

# THE AUSTRALIAN MINING REVIEW

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FOCUS:  
TUNGSTEN

NEWS  
p18



WORTH ITS  
SALT

AUSTRALIAN  
POTASH  
p20



DR IAN DOVER  
METS IGNITED

IN THE SPOTLIGHT  
p62



## TESTING THE WATERS

Image: Anglo American. Photography: Geoff Brown.

The collapse of Vale's Brumadinho iron ore tailings dam in Brazil this year has put tailings and water storage facility management in the spotlight. Miners and industry groups were now working together to address challenges.

FEATURE p33

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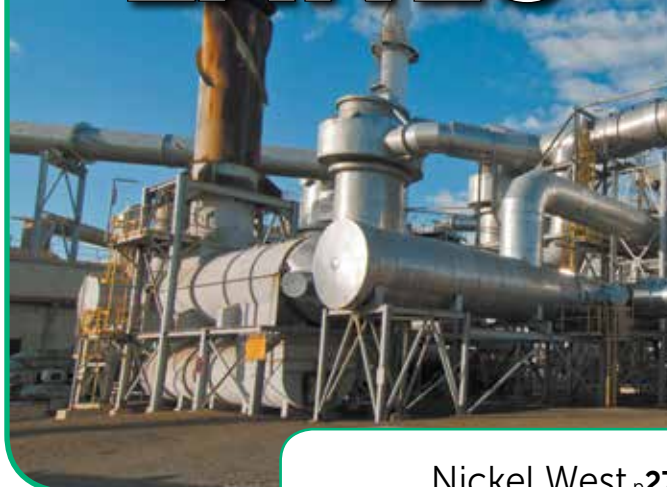
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## IN THE SPOTLIGHT:

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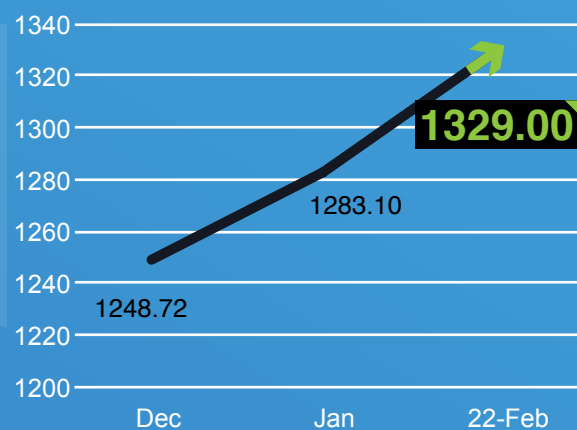
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# MAJOR COMMODITIES SNAPSHOT

## GOLD

\$US/oz

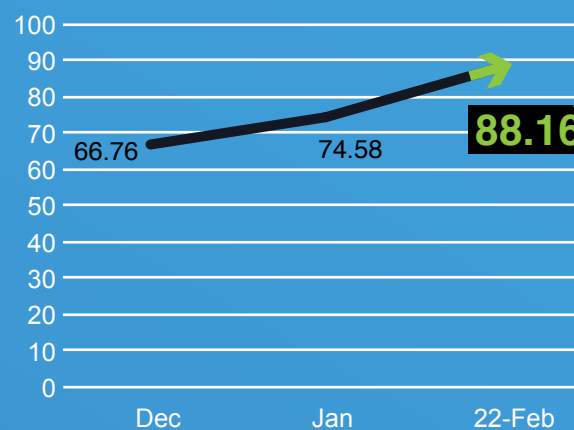
Gold prices climbed again through February, tipping over the \$US1300/oz mark amid optimism over US-China trade talks.



## IRON ORE

\$US/t  
62% Fe CFR China

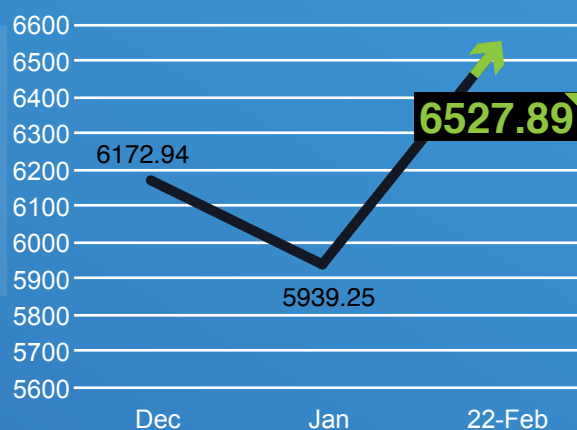
Iron ore prices are at their highest level in almost two years due to a supply disruption in Brazil; a consequence of Vale's fatal dam disaster.



