successful year.

All images: Thiess.

ELIZABETH FABRI

THIESS' history dates back to 1934 – when five Thiess brothers began work as road contractors in Darling Downs, and forged a reputation for excellence in construction.

In the 1940s, the brothers pioneered large-scale open cut coal mining activities in QLD and NSW in response to an energy crisis, and in 1958 nabbed one of the most sought after Australian construction contracts at the time – the Snowy Mountains Hydro-Electric Scheme.

In 1961 the company went global, winning its first civil engineering contract outside of Australia for the NZ Hydro Scheme.

After launching itself on the international stage, in 1962 Thiess Peabody Mitsui formed to operate the Kiangra and Moura mines and exported QLD's first metallurgical coal to Japan.

In 1979, Thiess was responsible for building the famous Loy Yang Power Station chimneys, and in 1996 became the first contractor to operate an established mine on behalf of a mine owner, through its contract win at Collinsville coal mine in QLD's Bowen Basin.

Today, Thiess delivers a full suite of mining services, from development, extraction, processing to remediation, asset management and maintenance, and enabling services.

In fact, in 2015 it became the world's largest contract miner responsible for top tier companies.

In its 2018 full-year results released in February, CIMIC Group executive chairman Marcelino Fernandez Verdes said the year was another positive one, which was attributed to a line-up of contract awards for its Thiess business.

"In 2018, we focussed on enhancing the



Thiess recently won a \$1.7 billion contract in Botswana.

capability of our operating companies to provide integrated solutions, ensuring we deliver enduring value for our clients across the lifecycle of their assets, infrastructure and resources projects," Mr Fernandez Verdes said.

"Our pipeline of work has further increased and we have a positive outlook for 2019 and beyond.

"This is led by the strong performance of the mining sector, an increasing level of infrastructure opportunities in Australia, and the trends towards more outsourcing of services and for greater investment in PPPs."

Contract Wins

The 2018 calendar year already saw a pick-up in mining activity through Thiess' many contract wins, including a lucrative \$1.2 billion five-year contract extension at

BHP's Mt Arthur coal mine in the Hunter Valley.

The contract, awarded in October, was the third successive contract Thiess had secured with BHP at Mt Arthur Coal, which would include additional services as mine operator of the southern end of the Mt Arthur Coal operations (the Ayredale and Roxburgh pits).

Thiess would also perform mine design, planning and scheduling services, drill and blast operations, overburden removal and coal mining, with about 300 permanent jobs up for grabs.

CIMIC Mining and Mineral Processing group executive and Thiess managing director Douglas Thompson said the team had a "proud history in the region and working with BHP".

Thiess currently provided mining services at three locations in the Hunter Valley, as well as two maintenance workshops.

"We're pleased to continue our work at Mt Arthur Coal's southern operations and support local jobs, suppliers and businesses," Mr Thompson said.

"We look forward to contributing to the success of the Mt Arthur Coal operation."

Another coal contract win was its \$160 million extension at Coronado's Curragh coal mine in QLD, awarded in June, where Thiess had been providing services since 2004.

The work package included mining about 45 million bank cubic metres of waste and coal at the Curragh north pit until June 2019, and delivery of existing scope of works under its current \$1.1 billion contract until 2021.

Moving West, Thiess also picked up a \$225 million contract in June at BHP Nickel West's Rocky's Reward project.

The 34-month contract comprised a further cutback at the pit and works on a satellite pit, such as mine planning and engineering, drilling and blasting, mining of overburden and ore and rehandling services to the Leinster processing facility.

In September, BHP Nickel West awarded Thiess a supplementary contract at the Leinster underground mine, which extended 24 months, and was valued at about \$190 million.

Weeks later a \$420 million four-year extension was announced to continue operations at Antofagasta Minerals' Encuentro open pit located in northern Chile.

Thiess' contract streak continued in November, when it was tasked with installing autonomous haulage system technology across Fortescue Metals Group's (FMG) fleet of 65 haul trucks at its Christmas Creek operations in the Pilbara, WA.

The 18-month contract included the installation of the system onto FMG's Komatsu 930E and Caterpillar 789D trucks.

(CONTINUED ON PAGE 36)

Electrical solutions on time and on budget

NATIONAL

STAR Electrical provides turnkey electrical, instrumentation, and SCADA solutions to mining, water and power utilities, as well as road, rail and other critical infrastructure.

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STAR has successfully delivered electrical and instrumentation services on time and on budget to major surface mining projects, including the Boggabri Coal Handling and Preparation Plant (CHPP) and the Cobar CSA Powerhouse and Incoming High Voltage (HV) Supplies upgrade.

The company has extended its capability to underground hard rock mining with its ongoing relationship at Cobar CSA mine, completing replacement and reconfiguration to HV underground switchboards.

Hanson Quarries also engaged Star to upgrade their low voltage switchboards to meet the latest regulations at its Somersby quarry.

STAR's E&I team has also delivered hazardous area applications such as Vopak and Bulk Liquid Fuel Berth at Port Botany, Malabar Biosolid plant in Sydney, sewerage and water pumping and



STAR Electrical provides turnkey solutions on time and on budget.

treatment facilities across NSW.

Star's infrastructure resume included City West and City East Cable Tunnel

fitout, Wynyard Walk, Bradfield and Domain Tunnels and soon-to-be-completed WestConnex M4 extension, and the new

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More information can be found at: www.star-group.com.au.

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(CONTINUED FROM PAGE 34)

“Our pipeline of work has further increased and we have a positive outlook for 2019 and beyond.”

Caval Ridge coal mine.

Rounding off a successful year, in December Thiess’ also announced it had won a \$150 million contract extension with BHP Billiton Mitsubishi Alliance’s Caval Ridge coal mine in the Bowen Basin, QLD.

2019: A Strong Start

Moving into the New Year, further contracts were secured at Bayan Resources’ Melak mine expansion in East Kalimantan, Indonesia, and Debswana Diamond Company’s Jwaneng mine Cut 9 project in Botswana.

The \$172 million, 12-month extension in Indonesia would take Thiess’ contract out to 2023, and would see it increase coal production and overburden removal, and continue its existing mining services.

In Botswana, the \$1.7 billion contract

through its JV Majwe (Thiess owns 70 per cent) with Bothakga Burrow Botswana would span nine years, and include drill and on-bench services, mine planning, equipment maintenance, load and haul and mining operations.

“I am pleased to be extending our long-term relationship with Debswana Diamond Company and Majwe, delivering scalable and innovative solutions that are tailored to our client’s production and expansion needs,” Mr Thompson said.

“This contract extends our compliance with Botswana’s Citizen Economic Empowerment Policy and to delivering sustainable mining.”

Technology in Focus

Beyond its recent contract wins, Thiess

was also advancing automation across its projects.

Technology was a primary focus for the business, which was highlighted in CIMIC’s recently released 2018 annual report.

One such initiative was its aim of making scissor lift elevating work platforms safer to use for operators.

Thiess – alongside EIC Activities, CPB Contractors, and UGL – had taken up the challenge and were currently trialling a new technology to protect users.

“Scissor lifts are mechanical devices that provide temporary access to work areas at height,” CIMIC stated.

“To make scissor lifts safer, the Group has partnered with a technology company to design and test a new type of safety device that provides a hard engineering control when using these platforms in complex

construction and mining environments.”

CIMIC said with LiDAR (light detection) sensors, the solution could detect and prevent the machine from impacting obstacles, or entrapping the operator, therefore improving the safety of the operator and other workers on the platform.

“The Group has acquired 10 LiDAR sensor units and trialled these on CPB Contractors and Thiess sites during the year,” it stated.

“Trials have been staggered so as to incorporate improvements and lessons learned from each site as they progress.

“Our goal is to develop the solution to the point where it could be successfully manufactured and improve safety for our sites and the wider industry.”

Digital technologies such as virtual reality (VR) were also being deployed across projects as well as in the workshop, according to CIMIC.

It added companies that implement automation technologies were “gaining a significant increase in productivity and a decrease in expenditures”.

“Some companies have seen productivity rise by 15-20 per cent as they adopted new technologies,” CIMIC stated.

“Thiess’ contract with Fortescue strengthens its position as a leading provider of autonomous services and is an acknowledgment of where the mining industry is headed.”

Looking ahead, CIMIC said the Group was committed to bringing this innovative approach to the successful delivery of its projects.

“In 2019, we plan to scale the Thiess Innovation framework to provide transparency of ideas for collaboration across geographical boundaries; and unlock the value of innovation through the delivery of the Innovation and Technology road map to define Thiess’ digital landscape for our business strategy,” it stated.



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BALANCING ACT

Glencore announced its decision to cap coal production at current levels after heavy pressure from investor signatories of the Climate Action 100+ initiative – but the global miner remains comfortably set with its Australian assets to cater for an expected increase in coal demand.

All Images: Glencore Australia.

EMMA DAVIES

GLENCORE is Australia's largest thermal coal producer with more than 75 million tonnes of coal produced by the company's Australian assets annually.

In 2018, Glencore acquired 49 per cent of Rio Tinto's Hunter Valley Operations (HVO), an 82 per cent share of the Hail Creek coal mine and 71.2 per cent of the greenfields Valeria coal project.

The acquisitions confirmed the company's commitment to Australia's coal industry just months before it announced it would cap coal production globally after pressure from investor signatories of the Climate Action 100+ initiative.

The company released a statement on 20 February detailing the steps it would take, and in its Preliminary Results 2018 report, confirmed it had a key role to play in enabling the transition to a low carbon economy.

"We aim to prioritise capital investment to grow production of commodities essential to the energy and mobility transition and to limit our coal production capacity broadly to current levels," the report stated.

"Our commitments include: Paris-consistent capital discipline, developing new longer-term Scope 1 and 2 reduction targets, regular review of progress, alignment with TCFD recommendations and corporate climate change lobbying review.

"We believe this transition is a key part of the global response to the increasing risks posed by climate change, which must pursue the twin objectives of both limiting temperatures in line with the goals of the Paris Agreement and supporting the United Nations Sustainable Development Goals, including universal access to affordable energy."

In 2018, Glencore produced 129.4 million tonnes of coal from its 26 coal mine assets across Australia, Colombia and South Africa; of which 94.4 million tonnes of thermal coal was sold.

The company's operations currently had capacity for 150 million tonnes of coal and it had agreed not to increase tonnage of thermal coal produced by the group on a future basis.

"We aim to prioritise capital investment to grow production of commodities essential to the energy and mobility transition and to limit our coal production capacity broadly to current levels."



Global production outlook remains high for 2019 at about 145mt.

And Glencore was well positioned to make the transition through its portfolio in cobalt, nickel, copper, vanadium and zinc – all commodities that underpinned energy and mobility transformation.

"Our commodity portfolio and its key role in enabling the energy and mobility transition for a low-carbon economy enables us to look ahead with confidence and to remain focussed on creating sustainable long-term value for all our shareholders," Glencore chief executive Ivan Glasenberg said.

Glencore would also take steps to reduce its greenhouse gas emission intensity by five per cent by 2020 (compared to a 2016 baseline), and allow public access to annual reports of its progress towards meeting climate change objectives, as well as re-assess whether its membership in relevant trade organisations might undermine its support for the Paris Agreement and goals.

Minerals Council of Australia chief executive Tanya Constable agreed that there was a need to minimise the cost of meeting Australia's international emission reduction targets.

Ms Constable cited the BAEconomics' peer-reviewed modelling, which showed how the use of international offsets along with carry-over of earlier Kyoto-period overachievement would significantly reduce the cost of meeting emissions reduction targets.

"Addressing climate change is not

easy, particularly for a major energy and resource-intensive country like Australia, which needs a diverse future energy mix that balances affordability, reliability and emissions reduction," Ms Constable said.

"This is why a measured response is critical to reducing greenhouse emissions in a way, which does not damage the economy, destroy jobs and hurt Australian businesses and families.

"Using credible and verifiable international offsets along with carry-over of emission reductions from the first and second Kyoto commitment periods will be central to Australia implementing a measured response."

Australian Outlook

According to the International Energy Agency, the elimination of coal-fired generation was a key climate policy goal in some countries, while in others, coal was abundant and affordable and remained the key source of electricity.

In Australia, the coal market was proving resistant to change, which boded well for Glencore's bottom line – regardless of a coal cap.

The Indian economy was expected to grow more than 8 per cent a year to 2023 and with the electrification process continuing, power demand was forecast to rise by more than 5 per cent per year over the period.

In Glencore's Full Year 2018 production report, Mr Glasenberg indicated Australian coal could supply this market.

"Indian and Chinese thermal electricity demand growth was 4.9 per cent and 6.0 per cent [in 2018] respectively, supporting demand growth for imported thermal coal," Mr Glasenberg said.

"In Asia-Pacific markets, excluding China and India, import demand was buoyed by 8.9GW of newly commissioned coal fired power stations to meet demand for low cost base load electricity.

"More than 50GW of new coal fired generation capacity is currently under construction in the region."

Mr Glasenberg also cited the increase in global steel production to 4.7 per cent in 2018, with 73 per cent of steel being produced via blast furnace using coking coal.

"Globally, pig iron production from blast furnaces increased by 1.5 per cent in the seaborne import markets, excluding China. Australian supply recovered to meet the coking coal demand growth," he said.

"While most commodities ended the year materially lower than where they started, thermal coal was broadly unchanged, as demand for high-quality coals remained robust against a backdrop of limited reinvestment in supply."