## COPPER

\$US/t  
LME Price

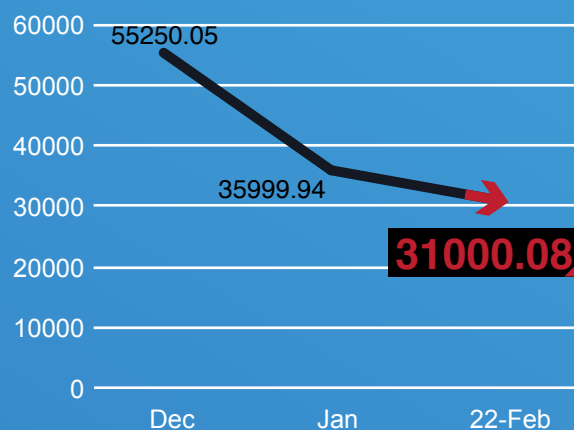
Copper prices drifted higher and hit a seven and a half month high late February on the back of low inventories.



## COBALT

\$US/t  
LME Price

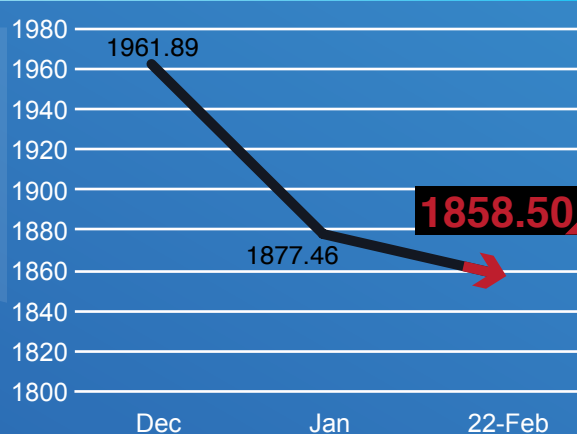
Cobalt spot prices continued to tumble through February, but analysts remain hopeful this drop will be short-lived.



## ALUMINIUM

\$US/t  
LME Price

Aluminium prices remained relatively volatile through the month, hovering between \$US1820/t and \$US1900/t.



## ZINC

\$US/t  
LME Price

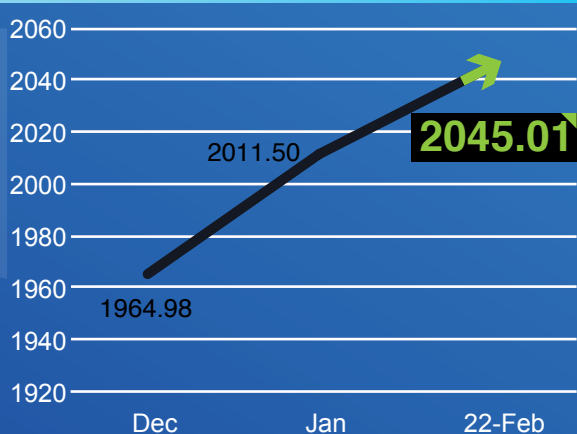
Zinc prices continued to rise over the month, amid environmental constraints and delays to new capacity in China.



## LEAD

\$US/t  
LME Price

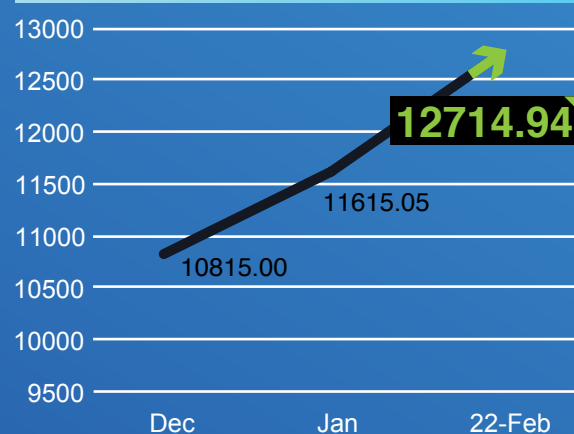
Lead prices saw some improvement towards the end of February, still holding firm over \$US2000/t.



## NICKEL

\$US/t  
LME Price

Nickel prices surged higher in February due to falling inventories that are believed to be at their lowest level since 2014.





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# Barrick considers Newmont merger

**ELIZABETH FABRI**  
INTERNATIONAL

BARRICK Gold has confirmed it is reviewing an opportunity to merge with global rival Newmont Mining in an all-share nil premium transaction.

Following various media reports, on 22 February Barrick issued a two sentence statement verifying the news, but assured “no decision has been taken at this time”.

The mining giants jointly owned the Kalgoorlie Consolidated Gold Mines (KCGM) venture, which operates the Kalgoorlie Super Pit, in WA.

Takeover talks followed an active six months of M&A in the gold space, including Barrick’s \$US6.5 billion acquisition of Randgold Resources in January.

In January, Newmont had also made a \$US10 billion offer to purchase Goldcorp, which was scheduled to close in the June quarter.

Barrick was currently the world’s largest gold producer, and if the Newmont/Goldcorp merger went through as planned, it was set to lose this title.

On 24 February, Newmont said that Barrick – which currently owned a small percentage of Newmont stocks – planned to propose amendments to bylaws to lower the ownership threshold needed to call a meeting



Barrick and Newmont jointly owned the Kalgoorlie Super Pit.

of Newmont shareholders from 25 per cent to 15 per cent.

The proposals would be made at Newmont’s next annual meeting of stockholders.

In a statement Newmont labelled Barrick’s bid as “unsolicited” and said it “does not intend to speculate about Barrick’s motivations or intentions and reserves all rights with respect to the shareholder proposals”.

Newmont had since issued a statement confirming it had received an acquisition proposal from Barrick, which was conditional on Newmont not proceeding with the proposed

combination with Goldcorp.

“Newmont has previously reviewed and rejected potential combinations with each of Barrick and Randgold Resources, prior to their merger,” Newmont stated.

“Newmont’s proposed combination with Goldcorp represents the best opportunity to create optimal value for Newmont’s shareholders and other stakeholders.

“Newmont’s board of directors intends to fully evaluate the Barrick proposal and respond in due course, including providing advice to its shareholders.”

On 25 February, Barrick chief executive Mark Bristow encouraged the merger with Newmont, which he said would “form the world’s best gold company with unprecedented potential for value creation”.

“The combination of Barrick and Newmont will create what is clearly the world’s best gold company, with the largest portfolio of tier one gold assets and the highest level of free cash flow to drive future growth and support sustainable shareholder returns, run by a management team with an unparalleled record of delivering value,” Mr Bristow said.

## Yancoal posts record profits

**EMMA DAVIES**  
NATIONAL

YANCOAL shares have surged by almost 30 per cent on the back of record 2018 results, including profit after tax of \$852 million.

Financial results released to the market late February revealed a record dividend of 28.55c per share, and debt reduction of \$US500 million.

On 26 February, the company’s share price had spiked to \$4 per share, up from \$3.18 a day prior.

Yancoal chairman Baocai Zhang said the company’s exceptional financial results were due to the continued, transformational growth driven by its tier-one assets.

“We have also raised new capital, expanded our shareholder base, and are about to pay our final dividend and special dividend with a total payout rate for 2018 of around 60 per cent,” Mr Zhang said.

“At the operational level, the integration of the acquired Coal & Allied assets of Hunter Valley Operations and Mount Thorley Warkworth is going well and operational synergies continue to be delivered ahead of expectations.

“We have fortified our position as a leader in the international coal market and returned the Yancoal Group to a position of market strength and financial health.”

The company was set to invest in new fleets and operational improvements across its low-cost, high-quality producing tier-one assets in Australia in 2019.

## Government releases resources plan

**EMMA DAVIES**  
NATIONAL

THE Federal Government has released its first National Resources Statement in more than 20 years; a move that is set to reinforce Australia’s position as a global leader in the resources sector.

The statement outlined how the Government would attract investment, develop new resources and markets, and share the benefits of success with more regional communities.

Federal Resources minister Matt Canavan said that the Government’s vision was to have the world’s most advanced, innovative and successful resources sector, which would deliver sustained prosperity and social development for all Australians.

“By 2030, Asia will produce more than half the world’s economic output, consume 40 per cent of its energy and be home to a middle class of almost 3.5 billion people,” Mr Canavan said.

“Given this growth, and if Australia can maintain its global share of commodity production, at least 24,000 new direct mining jobs could be created.”