Subsequently, Glencore's coal production outlook for 2019 remained high with a production guidance increase to about 145 million tonnes globally - reflecting a full year's contribution from Australian assets HVO and Hail Creek plus business improvement initiatives at existing operations.

The company had already identified some \$185 million of managed annual cost savings/margin improvements to be realised upon completion of the restructure plans at both HVO and Hail Creek.

It remained to be seen just how important a role these low-cost, high-quality assets would play in Glencore's Australian operations in the years to come, but the company has cleverly positioned itself positively in the debate around energy and climate change, soothing the ruffled feathers of investors while simultaneously maintaining its grip on the Australian coal market.



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GROWTH POTENTIAL

With production well and truly underway at Dacian Gold's Mt Morgans project in WA, the company was now turning its attention to exploration to grow mine life.

All images: Dacian Gold.

GERARD MCARTNEY

AFTER an "excellent" December quarter, Dacian Gold declared commercial production at its flagship Mt Morgans project in January.

The mine, 37km south of Laverton, presented Dacian with 200,000 ounces of gold over an estimated 10-year mine life, and a clear path to mid-tier status through its organic growth options; the Westralia underground operation, open cut Jupiter mine, and new discovery Cameron Well.

Dacian Gold executive chairman and chief executive Rohan Williams said the company achieved its commercial production milestone in January exactly when it said it would.

"We have now been producing for almost a year and are well on the way to being Australia's next mid-tier gold miner," Mr Williams said.

"[The three months ending December] was an outstanding quarter, with production increasing 30 per cent from the September quarter.

"Again, this ramp-up is in line with our stated objective of materially increasing quarterly production levels over the course of FY19."

Gold production for the December quarter totalled 37,930 ounces and was expected to reach between 180,000 to 210,000 for the financial year.

But, due to underground equipment availability issues, in late March the company reduced guidance for the March quarter to between 36,000 and 38,000 ounces, which had subsequently bought it's guidance for FY19 down to between 150,000 to 160,000 ounces.

In a statement, the company said that it had resolved the issue, and that "production for the June quarter was expected to be in the range of 50,000-55,000oz at an AISC of \$1050-\$1150, representing an annualised production run rate of more than 200,000 ounces.

Mining at Mt Morgans was now underway across all three declines at Westralia – Beresford South, Beresford North, and Allanson – as well as Jupiter's Cornwall shear zone.



Dacian Gold has been aggressively looking for new resources to increase its guidance and extend the mine life.

Increased production in the coming quarters would be achieved via higher grade ore from the Jupiter open pit and the Westralia underground mine.

Exploration

Exploration was a key focus for the company moving forward.

In August 2018, shortly after the construction phase of Mt Morgans was completed, the company launched an aggressive \$25 million 110,000 metre exploration campaign.

Mr Williams said its exploration program was "going well".

"Not every exploration play turns up a new gold mine and we were lucky that we found two new large gold mines at Westralia and Jupiter pretty much off the bat," he said.

"The new exploration projects at Cameron Well and Basin Margin will take time to better understand, but we are optimistic that Cameron Well will become our third mining centre at Mt Morgans as it is quite an advanced exploration story.

"Basin Margin is a much earlier exploration story but it is situated in a very interesting area and there is gold around so we are keeping our fingers crossed."

"It was an outstanding quarter, with production increasing 30 per cent from the September quarter."

Margin project overlies the structurally complex geological contact which separates the Wallaby conglomerate and the mafic package.

Follow up drilling at the Basin Margin project commenced in late March 2019.

Outlook

Mr Williams said the company was on its way to achieving a 10-year mine life via these exploration ventures.

"We currently have a 1.4 million ounce ore reserve that we know will give us seven years of about 200,000 ounces per year," he said.

"We know we have extensions of inferred resource to Westralia that is not included in the ore reserve and we are very confident these extensions will continue and will grow the resource base."

Mr Williams added the company was optimistic Cameron Well would be its third mining centre, and expected the resource and ore reserve to grow over time, along with Basin Margin.

"With seven years effectively in the bank today, and known extensions and likely new discoveries, it doesn't take too much of a stretch to be able to argue this could be a 10-year gold mine, and personally I think it has every chance of being much more than 10 years," he said.

"But there's a lot of work to be done first."

For the remainder of 2019, Mr Williams said the company would be ramping up production to reach nameplate capacity, and paying down debt from operational cashflow.

He said Dacian was also examining new technologies that could add value to the operation.

"We are certainly watching the new technology developments that are entering the mining space but we will bed down those milestones we have set for 2019 before we enter that fray," Mr Williams said.

"Areas of new technology that I want to investigate for Mt Morgans include ore-sorting technology, 3D seismic and where we can improve mining productivities."



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

Delivering Mt Morgans on time within budget

NATIONAL

GR Engineering Services (GRES) is an ASX-listed process design and engineering company providing fixed price EPC and EPCM project delivery services to the mineral processing industry internationally.

GRES recently delivered the Mt Morgans gold project for Dacian Gold Limited (Dacian) on time and within budget.

The company assisted Dacian in this project development by undertaking the feasibility study, followed by design and construction of the 2.5Mtpa carbon in leach (CIL) plant at the project, where ore is primary crushed and milled in an SABC comminution circuit prior to gravity gold recovery and leaching in the CIL circuit.

GRES also delivered the non-process infrastructure at the project and managed the TSF construction.

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developed by GRES enabled clients to confidently move into development with the knowledge that the outcomes from study work will be replicated in their projects.

GRES has successfully completed feasibility studies, process and engineering designs and construction for projects of various scale, covering a diverse range of mineral commodities.

The company has delivered processing facilities and infrastructure for precious metals, base metals, mineral sands,

industrial minerals, tin, tungsten and iron ore projects for a range of clients in Australia and internationally.

GRES also has a presence in the hydrocarbons industry via its wholly owned subsidiary, Upstream Production Solutions (Upstream).

Upstream is a leading provider of operations, maintenance and well management services to the oil and gas industry in Australia and South East Asia.



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Alkane Resources is striving to capitalise on lithium and rare earths demand with cash flow from its Tomingley Gold Operations in NSW driving development of the nearby poly-metallic Dubbo project.

EMMA DAVIES

EARLY this year operations at Tomingley, which had historically produced 1 million tonnes of gold per annum, transitioned from open pit to underground mining.

Both the main decline and vent portals had been established and first production of ore was expected by the second half of 2019.

In a statement, Alkane managing director Nic Earner said the company had a strong financial year ahead to June 2019 with a production guidance of between 35,000 and 40,000 ounces of gold at an All-In Sustaining Cost of between \$1050 and \$1150 per ounce.

The company also had forward contracts in place for 28,500 ounces of gold at an average price of \$1811/oz.

“This is another great half driven by the great team we have at our Tomingley gold operation,” Mr Earner said.

“Alkane’s strong balance sheet positions us well to execute our growth plans into 2019.

“With our development underground, our encouraging exploration, our development ready Dubbo project and our strategic investments we look forward to the rest of this year.”

The Dubbo project was development ready with the company’s strategic priority including securing financing.

The project comprised of a large in-ground resource of zirconium, hafnium, niobium and rare earth elements, and had a potential mine life of more than 75 years due to significant extension and expansion potential.

As an advanced poly-metallic project outside China, the Dubbo project had a potential strategic and independent supply of critical minerals for a range of sustainable technologies and future industries.

Alkane said the project would position the company as a significant world producer of critical technology metals with the preferred approach to produce high-value downstream high-grade products.

The company also said that securing a supply of critical technology metals was vital to advanced technologies for clean energy, transport and manufacturing.

Alkane’s wholly owned subsidiary, Australian Strategic Materials (ASM), was working towards securing offtake contracts and a resultant strategic investor in the project.

Alkane remained hopeful that the increased regulatory pressure within China should cause further price movement within the market, which may create a catalyst for offtake contracts.

China’s first national law on soil pollution came into effect on 1 January which included remediation costs for owners of any polluted land (including past and present contamination) which would be included in operating costs and passed down to consumers.

This could result in a more level playing field for western producers when the full costs of production are accounted for, particularly for zirconium and rare earths products - which would be produced by the Dubbo project.

The long-term outlook for the zirconium chemical industry indicated increased demand and supply chain issues for critical metals and materials, including rare earths, zirconium, and hafnium.

Federal Resources and Northern Australia minister Matt Canavan echoed the outlook, releasing a statement on Australia’s ability to become a major global supplier of minerals critical to 21st Century technologies.

“Australia is already demonstrating it can meet the needs of key trading partners in a range of critical minerals,” Mr Canavan said.

“We are one of the world’s top five producers of antimony, cobalt, lithium and rare earths, minerals rated as ‘critical’ by the US, UK or EU.”

The Dubbo project was a well-placed, low risk, and development ready non-Chinese supply of these critical minerals which Alkane would continue to seek fair and binding offtake agreements for in 2019.



Alkane Resources managing director Nic Earner.

“Alkane’s strong balance sheet positions us well to execute our growth plans into 2019.”

Gold Strategy

The company had also followed a gold investment strategy, which included investing in junior gold mining companies such as Calidus Resources - to which Alkane could bring high additional capital, expertise and operating capability.

In October 2018, Alkane invested in Calidus due to its excellent prospects in WA and its highly feasible development path, and held about a 10.2 per cent interest in the junior.

A strategic placement to Alkane Resources of 125 million shares at 2.95 cents per share raising \$3,687,500 along with the strategic technical alliance allowed Calidus to leverage Alkane’s operational experience and cost base to assist in its exploration drilling campaign at its 1.25 million-ounce Warrawoona gold project in the Pilbara, WA.

“The Warrawoona region remains essentially unexplored outside of the immediate Klondyke resource area and we believe that it is highly prospective for large

mineralised orogenic gold systems,” Calidus managing director Dave Reeves said.

Alkane did not progress with its proposed investment into gold exploration company Explaurum Limited.

Exploration

Alkane had plans for an extensive exploration program focussed on the immediate area to the south of the Tomingley, which featured a cumulative strike length of 2500 metres comprising the Roswell, San Antonio and El Paso prospects.

The objective was to define additional resources that had the potential to be mined either via open pit or underground operations which could add to the Tomingley Gold Operations.

RC and diamond core drilling was underway to further understand the potential for gold resources at Roswell, San Antonio and El Paso prospects.

Core drilling was underway at the Peak Hill gold mine, where a revamped resource was reported in October 2018 of 1.02 million tonnes grading 3.29g/t gold and 0.15 per cent copper (108,000oz) at a 2.00g/t gold cut-off.

This led Alkane to investigate the feasibility of extending the Peak Hill gold mine, 15km south of Tomingley, with potential for underground mining to access the resources for the Tomingley processing plant.

Alkane also had advanced gold copper exploration projects at the 100 per cent owned Northern Molong porphyry project, Wellington, Rockley and Elsenora prospects.

Wellington had a small copper-gold deposit which could be expanded, while at Bodangora (NMPP) a large monzonite intrusive complex had been identified with porphyry style gold copper mineralisation.

Gold and base metal mineralisation had been identified at the Rockley and Elsenora prospects.

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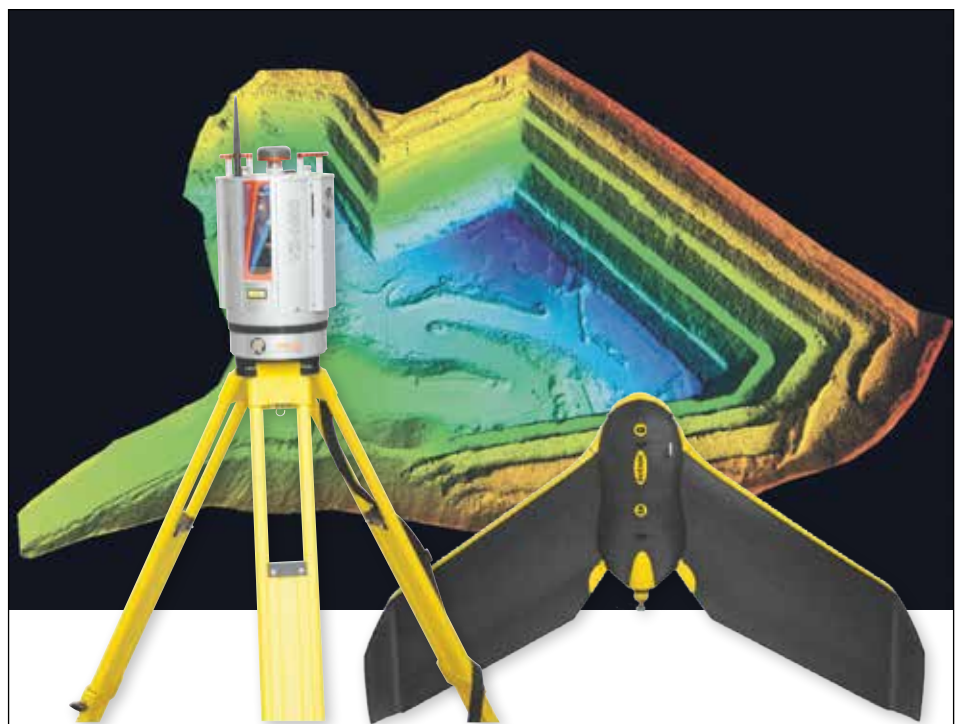
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scanning, mine engineers would become virtual surveyors, receiving data at their desks via AutoCAD, 3D surface meshes or similar software.