The statement included a five point action plan which highlighted key areas including delivering the most globally attractive and competitive investment destination for resources projects; opening up new industries and resources regions; a better focus on the sector’s innovation, research and development on long-term, sectoral growth; developing and retaining the world’s best workforce; and delivering better outcomes for stronger and more engaged communities.

The Federal Government would also work in conjunction with the States and Territories through the COAG Energy Council to establish a new critical minerals work program to boost exploration, develop a data strategy to de-risk investment decisions, and build community confidence in the sector.

*Image: Minerals Council of Australia.*



Federal Resources minister Matt Canavan launched the statement at the Minerals Council of Australia 2019 Minerals Week breakfast.

“Our resources sector makes up eight per cent of our economy and exports are predicted to reach a record \$250 billion in 2018–19,” Mr Canavan said.

“It also employs around 1.1 million people directly and indirectly and is the largest employer of Aboriginal and Torres Strait Islander people.

“This National Resources Statement will help keep us at the top of our game and pave the way for decades of prosperity for all Australians.”

Association of Mining and Exploration Companies (AMEC) chief executive Warren Pearce welcomed the statement, which built on the recommendations of the Resources 2030 Taskforce commissioned by the Government last year.

“These priorities and initiatives identified by the Government are all recommendations in AMEC’s Federal Policy Platform; we are pleased to see Government listening to our industry, in particular the pragmatic recommendations of the Resources 2030 Taskforce,” Mr Pearce said.

Queensland Resources Council (QRC) also applauded the release.

“To make the most of our resources diversity and opportunities, all levels of Government must work together to ensure stable and consistent regulation, as well as support for new investments from the North West Minerals province, to the Bowen and Surat basins and the Galilee Basin,” QRC chief executive Ian Macfarlane said.



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## IN BRIEF

### South32 announces new chair

#### WA

FORMER BHP executive Karan Wood has been named as the new chair elect of South32's board of directors, succeeding chairman David Crawford on 12 April.

"I am delighted that Karen has been elected as my successor," Mr Crawford said.

"Her experience in strategy and governance, and her legal and people skills, position her well to lead the board.

"Karen has a wealth of industry knowledge, a deep understanding of the business and is an excellent choice for the role."

Ms Wood worked for BHP for four years and has been an independent non-executive director of South32's board since November 2017.

### Hellyer achieves first shipment

#### TASMANIA

TASMANIA's Hellyer gold mine has delivered its first shipment of silver, lead, gold concentrate from the port of Burnie.

Following the commissioning of the Hellyer tailings reprocessing facility on Tasmania's west coast, it's the first of a total annual shipment of more than 36,000 tonnes each year for the next decade.

"The first product shipment proves the technical and commercial viability of the Hellyer reprocessing project," Hellyer gold mine director Steve White said.

"We are delighted with the progress of the project and the enthusiastic support we have received in Tasmania.

"It's a great place to do business at present."

### Land court rejects Rocky Hill

#### NSW

THE NSW Land and Environment Court has determined Gloucester Resources' application for its Rocky Hill coal project in the Hunter Valley "should be refused", claiming the proposed mine would have "significant" and "adverse" social and environment impacts.

The Rocky Hill project would have comprised an open cut mine with a 21mtpa capacity over a 16-year mine life.

Gloucester had been developing the project for almost a decade, with exploration beginning in 2010.

"The construction and operation of the mine, and the transportation and combustion of the coal from the mine, will result in the emission of greenhouse gases, which will contribute to climate change," the court stated.

# Victoria's minerals industry: prosperity beyond 2019

#### MEGAN DAVISON

#### MCA EXECUTIVE DIRECTOR — VICTORIA

FROM its 1850s gold rush beginnings to the digital 21st century, Victoria's minerals industry remains an integral part of the State's social and economic fabric.

Today's industry extended beyond gold mines in Central Victoria to coal operations in the Latrobe Valley, the nation's only antimony mine, and world-class copper and mineral sands projects across the State.

State-based exploration had tripled in recent years, and Victoria's rich mineral endowment made it highly prospective for gold, base metals including copper, and mineral sands discoveries.

Early stage lithium exploration was also occurring in the State's east.

Melbourne was a global centre for mining services and home to major mining companies.

Victoria also served as a national hub for mine equipment, technology and services (METS) sector exports with strong manufacturing and engineering capabilities in Melbourne and the regional centres of Geelong, Ballarat and Bendigo.