A complete digital representation of a tunnel or a section of tunnel, means engineers and planners could virtually go to the site and examine it in detail from a safe distance.

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More information on 3D laser scanning and the applications on mine sites can be found at: www.lrsurveyors.com.au.



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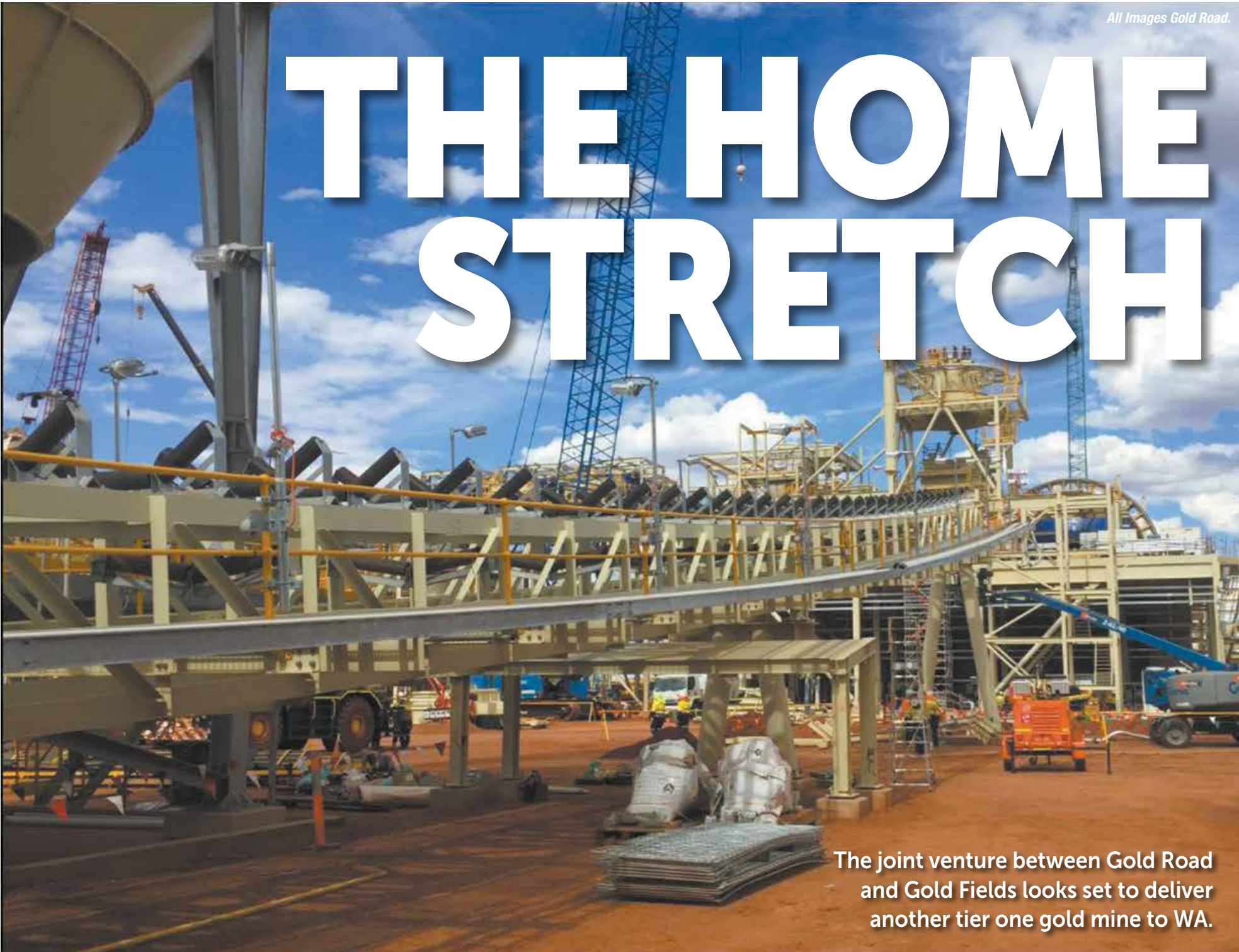
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The joint venture between Gold Road and Gold Fields looks set to deliver another tier one gold mine to WA.

GERARD MCARTNEY

THE Gruyere joint venture is aiming to pour first gold during the June quarter, and anticipated full production by the end of 2019.

After a re-evaluation in 2018, the final forecast capital cost for construction was estimated at \$621 million, up from the initial capex of \$507 million.

The project was expected to produce an annual average of 300,000 ounces over its 12-year mine life; about 30,000oz more than the 270,000ozpa originally flagged, making the project an emerging tier 1 gold producer.

In a statement, the company said that the increase was driven by the “opportunistic purchase of larger SAG and ball mills to lift throughput to 8.2million tonnes per annum (mtpa) in fresh rock from 2021.”

At 14 February, the JV partners had mined 185,000 tonnes of ore, which created a substantial stockpile in preparation for initial production.

In mid-February, the JV announced its annual guidance for 2019 would sit between 100,000 and 120,000oz, with an all-in sustaining cost of between \$1050 and \$1150 per ounce.

Downer, which was awarded a five-year \$400 million mining services contract in December 2017, started double shift operations in January 2019 as a part of the production ramp up.

“It is good to see the Gruyere project develop from conceptual plans through

2019 HIGHLIGHTS

- Annual production to increase up to 300,000oz once the mine is fully operational
- First gold pour expected in June quarter 2019
- Annual production guidance of 100,000-120,000oz
- All-in sustaining costs guided between \$1050 and \$1150/oz
- \$20 million exploration budget
- 3.9 million oz Reserve and 6.6 million oz Resource

feasibility study to a well-designed large scale, long-life, low-cost operation that is on the threshold of delivering substantial value for our shareholders,” Gold Road chairman Tim Netscher said.

The project would also see two additional ore sources added to the Gruyere pit that would increase its milling capacity from 7.5 million to 8.2 million tonnes.

The Mine

The Gruyere gold project was situated on the mining lease M38/1267, about 200km

east of Laverton.

Pre-feasibility was completed in February 2016, followed by a feasibility study in October 2016.

The project was wholly owned by Gold Road until November 2016, when the company entered into the 50/50 joint venture agreement with South African giant Gold Fields, which paid \$350 million and took on the development and operation of the project.

The sale provided 50 per cent of the required capital that, according to Gold Road, “de-risks the project to a significant degree through the introduction of a partner highly experienced in the

development and operation of open-pit gold mines that has agreed to cover any cost overrun up to 10 per cent of the total development budget.”

Construction began in the second half of 2017, and will be completed by mid-2019.

Before production could begin, the JV partners contracted APA Group which would build, own and operate the site’s 45-megawatt gas-fired power station, and the 198km of new pipeline to connect the site to APA’s existing pipeline network.

To secure water for the Gruyere Village, GR Engineering Services completed the construction and commissioning of six out of eight bores at the Anne Beadell borefield.

The Yeo borefield, which was to be used as the main source of water for the process plant, was developed jointly by MACA and the ACJV.

The total investment in construction was more than \$1 billion.

Heavy rain in the 2018 March quarter delayed the first gold pour as localised flooding led to access constraints at certain parts of the project, pushing the first pour back to the second quarter of 2019.

In June 2018, the company announced that as the project entered its critical phase of construction and development, an independent review of the project determined an 8 per cent increase was necessary “after scope changes and force majeure,” saw production cost rise from \$507 million to \$621 million.

(CONTINUED OVER)

(CONTINUED FROM PAGE 43)



There were 648 rooms installed at the Gruyere Village.

The project had begun recruiting and would require up to 350 staff, with the Gruyere JV requiring 90 new permanent staff, and Downer needing 154.

The company had offered an eight-days-on, six-days-off roster in order to attract workers.

Exploration

The JV partners also continued to explore through the Gruyere JV tenements, with emphasis on the discovery of high-margin ore reserves that could supplement the Gruyere life-of-mine schedule.

The 14km Golden Highway had already defined 600,000 ounces, and infill drilling was completed at Montagne and Argos deposits.

These deposits were within economic haulage distance to Gruyere and could potentially be exploited as satellite open pit mines that could increase the mine life of Gruyere.

In Gold Road's 100 per cent owned northern and southern tenements, staged exploration of the high-priority targets had considerable success.

The company's past and planned expenditure would amount to about \$70 million, and was moving toward resource definition at Gilmour, Smokebush and Corkwood, while continuing to make high grade bedrock intersections in early stage prospects and in new shallow gold anomalies.

Gold Road would focus its exploration and evaluation efforts on defining deposits that could support the next significant standalone operations.



The mine purchased larger SAG and ball mills to increase throughput.



The Gruyere airstrip.

Clarke Energy delivers power to Gruyere

WA

THE Gruyere gold project is a 50/50 joint venture (JV) between Gold Road Resources and global miner Gold Fields.

As an emerging tier one gold project, the Gruyere JV partners expect that once full production is realised it will be able to produce an annual average of 300,000 ounces over the projected 12-year mine life.

After flooding in 2018 delayed the first pour, the company pushed the date back to the March quarter of 2019, and announced its 2019 guidance to be within 100,000 and 120,000 ounces.

The project is in the Yarnma greenstone belt in WA, 200km northeast of Laverton, and to the north of APA Group's eastern goldfields pipeline.

One of the biggest challenges for the JV in bringing the project toward production was its remoteness, and significant infrastructure investments had to be made in order to ensure the viability of the project.

APA Group was contracted to install 198km of new gas pipeline, and Clarke Energy was contracted to produce and construct the 45-megawatt gas-fired power station at the Gruyere gold project.

Clarke Energy is GE's distributor and service partner.

The company provided and installed 11 of GE's high-efficiency Jenbacher J624 gas engines for the new 45-megawatt Yarnma power station at the Gruyere gold project.

GE's Jenbacher J624 is the world's first two-stage, turbocharged gas engine.



Clarke Energy was chosen by the Gruyere project to build and operate its gas-fired power station.

It provided significant advantages, particularly in the areas of operation in hot environments – such as the Gruyere gold project– and in multiple engine power plants for independent power production and combined heat and power applications.

Clarke Energy engineered, procured and constructed the power station, while APA would transport the gas for power generation – a total of about 1500km – using its interconnected pipelines and its purpose-built 198km Yarnma gas pipeline.

“Together with Clarke Energy as the EPC and GE's demonstrated Jenbacher gas engine technology providing the power,

we will be able to, once again, deliver a compelling energy solution for our customer using both our interconnected pipeline and power generation capabilities to the remote gold mine,” APA Group networks and power group executive Sam Pearce said.

“As an infrastructure owner, our priority is to provide safe, reliable and efficient energy to our customers.”

The Jenbacher J624s were built in GE's Austrian facility and transported during late 2017.

“GE's high-efficiency, high-performance and dependable gas engine technology is an excellent fit for APA Group's needs of safety,

reliability and efficiency and is well-proven with an installed gas engine fleet of over 700 MW in Australia,” Clarke Energy managing director Greg Columbus said.

The pipeline was commissioned late 2018 in alignment with the Gruyere JV's expectation of first gold scheduled for 2019.

Clarke Energy was a leader in engineering design, installation and long-term maintenance of gas engine power plants.

The company was an authorised distributor and service provider for GE's Jenbacher gas engines in 25 countries.

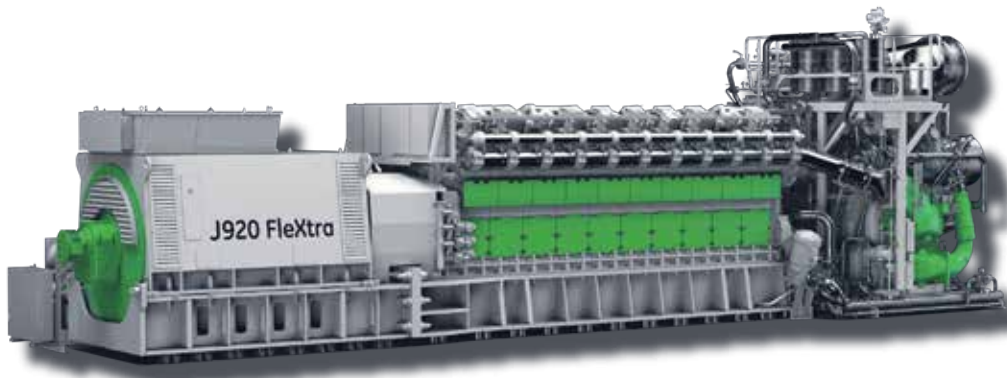
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LAND OF OPPORTUNITY

Sheffield Resources is advancing development of its flagship Thunderbird mineral sands project, between Derby and Broome in northern WA, with first production to begin in Q4 of 2020.

All Images: Sheffield Resources.

EMMA DAVIES

THE Thunderbird mineral sands project is one of the largest, high-quality mineral sands discoveries in recent decades, and after securing all key permitting early this year, is now construction ready.

The project would generate a suite of mineral sands products, including premium zircon suitable for the ceramic sector and LTR ilmenite – which would be one of the highest-grade sulphate feedstocks available globally.

Sheffield Resources anticipated a two-year construction phase for the project with the Bankable Feasibility Study (BFS) supporting a low cost, low risk operation over a 42-year mine life.

Early works were already completed, including the commissioning of 52 rooms, messing and laundry facilities within the accommodation village, mine site arterial road construction and development of communications infrastructure and a waste water treatment plant

In addition to mine development infrastructure expenditure, about \$4.3 million was incurred on engineering and design.

Expenditure directly associated with local contractors and staffing in the Kimberley region totalled \$5.2 million.

In late 2018, Sheffield's social licence to operate in the Kimberley was confirmed through the signing of the Native Title Co-existence Agreement with traditional owners.

GR Engineering Services Limited (GRES) was also appointed to design and construct the 7.5 million tonne per annum Stage 1 mineral processing plant and supporting infrastructure.

Liquefied natural gas (LNG) would be used for processing at Thunderbird, which would be supplied via a 15-year joint venture agreement between Woodside and Energy Developments (EDL).

This would include the supply and delivery of 1950 terajoules per annum of LNG to the Thunderbird project from Woodside's Pluto LNG Truck Loading Facility near Karratha, which would equate to double the current supply in the Kimberley and almost double again once stage two came online.

"For Sheffield, there are three key benefits of using LNG at Thunderbird; it provides a low cost and a low emission fuel source that is very

well suited to the ilmenite low temperature roast (LTR) process," Sheffield managing director Bruce McFadzean said.

"The BFS assumed an outsourced LNG storage and power station facility model on a Build Own and Operate (BOO) basis.

"The Northern Australia Infrastructure Facility (NAIF) funding arrangements enable in-sourcing of LNG storage and power station facilities to take place, providing significant reduction in operating costs compared to BFS assumptions."

On 19 September 2018, Sheffield secured infrastructure funding support from the Northern Australia Infrastructure Facility (NAIF).

Part of the \$95 million financing package would be allocated to the proposed Thunderbird LNG storage and power station facilities — which would be constructed and operated under separate agreement with third parties.

Mr McFadzean said Sheffield was extremely pleased with the level of support shown by Woodside and EDL in delivering a low cost, long-term energy solution for Thunderbird.

"The project is now fully permitted and construction ready, with offtake and financing agreements in place," he said.

"We look forward to continuing our relationship with Woodside and EDL as we move toward development during 2019."

Market Outlook

In a recent market update, Sheffield said it was continuing discussions with potential offtake partners for the project.

It said a range of potential customers had received samples of ilmenite, and encouragingly all samples reviewed and assessed were approved by the respective parties as a direct feedstock for sulfate pigment production or chloride slag feedstock.

"Currently with 77 per cent of Stage 1 Thunderbird forecast revenue contracted under binding offtake agreements, covering 100 per cent of the Stage 1 zircon products and 50 per cent of Stage 1 LTR ilmenite, we have satisfied all debt requirements," the company stated.

"Many enquiries have also been received from potential offtake partners for the possible supply of Stage 2 products, particularly zircon related products.

"A majority of the groups who have made enquiries have already received and assessed the samples approving the material for processing in a wide range of applications, including the largest share of the market in ceramic applications."

Mr McFadzean said the zircon price had rallied in the past few months, meaning the outlook for minerals sands in Australia remained positive.

"During the past 18-24 months the excess stock levels have reduced leaving little inventory," he said.

"Demand is strong and expected to grow in the coming years from 1.2 to 1.5 million tonnes (mt)/year by 2025/26."

The major mines supplying zircon also had declining grades, which, combined with strong demand, had led to mining groups accelerating the depletion of their mines as they mined aggressively to meet demand.

"There has been inadequate investment in the industry over previous years meaning no new large deposits are coming on line," Mr McFadzean said.

"Thunderbird is the largest undeveloped project globally and you'd need about four Thunderbirds to fill the supply deficit – and no one knows where the remaining supply is going to come from."

Mr McFadzean also said that Australia was a safe jurisdiction for potential investments compared to suppliers in Africa.

"Over the past one to two years the second largest producer, RBM in South Africa, has been subject to continuous strikes and industrial action reducing their output," he said.

Titanium dioxide demand was also expected to grow from 7.3mt to exceed 9.0mt by 2026, with future growth to be supported by the pigment industry, which accounted for between 85 and 90 per cent of the total end market.

"Sulfate ilmenite supply is expected to remain relatively flat in the short to medium term, followed by a declining profile if no new supply is brought online in the near future," Mr McFadzean said.

"Net sulphate ilmenite is also expected to decline without further investment, as more product is utilised to produce chloride slag — the Thunderbird ilmenite feeds both chloride and sulfate pigment processes."

Mr McFadzean also said that even though Australia is the biggest supplier in the market

our output was declining.

"An apparent lack of investment in the industry together with the major producers' (Iluka and Tronox) declining grades (and thus more difficult mining) - will result in lower output," he said.

"You might say a void is forming because no new significant mines coming on line."

Exploration Options

A regional exploration program in 2018 led to the discovery of a high-grade maiden mineral resource at Sheffield's Night Train deposit at the Dampier mineral sands project.

This included a high-grade component of 50 million tonnes at 5.9 per cent heavy minerals (HM), above a 2.0 per cent HM cut-off, similar high in-situ zircon and titanium mineral grades to those of Thunderbird, which sits about 20km south of the Night Train deposit.

"Night Train has the potential to extend the life of the Thunderbird operation, by providing an alternative feed source for the plant," Mr McFadzean said.

"It could enable greater flexibility for future development and add value to this emerging world-class mineral sand province.

"Mineral sands is a product that doesn't involve chemicals and environmentally it's a very low impact process that really suits the Kimberley region."

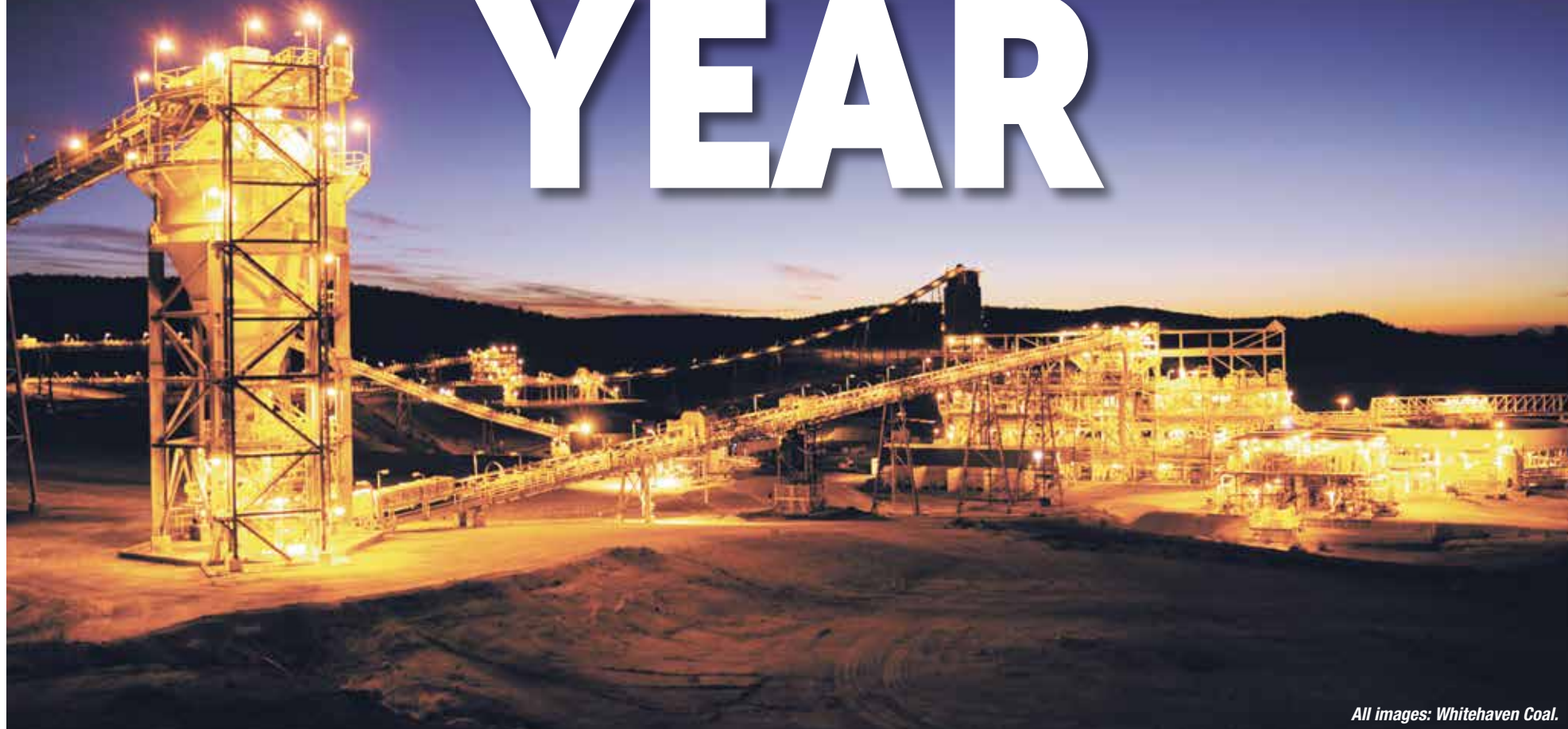
While positive about Night Train, Mr McFadzean said the potential quality and grade of the exploration target was conceptual in nature, with insufficient exploration to estimate a mineral resource, and uncertainty that further exploration would result in the estimation of one.

Follow up aircore drilling to extend the regional discoveries and infill Night Train was scheduled for Q3 2019 in conjunction with geotechnical and geochemical test work on the Derby East silica sands samples.

Further exploration planned for 2019 included bulk sample mineral characterisation test work at Night Train, and mineral assemblage determination test work for Night Train, Cold Duck, Porphyry Pearl, Cisco, Nomad, Concorde, Bohemia and Buckfast deposits.

Sheffield remained confident that the multiple new mineral sands prospects identified during the 2018 regional exploration program confirmed that the Canning Basin was a major new mineral sands province.

A RECORD YEAR



All images: Whitehaven Coal.

GERARD MCARTNEY

THE first half of FY19 saw Whitehaven Coal post a net profit of \$305.8 million after tax, sales revenue grow by 11 per cent, and its net debt pile shrink to \$244.2 million.

While the company reported a positive outlook for the rest of 2019, it had downgraded its FY19 guidance from between 22 and 23 million tonnes to between 21.5 and 22.5 million tonnes amid issues at its Narrabri mine.

But other than an expected decrease in production, it was clear skies ahead for Whitehaven Coal.

In a recent investor briefing, Whitehaven Coal managing director and chief executive Paul Flynn said a number of records were achieved, making it a “very good start to the year”.

“I’m pleased to report a record half year financial result and an interim dividend for shareholders which takes the total shareholder return over the past 18 months to 80 cents per share,” Mr Flynn said.

“Importantly, we have achieved this result in spite of higher, but moderating costs, underscoring the resilience of the business as it continues to grow in scale.”

The company attributed its success in the first half of FY19 to the increase in price for high-quality thermal coal that climbed \$US15 per tonne to \$US96 per tonne from the previous period.

This increase reflected South East Asia’s and China’s growing appetite for higher quality Australian thermal coal, as the region continued to roll out coal fired power stations.

Citing consultants, CRU, the company forecasted demand for coal in Europe would decrease, however as Asia continued to build more coal fired power stations requiring high-quality thermal coal, Asian demand would outweigh the decline from the European market.



Maules Creek produced a record 6.2 million tonnes in 2018.

The company predicted global demand for thermal coal in power generation would grow by more than 400 million tonnes in the next five years.

Maules Creek

After a slower than expected start to the financial year, Glencore’s Maules Creek mine produced a record 6.2 million tonnes of ROM coal for the first half of FY19, and was on track to meet guidance of between 11.8 and 12.2 million tonnes for the full year.

The company decided it would offer a 50/50 split between coking and thermal coal, and offer three distinct products in order to take advantage of the large differences between high and low-quality thermal coal.

By blending lower quality coal from multiple seams in the mine, it would produce a very-low ash, low sulphur semi-soft coking coal; a low ash, low sulphur semi soft coking coal and a <10 per cent ash, very high CV low sulphur semi-soft thermal coal.

This would require more coal washing, and create lower yield at a higher cost to produce.

However, the company said that by offering the three products it was able realise higher average prices.

“What we think, is that there is a very good opportunity here to wash a little bit more and maximise those premiums for our thermal coal in particular,” Mr Flynn said.

The company had also looked at adopting autonomous elements at Maules Creek.

“We have started the physical aspects of the autonomous journey that we’ve been evaluating at Maules Creek, and just a week ago we had our first trial in a segregated part of the pit,” Mr Flynn said.

“That will ramp up continually, but gradually as we work our way through a very exciting prospect of obviously brining costs down.”

Narrabri

During the first quarter of FY19, production was constrained due to the longwall change out.

“With the change out in September, it certainly recorded less tonnes than what you’d like to see,” Mr Flynn said.

This meant that full year ROM coal

production guidance was revised to between 5.6 and 6 million tonnes of ROM coal.

In the December quarter, the mine achieved near-record levels of ROM coal production.

The company said that longwall mining would continue at the current LW108 panel for the second half of FY19, but the decision had been made to change out the longwall when it reached a volcanic intrusion in the LW108 panel.

Once mining hit the volcanic intrusion, the longwall would be changed out and moved directly into LW109, where the remaining black coal from LW108 would be mined.

ROM coal production guidance for FY20 was expected to be sit between 6.2 and 6.6 million tonnes.

Narrabri Stage 3 also showed promise, which included converting the southern exploration licence into a mining lease.

“The future for Narrabri is very bright,” Mr Flynn said.