The sector provided 121,000 direct and indirect jobs, and its economic contribution to Victoria was estimated at \$13.6 billion.

Many elements would need to come together to ensure the Victorian minerals industry will be capable of continuing its legacy of contribution to the State's prosperity.

A healthy pipeline of resource projects underpinned long term viability: increasing the quality and quantity of mineral discoveries was essential.

Complementing this pipeline must be predictable, long term and responsive policy and regulatory settings which attract investment.

Government policy settings mattered



Image: Fosterville mine.

Gold at the Fosterville mine in Victoria.

because Victoria cannot take mineral prospectivity for granted.

Efforts to streamline, enhance and modernise the existing legislative framework should be prioritised.

When combined with a well-resourced and competent regulator, initiatives which minimise red tape, reduce the regulatory burden and deliver a risk-based, outcomes-focussed legal regime would position the industry, and accordingly the communities in which it operates, for ongoing success.

Access to land for both exploration and minerals development was fundamental.

Mineral resources were owned by the Crown and it was understood that the right to land access was earned by demonstrating responsible land and environmental stewardship.

Protecting the environment, investing in communities, delivering socio-economic benefits and facilitating regional development was paramount for maintaining the Victorian minerals industry's social licence to operate.

Mandalay's Community Hub showcased this commitment.

Mandalay had also partnered with local conservation volunteers to rehabilitate degraded farmland and develop community wetlands.

In the Bendigo region, Kirkland Lake's Fosterville gold mine employed more than 550 people from the surrounding community, delivered about \$200 million in benefits to the local area annually, and had a long history of environmental rehabilitation.

In the Latrobe Valley, EnergyAustralia's rehabilitation program at Yallourn Mine was more than 20 years old.

Planned final landforms included grasslands, woodlands and wetlands, as well as a pit lake interconnected with local rivers.

Some 25,000 Strzelecki gums had been planted, which contributed to habitat for locally significant koala populations, and within a constructed wetlands development, more than 140 bird species had been recorded over the past decade.

Demonstrating modern, responsible mining practices fostered trust.

Genuinely engaging with stakeholders – employees, indigenous peoples, local communities, regulators, wider civil society – would ensure the industry continued to build relationships based on mutual respect.

Prioritising, and progressing these priorities and behaviours, would also ensure a strong, robust and sustainable resources sector that would benefit all Victorians.

More information can be found at: [www.minerals.org.au/mca-victoria](http://www.minerals.org.au/mca-victoria).

# Hancock makes bid for Riversdale

#### EMMA DAVIES

#### NATIONAL

GINA Rinehart's Hancock Corporation has announced an all-cash offer to acquire all of the ordinary shares in Riversdale Resources, in which Hancock does not already have a relevant interest.

Riversdale is an Australian coal development company with assets in the Crowsnest Pass Complex in Alberta, Canada, including the Grassy Mountain project.

Hancock had offered a price of \$2.20 per share and would increase the offer price to \$2.50 per share (totalling a bid of almost \$600 million) if Hancock's shareholding in Riversdale reached more than 50 per cent on a diluted basis before the close of the offer.

This would offer a 47 per cent premium to the weighted average subscription price of \$1.70, under which Hancock acquired its current shareholdings in August and September 2018, and would mean a 43 per cent premium to the \$1.75 maximum subscription price for any new share issued by Riversdale during the last 12 months.

If Hancock achieved a shareholding of not more than 50 per cent on a diluted basis then the \$2.20 per share offer would represent a



Image: Hancock Prospecting.

Hancock Prospecting chairman Gina Rinehart has her sights set on Riversdale's Canadian assets.

29 per cent premium to Hancock's average previous subscription price, and a 26 per cent premium to the maximum new issuance price during the last 12 months.

"On behalf of Hancock Prospecting and Hancock Corporation, we are delighted to provide the shareholders of Riversdale with this all cash offer," Hancock Prospecting executive director Jay Newby said.

"The directors of Hancock consider that its premium pricing and low conditionality make

it a compelling opportunity for Riversdale shareholders.

"All shareholders are encouraged to accept the offer at their earliest opportunity."

Given Riversdale was unlisted, Hancock's offer provided all Riversdale's shareholders a rare opportunity to sell their shares at a compelling cash price.

Hancock Prospecting currently held 19.8 per cent of Riversdale's issued shares.