The company had dedicated a team that lodged a gateway submission to the Department of Planning and Environment (DPE), which would be the first step in the environmental impact assessment (EIA) process for the project.

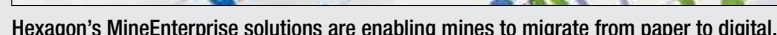
At March 2019, parallel studies were underway to refine the options for expanding the mine lease.

Gunnedah Basin

Whitehaven’s three foundation mines, Tarrawonga, Rocglen and Werris Creek, and the Sunnyside rehabilitation project underperformed in the period.

Rocglen would cease production at the end of FY19, and to partly offset losses associated with the closure; the Tarrawonga mine would be expanded to a fully approved capacity of 3 million tonnes of ROM coal.

(CONTINUED ON PAGE 49)



NATIONAL

More information can be found at: www.hexagonmining.com.





“With first-rate development assets in our Vickery and Winchester South projects, we are strongly positioned to meet the wave of demand for quality thermal and metallurgical coal.”

(CONTINUED FROM PAGE 47)

Whitehaven Coal finds itself perfectly positioned to fill the gap in the Asian market.

“It’s sad to see, but it will give us the opportunity to move into an active rehabilitation phase,” Mr Flynn said.

The expansion of Tarrawonga was expected to commence in the September quarter, and would involve the acquisition of new mining equipment and infrastructure that would replace the ageing equipment with a modern, larger capacity fleet.

By modernising the fleet, the company would increase the productivity of the mine and expand production to its permitted rate.

“We expect to have them on the ground in September/October period later this year,” Mr Flynn said.

Vickery Extension

On 13 August 2018, Whitehaven lodged an EIS to the DPE for its Vickery extension

project, which reviewed it and placed it on public display on 13 September.

Whitehaven Coal said after six weeks, a total of 560 submissions were received with 63 per cent in favour of the project.

The DPE completed its preliminary issues report and the first public hearings were held in early February at Boggabri and Gunnedah.

Mr Flyn said it was good for the Independenct Planning Commission to know there was strong support for the project.

The company aimed to gain approval for the project by the end of 2019, and begin construtrion in early 2020

The project was anticipated to generate about 500 jobs during the construction phase, and about 450 during operations, with the majority of work to be awarded to locals.

Winchester South

Whitehaven acquired Winchester South in the June quarter of 2018 from Rio Tinto, and had been developing it since.

Winchester South was in an established mining precinct with a rail line that passed directly over the Winchester South tenement.

“We’ve moved into a phase of planning for what’s going to be a large project,” Mr Flynn said.

“We certainly think that this project is going to deliver significant boost to shareholders.”

The company assembled a small team who, after collecting technical data, determined the JORC resources for the project were 530 million tonnes; a 49 per cent increase on the 365 million tonnes predicted by previous owners.

The company said it would aim for comprehensive drilling to commence in the

June 2019 quarter.

Once developed, the mine would have a life of between 20 and 30 years at a production rate of between 7.5mtpa and 15mtpa.

Outlook

In its recent report, Whitehaven said its production was forecast to grow in the coming years through the start-up of the Winchester South and Vickery projects.

Within a decade, Whitehaven expected to be operating four highly efficient large scale mines producing high-quality thermal and metallurgical coal.

“With first-rate development assets in our Vickery and Winchester South projects, we are strongly positioned to meet the wave of demand for quality thermal and metallurgical coal we are seeing through the region,” Mr Flynn said.



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Reliable solutions

Excellence Line introduces smart technology to rockbreakers

NATIONAL

RAMMER introduced the renewed Excellence Line of rockbreakers with integrated smart technology for easier fleet management and new customer-focussed features for more efficient processes.

The easy idle blow protection (IBP) adjustment feature means that, on site, customers can now adjust the (IBP) to match the application.

IBP ensures that rockbreakers can't be operated until pressure is placed on the tool.

It also protected the tool from failures and tie rod stress, reducing oil overheating and protecting against premature failures.

Separate greasing channels have been added from the valve body into the lower

and upper tool bushing.

This enables optimum greasing for both bushings that increases the lifetime of the tool and the tool bushings.

Lower tool bushings can now be rotated and replaced on site reducing both operating and maintenance costs.

Rammer was the first on the market introducing RD3 monitoring device together with My Fleet platform making it easy for customers to monitor their rockbreaker fleet remotely.

With the cloud-based system, customers could pinpoint the exact location of their equipment, monitor correct usage and manage service periods for proactive and preventative maintenance.

Remote monitoring systems were available in all new Rammer Excellence models as standard.



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Make your rockbreaker fleet management easier and processes more efficient with the Rammer Excellence Line.

With the RD3 remote monitoring system you can remotely track and monitor rockbreaker usage and pinpoint its location.

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High performance pumps

NATIONAL

AUSTRALIAN Pump Industries has released a high-capacity diesel fuel transfer pump with ATEX flame proof rating.

Called the B3XRA-ATEX, the big 3 inch x 3 inch pump delivers a maximum flow of 1430 litres per minute with a maximum head of 26 metres.

The self-priming facility means that the pump could draw fuel up from a vertical head — something a normal centrifugal pump simply can't.

Seals are viton, carbon and alumina as standard, and are compatible with pumping diesel fuel and light oils.

The B3XRA is powered by a flameproof heavy duty 5.5 kW motor with IP55 protection with the motor certified in accordance with ATEX standards.

The pump has the ability to operate even with depressions of air inside the pump.

That ability prevents air lock, and instead, the air and diesel fuel are mixed together at the impeller.

The air can then separate from the fuel, which continues to circulate, pulling air out of the suction line until the pump is primed.

"These self-priming centrifugal fuel



The new Aussie ATEX certified pump combines the advantages of a self-priming pump and flame proof motor for convenient, safe diesel fuel handling.

pumps are much simpler than gear or vane pumps," Aussie Pumps chief engineer John Hales said.

"As the impeller turns, it creates a vacuum.

"Atmospheric pressure then allows the

fuel in the tank to push it into the suction line and into the pump."

The high flow, high performance fuel transfer pump is ideal for mine sites, earthmoving contractors, transfer of marine diesel fuel or feeding large

generation plants.

It can also be used for waste oil collection and for heating oil transfers.

Further information on Aussie Pumps' ATEX rated fuel handling pumps is available at www.aussiepumps.com.au.



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MTT's specialised focus on timber roof support makes it a world-leader in the field.

Mine support specialists

NATIONAL

EVOLUTION and improvement in processes, products and systems is fundamental to the world we live in.

If it was not the case we would still all be driving T Model Ford's, and while that's not to say they were not a great vehicle at the time, advances have made the motor vehicles of today more safer, more productive, and more comfortable.

The same can be said for the lifecycle

of all products - even pieces of timber used in underground mines for ground support.

Mine Timber Technology (MTT) had undertaken five years of development and trials in new products to improve safety and improve performance of underground roof support; using advanced methods of timber machining and applying extensive knowledge of Australian hardwoods.

New product development is paramount to make the most of the

properties timber offers, and many of MTT's findings have enabled timber to become a 'new' product in mining applications.

MTT's extensive timber knowledge assisted in providing safer and more productive mines and reconciliation with environmental values needed for long term secure supply of timber roof support to the mining industry.

More information can be found at: www.minetimbertechnology.com.

Metso Bruno software optimises aggregate production processes

NATIONAL

HOW to build an optimal aggregate production process? There is no one simple answer to this question, as for some optimal means low operating costs and for others it means as little equipment as possible.

However, all share the same number one goal: to be able to produce exactly what their customers need. Metso spoke with its expert Saku Pursio, head of Bruno department, about how its simulation software can help customers select the right equipment.

Q. In short, what is Bruno about?

Bruno is an intuitive software program for simulating the aggregate production process and it includes all the required Metso equipment: feeders, crushers and screens. The user enters basic feed material and machinery data into the process and the software predicts how the process will perform. This way, the customer can determine the most optimal process for each specific need.

Q. What is the main benefit of using Bruno?

An aggregate crushing and screening process needs adjustment and changes for various reasons, such as too high production costs or poor product quality. With Bruno, the user can test suggested changes to find out if they have the desired effect without unintentionally compromising the performance some other way. It is much cheaper to spend a few extra hours at your desk making a feasible plan, instead of starting to make potentially costly changes blindfolded.

Q. Could you describe a scenario that showcases the value of Bruno?

Imagine that you have selected, bought and set equipment for your plant and you are ready to get going. Once the process has started, you notice that the crusher feed turns out to include larger rocks than expected, too large for the crusher to process. The difference isn't huge necessarily, but it is significant. In that case, you need to reline the crusher chamber, which causes a delay in start-up. If Bruno had been used, we could have estimated the feed size with high accuracy and prevented the issue from emerging in the first place.

On the other hand, it might be that production targets change and the current setup doesn't fit the needs anymore. With Bruno, the customer can quickly and easily find out how to reset the process flow. In addition to resetting the process flow, Bruno offers the possibility to try new equipment. For example, in certain applications it might be effective to change the HP crusher to a GP crusher. One real life case was when Bruno helped Riverbend to choose the equipment best suited to their needs.

One of the most common reasons why a plant doesn't deliver as expected is the fact that rock type is not properly taken into



Metso Bruno department head Saku Pursio.

consideration. We analyse a rock sample from the customer site to determine its specific characteristics and feed this information into Bruno. For instance, high abrasiveness can cause unexpectedly short wear part lifetime, which increases downtime and operating costs.

Q. What makes Bruno so accurate?

Accuracy comes from information that has been gathered from measuring real equipment, exactly the same ones used by our customers in their quarries. Almost all our quotations include a Bruno process flowchart as a standard feature and each case increases the database. This has been going on ever since Bruno was developed in 1994 and today there are 8500 users in 112 countries, literally in all four corners of the world.

There is no definitive right or wrong answer for any process – there can be several equally good ones. With Bruno, those scenarios can be compared and so it ultimately comes down to customers deciding what they wish to emphasise in their production processes.

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Impact Drill and Blast amalgamates Yahua investment

NATIONAL

IN 2016, Yahua Australia began investing into Australian based drill and blast companies with explosives supply capabilities.

These companies were strategically located to service the quarrying, mining and construction industries across Australia.

The companies were North Star Blasting, Caruana Blasting, Sequel Drill and Blast and Impact Drill and Blast.

Yahua Australia is proud to announce the amalgamation of these companies that will now trade as Impact Drill and Blast, one of Australia's largest drill and blast businesses with bulk explosives supply capabilities.

While the original owners of Caruana and Sequel retained senior management positions and shareholdings in the company and are responsible for day to day operations, Yahua Australia's parent company is an explosives manufacturer and supplier based in Chengdu, People's Republic of China, and listed on the Shenzhen Stock Exchange.

The Yahua Group operates 57 wholly-owned subsidiaries, 23 manufacturing bases engaged in civil explosive business in China, and have the annual capacity to produce 160,000 tonnes of explosives and 75 million detonators.

Yahua also own the Redbull Powder Company that has two bulk emulsion facilities in New Zealand.

Impact Drill and Blast has one major



Impact Drill and Blast has unrivalled flexibility and capability when it comes to rock on ground services.

hazard facility producing bulk explosives in Darwin, Northern Territory, and has been increasing its capabilities to service all areas of Australia, particularly in the areas of bulk explosive supply.

Redbull and Impact will be working as one team to service the Australasian region, combining to build a strong force to deliver complete rock on ground solutions to clients using the latest technologies, equipment and explosives products.

There are few companies with the necessary flexibility and capabilities to offer integrated rock on ground services that could fulfil the drilling and blasting needs of smaller quarrying businesses, right through to large multinational

quarrying and mining companies.

By offering integrated drilling and blasting solutions, the company helps maximise the efficiency of mining, quarrying and construction projects around Australia.

Impact Drill and Blast streamlines drill and blast operations to make the lives of project managers much easier.

As well as providing its own line of bulk explosives, the company has one of the largest fleets of blast hole drills in Australia with an experienced team of shotfirers, drillers, maintenance personnel, project managers and blast engineers to handle the most complex

of projects and to ensure that the job is always done safely, reliably and efficiently.

Impact Drill and Blast focus on providing customers with reliable, flexible and cost-effective solutions within the drilling and blasting industry, investing in the latest technology and equipment to maintain a high level of accuracy and industry compliance, when it comes to providing blast designs, blast hole drilling and explosive supply services.

The company prides itself on its obligation to be responsive to customers' needs, and its duty toward the community, the environment and the safety of employees.