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## IN BRIEF

### Exploration tenders approved

#### QLD

QLD Natural Resources, Mines and Energy minister Dr Anthony Lynham announced new minerals and coal tenders in the State's world-leading North West Minerals Province, including the Bowen and Surat basins.

Junior explorer Red Metal Limited would search for zinc, lead, copper and silver deposits across 400sqkm of land, 250km north of Mount Isa.

Additionally, Denham Coal, Queensland Coal Investments, Enx Togara and Wandoan Holdings would commence exploration over 369sqkm of land in the region.

"Unlocking land for resource exploration – whether it is to uncover coal, gas or minerals – is vital to continuing resource development," Dr Lynham said.

### Targets defined at Lake Mackay JV

#### TAS

PRODIGY Gold and JV partner Independence Group have defined 63 AEM targets that require further investigation at the Lake Mackay project in the Northern Territory.

Prodigy managing director Matt Briggs said the airborne survey had taken more than six months to complete and he was "excited to see the imminent commencement of drilling of these targets".

"An RC drilling program of 9600m is planned to commence early Q2 2019," he said.

"In previous drilling at the Grapple prospect, similar EM conductors have been associated with high-grade gold and base metal mineralisation."

### Antipa drills Paterson province

#### VIC

ANTIPA Minerals is set to commence a 20,000m drilling program at its 100 per cent owned Paterson province tenements in early April.

The company would systematically evaluate greenfields targets that may deliver large-scale discoveries based on Telfer, Winu, Havierson and Nifty analogues and the broader gold-copper potential within the El Paso Corridor, as well as evaluate additional opportunities for high-grade gold mineralisation from brownfields prospects at the Pajero and Triangle areas.

"The 2018 and 2019 aerial electromagnetic (AEM) targets will be systematically evaluated this year with the aim of making a world-class discovery in Western Australia's underexplored Paterson Province," Antipa managing director Roger Mason said.

# Bellevue completes \$20m raising

Image: Bellevue Gold.



Bellevue struck a bonanza grade zone at its namesake project.

#### GERARD MCARTNEY WA

BELLEVUE Gold has raised \$20 million in funding to put towards its namesake gold project in WA.

Funds obtained through the 37 million share placement would be used for ongoing exploration and general working capital purposes.

On 5 February the company revealed a 47 per cent increase in its inferred resource estimate to 1.53 million ounces at 11.8 grams per tonne of gold.

Another resource expansion upgrade was due in the second quarter of 2019.

"We are now fully funded to undertake drilling activities at Bellevue for the next 12 months," Bellevue Gold managing director Steve Parsons said.

The company's share price had tripled since September 2018 and, with a market capitalisation of \$274 million, it was already larger than some active gold producers.

The Bellevue project was one of Australia's highest grade gold discoveries, comprising the Viago Lode, Western Corridor and Bellevue Surrounds targets.

"The company is delighted to announce a further substantial resource upgrade at the Bellevue gold project," Mr Parsons said.

"The exploration team had discovered and delineated in excess of 1.5 million ounces of high-grade gold in just over 12 months since resource drilling commenced.

"The company believes there is significant scope for expansion of Bellevue shear hosted lodes as well as previously untested hanging wall lodes identified in recent drilling.

"Drilling is currently underway to test these targets with approximately 10,000 metres of drilling planned into the Bellevue min surrounds in the next three months."

# Honeymoon period just beginning

#### EMMA DAVIES SOUTH AUSTRALIA

BOSS Resources has updated its mineral resource estimate for its 100 per cent-owned Honeymoon uranium project in Broken Hill, near the border of South Australia and NSW.

The updated mineral resource for the Honeymoon re-start area included the Brooks Dam, Honeymoon and East Kalkaroo deposits, and totalled 24 million tonnes (mt) at 660 parts per million (ppm) uranium oxide for 36 million pounds (mlbs) uranium oxide, using a cut-off grade of 250 ppm.

This represented an overall 30 per cent increase in metal mass from the previously-reported mineral resource estimate, and a 149 per cent increase in measured and indicated status, totalling 27mlbs at 690ppm uranium oxide.

The resulting effect on the Honeymoon project's combined mineral resource was an increase of 13 per cent to 52.4mt with an average grade of 620 ppm uranium oxide for 71.6mlbs at a 250ppm cut-off.

"Today's announcement provides further validation that Honeymoon is one of the few uranium projects worldwide positioned to participate in the early stages of a new bull market," Boss Resources managing director Duncan Craib said.