THE AUSTRALIAN
MINING REVIEW

FEATURES FOR MAY 2019

Automation for the Mine Site
Boddington Gold Mine (Newmont Mining)
Cadia Valley Operations (Newcrest)
Cowal Mine (Evolution Mining)
Gascoyne Resources
Granny Smith Gold Mine (Goldfields)
Illawarra Metallurgical Coal (South32)
Kemerton Lithium Plant (Albermarle Lithium)
Metro Mining
Mine Maintenance Best Practice
Minerals Analysis Services
Mining in the Hunter Valley
Pilbara Ports
Ramelius Resources
Red River Resources
Regis Resources
Sandfire Resources
Salt Lake Potash
Yarrabee and Middlemount Mines



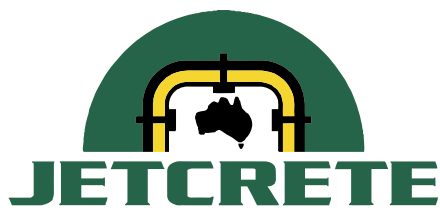
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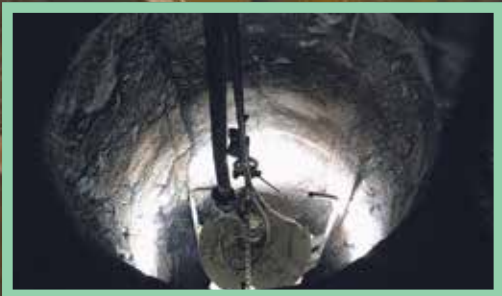
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With a background of over 30 years in the industry, Jetcrete Oz Pty Ltd has extensive experience in all aspects of concrete spraying and specialist ground support services. An ISO accredited company, Jetcrete operates in over 19 sites across Australia. 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
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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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Aussie's concrete pump solution

NATIONAL

AUSTRALIAN Pump Industries is working closely with industry leaders to provide pump solutions in mines, batch plants and quarries using Tsurumi KTZ submersibles.

These cast iron pumps have a proven record around the world moving high volumes of water for wash-down, dewatering, processing and recycling.

The secret of the KTZ success is in the simplicity of the design, cast iron construction and outstanding performance.

Tsurumi's large capacity 4 inch 11kW dewatering pump, the KTZ411, delivers in excess of 1000 litres of water per minute at a head height of 35 metres.

This means the pump is able to combat the common issue of pipe silting, which happens over time as sediment builds up inside pipes and reduces the internal diameter – restricting flow thus both accelerating the silting issue and reducing the transfer rate.

"We have proved that a high-capacity pump like the KTZ411 is able to push



The KTZ411 has proved itself to be an ideal investment for the corrosive environments in mine sites.

water through with a larger flow rate. High velocity flows mean less silting, therefore less maintenance and a less noticeable drop in performance of the pump over time," Aussie Pumps product manager Neil Bennett said.

Reliability is key

Tsurumi's KTZ series have been purposely built to withstand abrasive conditions and are manufactured from heavy duty cast iron with high chrome internal wear

components.

The pumps come fitted with a three-phase heavy duty two pole motors with thermal protection. The side flow design ensures the motor is cooled enabling the pumps to operate at low water levels or be installed on an incline.

The KTZ series also features anti-wicking cables and silicon carbide seals that function to maximise performance longevity in extremely challenging environments.

"Tsurumi submersibles are uniquely built to withstand dry running conditions. The dual silicone carbide seals are lubricated and cooled continuously in a protective oil chamber," Mr Bennett said.

The KTZ series is widely used in mining, tunnelling, quarries or concrete batch plant applications and piling duties and a 1000 volt option is also available for underground applications.

Local support

When a pump fails it's paramount to get it back in action as fast as possible.

That's why Australian Pumps have set up a national mining partner network to provide local assistance to operators.

This program has already proved itself a success in the industry as service agents gain specialised knowledge in selecting the right pump for the job.

The company is committed to carrying large stocks of these submersibles to make them available for immediate shipment.

Further information on Tsurumi's KTZ series and Aussie's Mining Partners Support Program is available from the Aussie Pumps website, www.aussiepumps.com.au.

THE AUSTRALIAN MINING REVIEW PROFILES FOR MAY 2019

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A conveyor revolution



NEPEAN Conveyors is changing the game for materials handling in 2019 by introducing its agile relocatable conveyor system.

NATIONAL

OVERLAND Conveyors are a vital piece of mining equipment, but they are not known for their mobility.

Once in place, asset owners generally expect conveyors to remain in place for many years to alleviate the costly exercise of moving a fixed conveyor assembly.

NEPEAN Conveyors has disrupted this paradigm with its latest innovation - a conveyor designed for ease of transportation, assembly and dismantling and relocation.

The relocatable conveyor system has taken more than two years of research and design to develop and has upended the traditional approach to conveyor design with its improved mobility, operational flexibility, ease of transport and speed of installation.

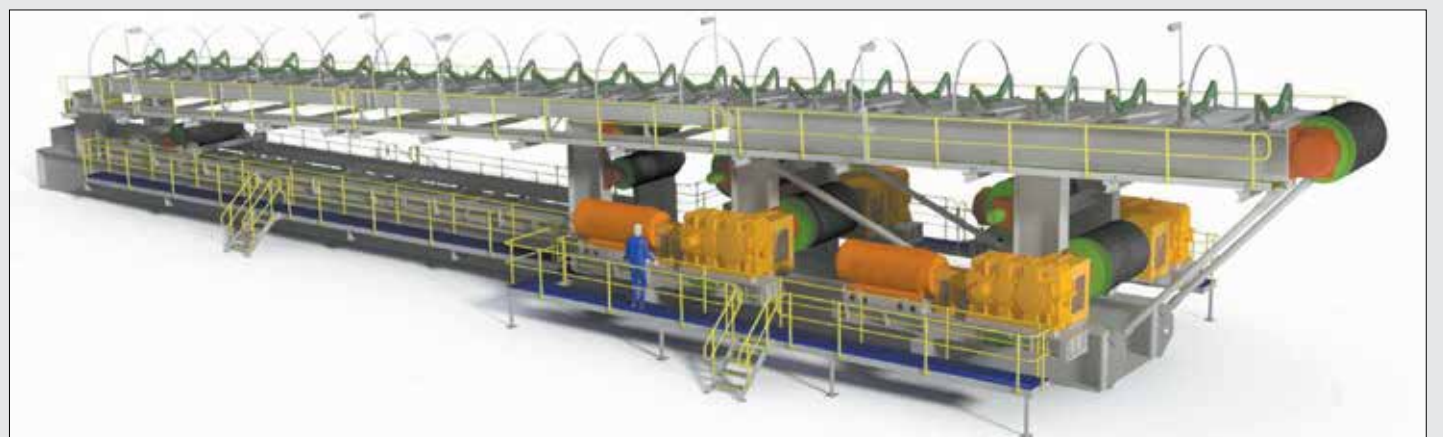
The relocatable conveyor has been designed around the geometry of a standard shipping container and is certified for standard freight shipping.

This means the conveyor could be transported anywhere in the world as a fully assembled unit on ships and unloaded directly onto trucks or trains and transported to a site's lay down area for direct assembly - all without extra handling or site-based assembly.

The frame units support belt widths of up to 1600 millimetres.

The modules can be triple stacked on a prime mover and unloaded in one bundle using standard container handling equipment, such as fork lift trucks, reach stackers, Frannas and other types of cranes.

"One of the areas we really wanted to target was logistics," NEPEAN NSW general manager Bill Munday said.



"The beauty of having a shipping container format is that they can be multi-stacked on ships, trains or trucks.

"You can potentially get nine modules per road train at a length of 12 metres per module."

The solution also minimises the requirement for extensive ground works through the integrated foldable legs.

Once the modules are aligned to an installation jig on the ground, the structure can be super elevated and banked around corners.

NEPEAN Conveyors standard design also includes options for trestles with independent walkways that can be easily assembled to build the conveyor over water courses or cattle crossings.

These design features and options allow for the conveyor pathway to be roughly graded to within 100 millimetres, reducing the requirement for time consuming detailed earth works.

"All the equipment is pre-designed for a fully functioning conveyor and the container module is just part of the system," Mr Munday said.

"We have also designed a unique one-piece head end that incorporates a drive system up to about 4000KW, a loop take-up and delivery jib that can be put on a 200-tonne float to transport around mine sites that requires minimal civil or earth works".

Interestingly, the conveyor is not classified as fixed plant due to the unique way it has been designed.

"If you put in a traditional system over a five-year period, that's classed as fixed plant and depreciates over those five years," Mr Munday said.

"With this type of equipment, because it's modular and reusable, it's got a 20-year lifespan, so you can depreciate it over a much longer period."

The system is primarily designed for use at satellite mine sites that will benefit from the improved portability of the system, while at the same time providing substantial cost savings and reducing downtime.

"From the testing we have done out here [in Wollongong], we have shown that we can install 1200 metres of ROM conveyor in a 10-hour shift," Mr Munday said.

"Realistically though, we would probably install about 600 metres in that time [on a typical mine site]. It pretty much works out at a metre a minute."

Mr Munday said a number of customers have confirmed that mining operations that traditionally used dump trucks for bulk material transportation, could easily use the relocatable conveyor in place of them due to its versatility.

The NEPEAN relocatable conveyor system, was launched in the first quarter of 2019, and holds strong potential for international expansion.

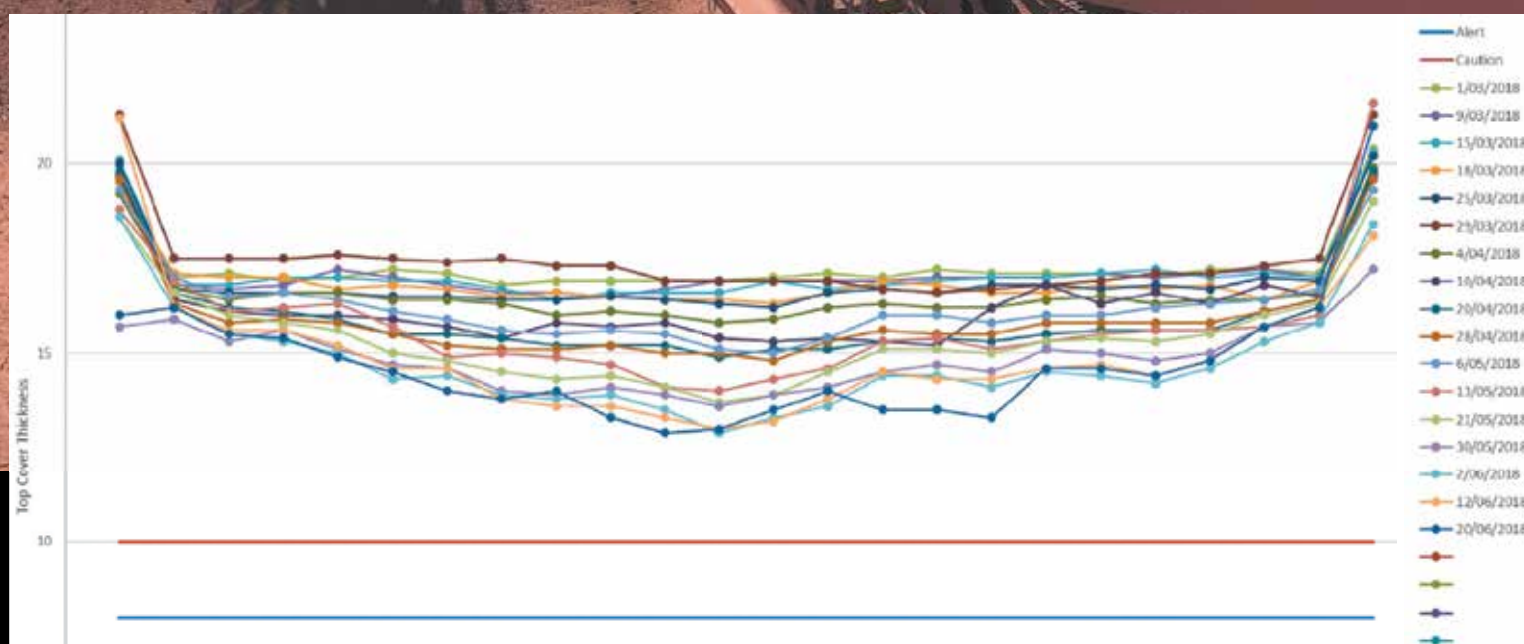
"The mining industry has gone through some tough times in the last few years, but we're starting to come out of that now," Mr Munday said.

"We're seeing much more positive attitudes and can see our business ramping up over the next 12-18 months.

"We've come out of the downturn in an extremely strong position."

More information about the NEPEAN relocatable conveyor system can be found at: www.nepeanconveyors.com.

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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Leading conveyor supplier

NATIONAL

ZHEJIANG Double Arrow Rubber Co. Ltd has ranked number one for the past eight years among the top 10 manufacturers in China, and with an annual output capacity of ± 50,000,000sqm, is the largest singly located conveyor belting manufacturing facility globally.

The company prides itself on its advanced production facilities, capabilities and testing equipment.

This, along with its internationally recognised accreditations (ISO 9001, ISO 14001 and GB/T28001), plus its state-of-the-art research and development centre, enabled Double Arrow to perfectly meet industry demands.

Zhejiang Double Arrow has supplied high-end products from China into the Australasian market for more than 10 years, and on 13 December 2018 Double Arrow Australia became a 100 per cent owned subsidiary of Zhejiang Double Arrow Rubber Co.