"A 30 per cent increase in mineral resource, covering a fully permitted mining licence ML6109, which is supported by an export



Image: Boss Resources.

Boss Resources has lifted the resource at its Honeymoon project.

license, will help fast-track the re-start of uranium production and facilitate offtake arrangements.

"We believe Honeymoon's global uranium endowment will increase through future exploration activity on our surrounding 100 per cent-owned tenements."

The company had already begun an exploration strategy designed to further increase the resource, including a short orientation survey of ground-based gravity over selected parts of the East Kalkaroo, Brooks Dam and Jason's deposits in

December 2018.

Boss Resources' geology team would finalise the 2019 exploration strategy by assessing additional cost efficient and effective geophysical alternatives to reduce the risk inherent in drilling under-explored areas.

The Honeymoon project currently had a combined exploration target of between 32mt and 78mt at a grade of 450 ppm to 1400 ppm eU3O8 (potential metal endowment of between 42 Mlbs and 100 Mlbs of contained uranium).





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## IN BRIEF

### BHP awards South Flank deals

#### WA

IRON ore giant BHP has awarded another set of contracts for its South Flank project under construction in the Pilbara.

In February, Monadelphous won a \$108 million contract to complete structural, mechanical, piping, electrical and instrumentation works associated with the project's outflow infrastructure.

"BHP has been one of our core customers, for both construction and maintenance projects, for more than 20 years," Monadelphous managing director Rob Velletri said.

"We are looking forward to partnering with them on this strategically important project."

In addition, Clough was awarded a contract to construct the ore handling plant, including interconnecting conveyors and transfer stations.

### OZ Minerals hands out EPC contract

#### SOUTH AUSTRALIA

OZ Minerals has awarded a \$16.3 million engineering, procurement, and construction contract to Perth-based GR Engineering to design and build a Northern Wellfield at its Carrapateena project in South Australia.

The scope of work included detailed design, survey, supply, transportation, construction, testing and commissioning for the development of the trunkline and transfer pumping stations associated with four wells to enable water to be supplied to the processing plant, currently under construction.

"The award of this work demonstrates GR Engineering's credentials in the supply of process infrastructure and performance of ancillary project works on a turnkey basis," GR Engineering managing director Geoff Jones said.

### Civmec, BGC nab Albemarle work

#### WA

CIVMEC has secured a contract at Albemarle's Kemerton lithium hydroxide plant in WA's south-west.

The project, approved in late 2018, included three 20,000 tonne per annum production trains, with a potential further expansion to five trains.

Under its contract, Civmec would be in charge of structural, mechanical and piping for the Hydromet and final product, reagents and utilities.

Fabrication would commence immediately, with site works to begin in the next few months and continue until March 2021.

On 21 February, BGC Contracting also announced it had snapped up an earthworks construction contract at the plant, which it began in January.

# NRW acquires RCR Mining

EMMA DAVIES  
NATIONAL

NRW has completed its acquisition of RCR Tomlinson's RCR Mining and RCR Heat Treatment businesses after the company went into voluntary administration late last year.

Almost 300 employees at RCR's Welshpool, Bunbury and Victorian locations received offers of employment with NRW to ensure a quick transition and minimal disruption to clients.

Perth-based administrator and McGrathNicol partner, Rob Brauer said the acquisition was a great outcome and secured the future of much of the original RCR Tomlinson business that was established more than 100 years ago.

"The sale ensures the RCR name remains prominent in the WA market and provides continuity for RCR customers, as they will continue to be serviced by the same expert RCR teams," Mr Brauer said.

NRW's managing director and chief executive Jules Pemberton said the company was pleased to acquire RCR Mining, especially its RCR Mining Technologies division which was recognised in the global market as a leading original equipment manufacturer (OEM) and innovative materials handling designer with an extensive product range.

"This acquisition delivers a complementary business to NRW and aligns with NRW's strategy to broaden

Image: NRW.



NRW has picked up RCR's Mining and Heat Treatment businesses.

the service offering to Tier 1 clients at a time of improving market sentiments," Mr Pemberton said.

"Since the announcement, NRW has received very positive engagement from clients who recognised the quality of the RCR Mining Technologies business and its people, together with the benefits the combination with NRW brings to their project objectives."

The acquisition of RCR Mining was earnings accretive with the purchase consideration of \$10 million (subject to

certain completion adjustments) being funded from NRW's existing cash reserves.