Zhejiang Double Arrow's key priority



Double Arrow R&D Institute

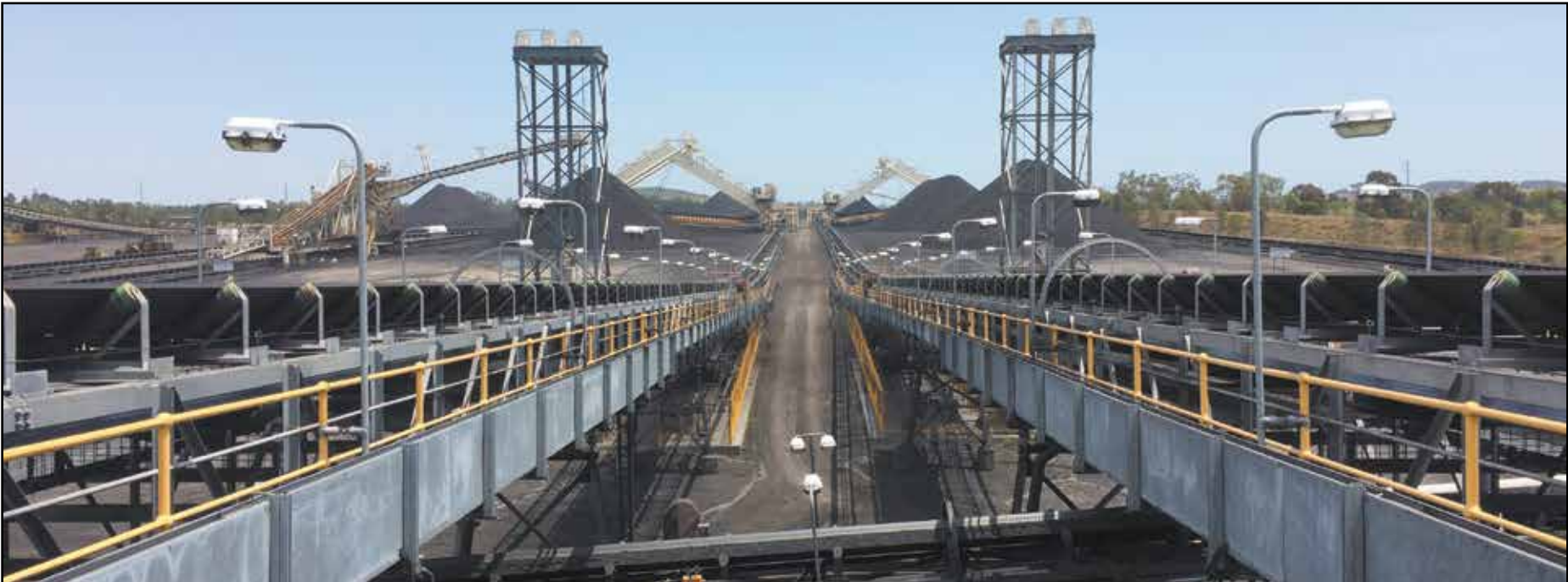
was looking into how it can develop its business and build a better service platform internationally.

The company's products are recognised

and preferred by valued customers and the market because of a unique understanding of customers' critical needs, and the company is well known for

its ability to provide product solutions and services to meet increasing requirements.

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



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Benefits of rubber torsion spring motor bases

**LEVERLINK MANAGING DIRECTOR
RICHARD SHARP**

A RUBBER torsion spring motor base is a revolutionary product that has saved countless hours on labour costs and has reduced costly downtime.

In Australia, during the late 1980s, the first rubber torsion spring motor base for vibrating screens was developed.

The spring (rubber torsion spring) was invented by Hermann Neidhart, who registered a number of patents in the 1940s.

A commercially available rubber torsion spring unit was attached to a simple base plate.

This was clamped to a predetermined angle, about that of the required torque for the functional specifications of the application.

When connecting the drive vee belts directly to the screen exciters, it resulted in the pulley to pulley centres not being fixed – such as in a pump drive.

That is, the pulley centres changed when the screen started and stopped (during resonance) as the body of the screen was mounted on steel coil springs for isolation purposes.

This, in many cases, resulted in drive belt slippage during the start-up phase.

Consequently, high vee belt and pulley wear happened.

Such applications were referred to as being dynamic.

A Category A motor base with a preloaded rubber torsion spring allowed the drive pulley to follow the action of the screen during resonance, maintain sufficient belt tension to avoid belt slippage and reduce the force transmitted to the supporting structure.

This extended vee belt life, extended drive and driven pulley life, and this meant that lighter motor support structures resulted, as mass of screen was not being applied during resonance.



Leverlink is bringing a two part feature on rubber torsion springs to the *Australian Mining Review*.

Explanation — Category A & B Motor Bases

At this stage it is important to explain that the motor base designs fall into two distinct groups.

These are described as Category A and Category B.

The “Category A” motor base design allowed for the electric motor to be connected directly to the outer section of the rubber torsion spring.

This allowed for a resilient mounting, and was ideal for applications such as vibrating

screens or feeders when the vee belts were connected directly to the excitor drive.

The downside of the design is the compression of the rubber cord under load allowed misalignment of the drive and driven pulleys.

To overcome this effect, an alignment bearing would be fitted to the drive side.

This was referred to as a dynamic application.

The “Category B” motor base had the electric motor connected to the inner section of the rubber torsion spring.

In turn, this was connected via bearings

to the side plates of the motor base.

The outer section of the spring was connected to a tensioning device for the purpose of fitting and/or changing drive belts and applying torque to maintain drive belt tension.

This design was for static applications, where the drive and driven pulleys were fixed.

In the next edition of the *Australian Mining Review*, Leverlink will run through the tensioning device, the dual spring motor base, and give a case study of how the new spring motor bases can save labour and time.

GEOSCIENCE AUSTRALIA RESOURCES DIVISION CHIEF

ANDREW HEAP

There's a lot to like about where Australia's 'critical minerals' industry is headed, with many mines already in development to capitalise on the growing battery and EV markets. However, there are still knowledge gaps when it comes to mineral processing and manufacturing that require further investigation. Elizabeth Fabri spoke with Geoscience Australia Resources Division chief Andrew Heap about opportunities for Australia on the back of the agency's recently released reports.



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Clean cooling systems

NATIONAL

TOTAL Coolant's Envirolife Heavy Duty (HD) Engine Coolant is a ready to use, low toxic corrosion inhibitor premixed with high-quality deionised water.

The advanced and proprietary carboxylate technology formulation uses virtually non-depleting organic corrosion inhibitors to ensure long-lasting corrosion protection for aluminium, iron, copper and solder alloys.

Developed for extended service performance in heavy duty engines, the water-based corrosion inhibitor boasts arguably the most extensive field experience in mining, oil and gas, power generation and heavy transport applications of any comparable product on the market.

Long Life

The unique OAT formulation ensures long life corrosion protection in all cooling systems, providing a coolant product that lasts the life of the engine.

When used in conjunction with a

system evaluation every 2000 hours through Total Coolant's Coolant Performance and Results (CPR) laboratories analysis program, extensive field testing has proven that the organic additive technology used will provide superior protection for at least 32,000 hours in marine and stationary engine applications, and up to 24,000 hrs for mobile plant

If Total Coolants Envirolife HD is replenished regularly to compensate for low level, the cooling water can be considered as fill for life.

Reliable

The Envirolife Heavy Duty Engine Coolant is stable and reliable corrosion protection for all systems metals including; aluminium, iron, steel, copper and solder alloys.

The corrosion inhibitors prevent wet liner cavitation erosion and protect aluminium heat transfer surfaces in modern automotive engines, providing outstanding hot surface aluminium protection - and since Total Coolants Envirolife HD can be used in most original equipment manufacturers (OEM) automotive, diesel and natural gas engines, the one coolant product can be inventoried across the whole engine fleet.

Total Coolants Envirolife HD Coolant is also up to 40 per cent more efficient at transferring heat than any glycol-based antifreeze on the market.

Viscosity affects how freely the coolant can flow through the cooling passages, the lower viscosity of Envirolife HD Coolant contributes to the increased cooling efficiency of the system.



A clean and rust free KTA 50 Cummins engine 28,000 hours after using the Total Coolants Envirolife Heavy Duty Coolant.

Compatible

Total Coolants Envirolife Heavy Duty Engine Coolant is suitable for a wide range of engine manufacturers, complying with a large number of performance levels, industry standards and specification requirements.

The product is compatible with all OEM system seals, hoses and plastic components, and satisfies the industry standard CEC elastomer compatibility test for oils and coolants.

Although Total Coolants Envirolife Heavy Duty Engine Coolant contains no ethylene glycol, the product is compatible with most factory-fill inhibited glycol or water-based engine coolants, allowing it to be used in a rationalised sense across a multifleet of engines.

Cost-effective

Total Coolant's proprietary and confidential organic acid technology (OAT) formulation uses an organic acid inhibitor with an extremely low depletion rate, providing complete and lasting protection for all cooling systems.

This technology offers excellent cavitation erosion protection without the need for supplemental coolant additives (SCAs), which significantly reduces maintenance costs and the need for ongoing repairs to the engine.

The phosphate-free technology also significantly reduces the development of hard water scale, and the low level of total dissolved solids improves water pump seal life and prevents gel formation.

The use of Total Coolants Envirolife HD has been proven to reduce engine coolant costs substantially over other water based conventional coolants, and is virtually maintenance free with no pre-charging or recharging of inhibitors required.

NON Flammable

Envirolife Heavy Duty Coolant is also non flammable, and records no fire or flash point.

Considering this safety aspect alone, makes Envirolife Heavy Duty coolant an obvious choice. It also mitigates a fire risk, particularly in an underground environment.

Using a non-flammable coolant is now high on many of Total Coolant's mining customers' priority safety list.

More information can be found at: www.totalcoolants.com.

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S O L V E LEAK PROBLEMS

ROOF RECOVERY™

Majority of roof leaks start with corrosion of box gutters flashings and penetrations and poor sealants are often applied over corrosion. Corrosion on exteriors and interiors can be treated including rusted purlins.

CCA specialise in turnkey roofing projects where Solarproof™ – a waterproofing and cooling membrane – is applied to entire roof areas to seal and cool buildings such as workshops, dongas, and food areas where air conditioners struggle. In any areas where heat stress is a challenge Solarproof™ will solve the problem.

Solarproof™ system has high UV stability and acts as an excellent protective coating in harsh environments where older roof areas have numerous issues, including high power consumption.

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DAMPIER SALT OPERATIONS

Administration building

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RAAF base Kimberley

Barrow island - accommodation units

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Better haul roads lower costs

NATIONAL

CLAYCRETE Global offers a unique end to end package when it comes to road haulage.

Claycrete Global provided advanced stabilisation product for clay bearing soils, and was supported by a team of experienced road pavement engineers.

The company believed that fully integrated solutions were the only way to guarantee the best possible outcomes for its clients.

When another company might provide a stabilisation product, Claycrete Global would also supply the engineers that designed it.

When another company would provide soil analysis, Claycrete Global would provide pavement designed to use local materials and fit the local environment.

Claycrete Global would also supply onsite support and construction assistance.

The company's services included designs that catered for GVM to 800 tonnes and speeds of up to 60kmph.

This package came with



Claycrete offers fully integrated road stabilisation solutions.

recommendations such as tyre advice backed by 35 years' experience, and quality tyres at competitive prices, backed by a global supply chain.

Claycrete Global believed that by fully integrating each aspect of road haulage, it was able to come up with solutions for pavement design with

purpose designed CBR that minimised rolling resistance on inclines and increased the rolling resistance on declines.

CHEMICAL SOIL STABILIZER



For over 20 years Claycrete Global has stabilized clay, gravel and limestone soils into strong, permanent, load-bearing and water resistant pavements.

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- Less maintenance
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Commercial & Industrial Engineering Service.

Metlabs was established in 2010 to meet the growing demand for non-destructive testing (NDT) throughout Western Australia.

We provide well trained, multi-disciplined technicians which means test methods can be carried out by any of them; reducing downtime for your company, inductions and site familiarisations.

Competitive pricing and efficiency with the ability to produce online reporting uploaded to a secure area of the Metlabs website allows you to review your results 24/7.

METLABS SERVICES:

- » **Non-Destructive Testing**
- » **Mechanical Testing**
- » **Pressure Equipment Inspections**
- » **Failure Investigations**
- » **Metallurgical Services**

Metallurgy

We specialise in a range of areas across processing, chemical or structural metallurgy and with the latest technology, training and equipment, we are capable of testing, inspecting and reporting on metal items and structures that range from tiny precision-made components to huge engineering parts.

To characterise and categorise the nature and probable causes of material and component failure Metlabs has both laboratory based and portable testing equipment.



Our electronic reports are prompt, detailed and informative reducing wait time and providing a thorough summary directly to the client.

Floor scanning

With the latest version of the computerised Floormap 3Di-R, Metlabs are highly experienced and capable of detecting defects on thicker materials while also having the ability to map topside and underside floor corrosion.

Upgraded magnets improve processing and analysis, and with a custom designed micro controller, new software and full statistics package this gives the tankage engineer a powerful, cost effective floor scanning tool.



Non-destructive testing

The best way to balance quality control & cost is allowing parts and material to be inspected and measured without damage. Metlabs use modern technology with the latest equipment to ensure fast, reliable results and is available for both shutdown and maintenance work.

METLABS SERVICES:

- » **Ultrasonic Testing (UT)**
- » **Magnetic Particle Testing (MT)**
- » **Penetrant Testing (PT)**
- » **Radiography (RT)**

Mechanical testing

Mechanical tests determine various properties of materials such as strength, hardness, ductility, toughness and corrosion resistance.

Metlabs offer onsite Metallurgical Testing including PMI, chemical analysis (XRF & OES), microstructure replication, hardness testing (Brinell and Leeb), surface roughness testing and ferrite measurements.

Conference to improve mine site rehabilitation



Mine Rehab 2019 focuses on more effective mined land rehabilitation.

NATIONAL

THE Best Practice Ecological Rehabilitation of Mined Lands (‘Mine Rehab’) conference series – organised in 2019 by the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) in conjunction with the University of Newcastle’s School of Environmental and Life Sciences – has been an invaluable forum for promoting best practice

approaches in the rehabilitation of mined lands.

In 2018, conference delegates were equally represented by academics, industry professionals and government officials.

The expected 300 delegates in 2019 would make Mine Rehab 2019 one of Australia’s largest conferences in this important and growing field.

The conference would include workshops at the University of Newcastle’s

NewSpace city campus on Wednesday 19 June, the conference proper at the Newcastle Exhibition and Convention Centre on Thursday 20 June, and mine site tours on Friday 21 June.

Mine Rehab 2019 would bring together mine rehabilitation stakeholders from all sectors to share current best practices and discuss what is done well, what could be done better, and what the future might hold for the industry.

The conference would be of interest to anyone with a professional interest in

mined land rehabilitation; government regulators involved in the mining sector, policy development and implementation; PhD, Masters and Honours students and graduates; established researchers; individuals and organisations representing the mining community and associated supply chains; and representatives from the broader community.

For more information, to submit an abstract, or to register, interested parties can visit www.minerehab2019.crccare.com.

9th Mined Land Rehabilitation Conference
Newcastle, NSW
19-21 June 2019
minerehab2019.crccare.com



Submit your abstract before 11 April



Lifting the load in the field

NATIONAL

MOST fitters will say that field repairs, without the help of forklifts, overhead cranes and other mechanical aides, are the most dangerous and taxing on the body.

On mine-sites the terrain can be rough and conditions not particularly conducive to safe work practices — particularly manual handling.

One of the most dangerous jobs in the field is belly plate removal.

Fitters rely on slings, pins and cummalongs to lower belly plates in order to gain access to other mechanical components on broken down machines.

Crush injuries and fatalities have occurred multiple times in Australia due to this exercise.

“Unfortunately, there’s still people out there getting hurt, and sadly fatal injuries have occurred from belly plates on dozers in our industry,” Peabody Wambo coal mine general manager Albert Scheepers said.

Thankfully there is a safer way - the Nivek Industries’ life-saving, innovative, remote controlled, Tracked Elevating Device (TED).

TED is a hydraulic, battery powered,



The Tracked Elevating Device (or TED) is an all-terrain belly plate jack – perfect for mine sites.

all-terrain belly plate jack, which allows the lifting and lowering of belly plates and other heavy components.

With the fitter at least 3m away from the danger zone, even if a slip occurred fitters remain out of harm’s way.

Thanks to a constantly developing range of smart attachments, TED is no longer restricted to helping remove and replace belly plates, and can now help take the weight of: track rollers, steer

cylinders, y-links, pumps, sumps, sound suppression, and cutting edges.

Even irregularly shaped objects are no issue to move around in tight spaces.

With the recent addition of a purpose-built TED Transport Trailer, it’s now even easier to get TED and attachments into the pit.

The trailer boasts stabiliser legs, easily accessible attachment bays, tie down points, spring assisted tailgate

ramp, guide rails and non-slip grip on the tailgate ramp, and an Australian made 1 tonne rated cargo net.

The TED Transport Trailer has been made to the highest mine spec and is perfect for contract fitters moving from site to site, or mines wishing to transport TED quickly and easily from workshop to pit.

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

Australian Made
Battery powered
Remote-controlled
Hydraulic
All-terrain
Tough
Versatile
Purpose built trailer available

Use TED on:
Belly plates
Cutting edges
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Track rollers



TED. Built TOUGH for field conditions.



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The equipment used to process onsite HDPE pipes is specially modified and comply with safety requirements.

Safer, cleaner and more efficient recycling

WA

POLY Pipe Recycling’s experienced team has been providing the mining sector with services in plastic collection and disposal for more than 20 years.

Due to plastic’s versatility, it was a common choice for mine site material (such as polyethylene pipes for water distribution) and once a mine site is

shut down, the removal of these plastic items became a corporate environmental responsibility.

Poly Pipe Recycling been working with mine sites all around WA for 20 years, providing services in the removal and recycling of plastic materials (such as high density polyethylene [HDPE] pipes).

The company’s comprehensive process ranged from collecting plastic waste to

manufacturing film wraps and reusable plastic resin (which is supplied to Australian plastic manufacturers to help support Australian business).

The team at Poly Pipe Recycling developed and implemented strategies that a) achieve the best environmental outcome and b) provide a cost neutral or viable solution for the recycling of recyclable waste.

Safety was a top priority and the team took all the necessary steps to ensure that each project was completed to an exemplary standard of safety - carefully considering the health and wellbeing of workers and complying with each site’s mine safety plan.

For more information on plastic waste removal can be found at: www.polypiperecycling.com.au.



PPR

POLY PIPE RECYCLING



Did you know that one tonne of recycled plastic saves 5,114 Kwh of energy, 16.3 barrels of oil, 98 million BTU's of energy and 30 cubic yards of landfill space?

More Recycling, Less Mining Waste

Western Australian owned, operated and based in the rural town of Dalwallinu, Poly Pipe Recycling handles the full resource recovery process of plastic materials.

Our mission is to provide eco-friendly solutions for mine sites, with a focus on preservation of natural resources.

We make it easy for mine sites to fulfil their environmental obligations by providing cost-neutral and viable solutions for the removal and disposal of plastic waste.

More than just Poly Pipe Recycling

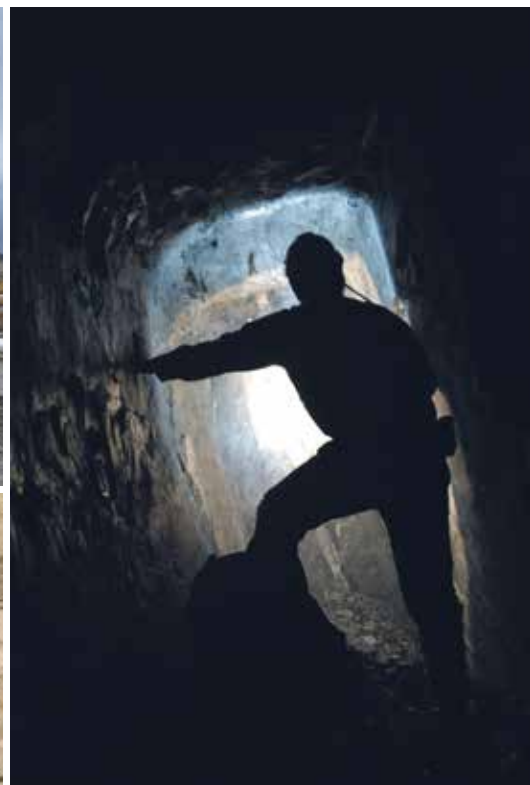
We collect and recycle not just poly pipe, but a range of other materials including IBCs, ventilation tubes, plastic drums, batteries as well as ferrous and non-ferrous metals.

We’re passionate about safety and as such, all processing equipment used by PPR is rigorously tested and specially modified to meet all safety requirements for mine site usage.



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 - Using our mobile head frames and winches or clients existing infrastructure, we can safely and efficiently repair high value mine assets
- **HORADIAM EXCAVATION**
 - Our method of progressive shaft opening via raise boring and Horadium techniques can be used in the excavation of new shafts and for the construction of large underground coal bins
- **EGRESS SYSTEM**
 - We have installed surface and underground ladders with complete lengths exceeding 300 metres and we can design, fabricate and install winder and Alimak based systems.

GEOSCIENCE AUSTRALIA RESOURCES DIVISION CHIEF

ANDREW HEAP

There's a lot to like about where Australia's 'critical minerals' industry is headed, with many mines already in development to capitalise on the growing battery and EV markets. However, there are still knowledge gaps when it comes to mineral processing and manufacturing that require further investigation. **Elizabeth Fabri** spoke with Geoscience Australia Resources Division chief **Andrew Heap** about opportunities for Australia on the back of the agency's recently released reports.

Q. Tell us about your background in geoscience and some career highlights to date?

I am currently chief of the Resources Division at Geoscience Australia with responsibility for energy and mineral, carbon capture and storage, and marine geoscience programs: a position I have held since September 2017.

I am a sedimentologist and geomorphologist by training, with additional qualifications in international business, having completed Bachelor of Science and Commerce and Master of Science degrees at the University of Auckland, followed by a PhD at James Cook University in Townsville.

I joined Geoscience Australia in 2000 and have had responsibility for leading its Energy and Marine and Coastal geoscience programs, prior to my current role.

Apart from the honour of now leading Geoscience Australia's programs to support Australia's resources sector, some career highlights include:

- Design of Geoscience Australia's current Exploring for the Future program, which is helping explorers target new mineralisation by imaging the deepest roots of mineral systems all the way through to the surface, and is employing many world-first techniques;
- Completion of a detailed assessment of Australia's geological carbon dioxide storage potential in highly prospective sedimentary basins;
- Establishment of the *National Offshore Petroleum Information System* to streamline industry access to Australian Government holdings of offshore petroleum exploration data; and
- Embedding geoscience as a criterion for designing Australia's system of marine protected areas.

Q. In March, Geoscience Australia released its *Critical Minerals* report, can you provide a brief run down on the main points people can take away from this?

The *Critical Minerals in Australia* report and previous reports by Geoscience Australia have identified the potential for Australia to produce a number of critical minerals either from existing mines, undeveloped prospects or new discoveries.

This potential exists through much of the country but is poorly understood and requires further investigation.

The report outlines a number of short, medium and long-term activities to best position Australia in this sector.

Australia has proven its ability to be an ethical and secure source of minerals, and therefore a smart and secure choice for investment.

Q. What are deemed critical minerals in Australia at present and why?



"More research is needed to understand the complete 'life cycle' of the critical minerals from their behaviour within ores through mineral processing and extraction to waste products."

To be classified as 'critical', a mineral must be both economically important to society and vulnerable to supply disruption.

One of the focuses of the *Critical Minerals in Australia* report is Australia's potential to become a major global supplier of minerals critical to 21st century technologies. In other words, minerals that aren't just critical to Australia but also countries around the world.

For example, the 'battery elements', including cobalt, lithium, and graphite, are essential to the manufacture and development of renewable energy systems and for electric cars.

Tellurium, gallium, indium, and rare-earth elements are key components of solar panels and wind turbines. Germanium is essential for electronic devices, especially screens.

Indium is a commodity with a currently small market size compared to that of many other critical minerals.

Indium is commonly recovered during the processing of zinc concentrates produced from zinc-lead mines, particularly from granite-related and volcanic-hosted massive sulfide deposits.

The main use of indium is in electronics, for example in the manufacture of TV monitors, as semi-conductors, in the manufacture of solar cells, and as a substitute for mercury in some uses.

Q. Many critical minerals are mined as by-products currently, is Australia well-placed to meet demand for these particular commodities?

Our leading expertise in mining and processing as well as extensive mineral

resources that are likely to contain critical minerals positions us well to become a major and secure global supplier of critical minerals.

If we are to reach our full potential, however, more work needs to be done. Many critical minerals are produced as by-products of the mining and processing of major commodities.

The *Critical Minerals in Australia* report indicates that there is an opportunity for Australian smelters and refineries to produce more critical mineral by-products. For example, a germanium and indium capability was recently added at the Risdon zinc refinery in Tasmania.

Processing is also a key issue when mining these materials – what further research and investigation is needed in this space?

The report indicates that there are a number of actions we can take to help Australia reach its full potential as a global supplier of critical minerals.

These include further mineral processing technology development and enhancing our manufacturing capability.

Currently, there is insufficient knowledge of critical minerals in Australian deposits and their behaviour during metallurgical processing.

More research is needed to understand the complete 'life cycle' of the critical minerals from their behaviour within ores through mineral processing and extraction to waste products.

Once this information becomes available, the potential volumes of critical minerals recoverable from ores, concentrates and wastes, will be quantifiable.

Q. Geoscience also recently released its latest report on Australia's Identified Mineral Resources (AIMR). What were the key findings here?

AIMR has been prepared annually by Geoscience Australia and its predecessors since 1975.

This gives us more than 40 years of data to draw on to outline trends in reserve and resource estimates and mine production in both the long and short term.

The latest edition of AIMR reaffirms Australia's reputation as a world-leading destination for investment in mineral resources.

Worldwide, we are a top five producer of 17 minerals including gold, iron ore, lead, lithium and zinc.

In 2017, Australia's mineral exports, excluding petroleum products, amounted to \$179 billion – 59 per cent of all export merchandise and 46 per cent of all goods and services.

It is not just us saying this. The results of the well-respected Fraser's Institute's 2018 annual survey of mining and exploration companies found that Australia was the second most attractive region for mining investment in the world, behind Canada.

Western Australia was ranked the second most attractive jurisdiction in the world for mining investment.

One of only two jurisdictions from outside of Canada and the United States to make the top 10.

The Australian Government is committed to ensuring Australia's resources sector remains strong and successful.

That is why it released in February this year Australia's National Resources Statement, with the vision to position Australia's resources sector as the world's most advanced, innovative and successful.

Q. Final thoughts?

By almost any measure, Australia is a world-leader in mineral resources. However, as I look to the future and consider how a successful resources industry will continue to support our way of life, whether it be through our modern telecommunications and energy systems, advanced manufacturing, or electric vehicles, it's important that we don't rest on our laurels in this highly competitive and diverse global industry.

I see opportunity for all levels of government, industry and academia, to harness our collective capabilities and wisdom and work constructively together to maximise Australia's potential from its vast mineral resources.

I look forward to working with all parts of the industry to ensure that resources remain part of Australia's DNA.



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