The deals followed the sale of RCR's rail businesses to John Holland earlier that month, along with its energy services business to The Environment Group, and laser cutting business to Perth-based Unique Metal Works.

AvidSys Group had since snapped up the remaining parts of RCR's WA operations, including its resources, power and Water West businesses.

## PYBAR wins Cowal underground contract



The Cowal open pit, 350km west of Sydney.

ELIZABETH FABRI  
NSW

PYBAR has been appointed to complete the underground exploration decline development and diamond drilling at Evolution Mining's Cowal gold mine.

The underground expansion, approved back in October, would include construction of the Galway-Regal-e46 exploration decline, and further resource definition and discovery drilling of the deposit, which had a Mineral Resource of 5.9 million tonnes at 3.17 grams per tonne for 603,000 ounces of gold.

The work was anticipated to cost between \$20 million and \$22 million over FY19 and FY20, with a further \$7 million expected to be spent on an initial 36,000m drill program.

PYBAR said it was now recruiting locals for the 12-month project, which would begin in early March.

"This contract further strengthens our position in the Eastern seaboard following the announcement of our contract at Peak Mine late last year," PYBAR chief executive Brendan Rouse said.

"We look forward to working closely with the Evolution team to support their

development requirements."

Cowal general manager Craig Fawcett said he and his team also "looked forward to working with PYBAR to deliver the project effectively".

"This development is an important component of achieving our objective of producing 300,000 ounces per annum at Cowal," Mr Fawcett said.

Cowal – Evolution's flagship mine – currently had a mine life through to 2032, with a subsequent expansion in the works to increase the plant processing rate by 31 per cent from 7.5 million tonnes per annum (mtpa) to 9.8mtpa.





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# CSIRO develops smelting process

ELIZABETH FABRI  
NATIONAL

CSIRO has pioneered a new smelting process that can produce soluble phosphate for fertiliser from low value ores.

The PyroPhos process was designed to eliminate hazardous waste, and offer a simpler, safer and more efficient alternative to traditional phosphate processing which included a wet acid process.

CSIRO team leader Keith Barnard said the process emerged following decades of research, and would be exclusively licensed to Process Capital subsidiary PyroPhos.

"The PyroPhos smelting process uses high temperatures to extract phosphate from ores, producing prized phosphate feedstock and a glassy gravel that can be used in road base construction and Portland cement," Dr Barnard said.

"A major benefit of the process is that it can be used on lower grade ores giving phosphate miners and processors the opportunity to increase their productivity in an environmentally sustainable way."

PyroPhos director Mark Muzzin described the innovation as a "unique technology offering in the soluble phosphate fertiliser market".

"Our networks and investor base give us



The smelting process is based on the award-winning SiroSmelt innovation.

the ability to connect PyroPhos technology to the global phosphate industry," Mr Muzzin said.

"We have had an excellent response from the industry and believe it has the ability to



Image: CSIRO.

The PyroPhos process produces a non-toxic glassy gravel (slag) waste product which can be used in road base.

make a major impact."

Demand for phosphate was expected to increase in coming years, as a growing global population put pressure on the food supply chain.

PyroPhos had plans to market the technology in up to 30 countries, including China, Morocco, the US, Russia and Jordan, which were the largest phosphate producers.

## Ava and Mining3 enter partnership

GERARD MCARTNEY  
NATIONAL

AVA Group has entered into an agreement with Mining3 to roll out its "revolutionary" automated conveyor monitoring solution that has the ability to pre-empt failure, and generate time and cost savings for miners.

According to Mining3, managing conveyor maintenance was currently a significant daily problem for miners, and conventional methods were often unreliable, hazardous, time-consuming and labour intensive.

Under the deal, Mining3 would help commercialise Ava Group's Aura IQ technology, which was on track to launch soon.

Mining3 chief executive Paul Lever said its focus remained on accelerating the research and development process to deliver breakthrough technology for its members and the global mining industry.

"The new development and commercialisation partnership with the Ava Group facilitates this outcome and ensures the industry benefit from much-needed advancements in technology," Mr Lever said.

Ava Group extractives and energy head Andrew Hames described the opportunity as "transformational" for the industry.

"Mining companies are striving to realise the full benefits of evolving digital capabilities to enhance improvements in productivity; including looking at ways of using data more effectively to improve asset management, reliability and introduce predictive capability," Mr Hames said.

## Mining the moon research underway

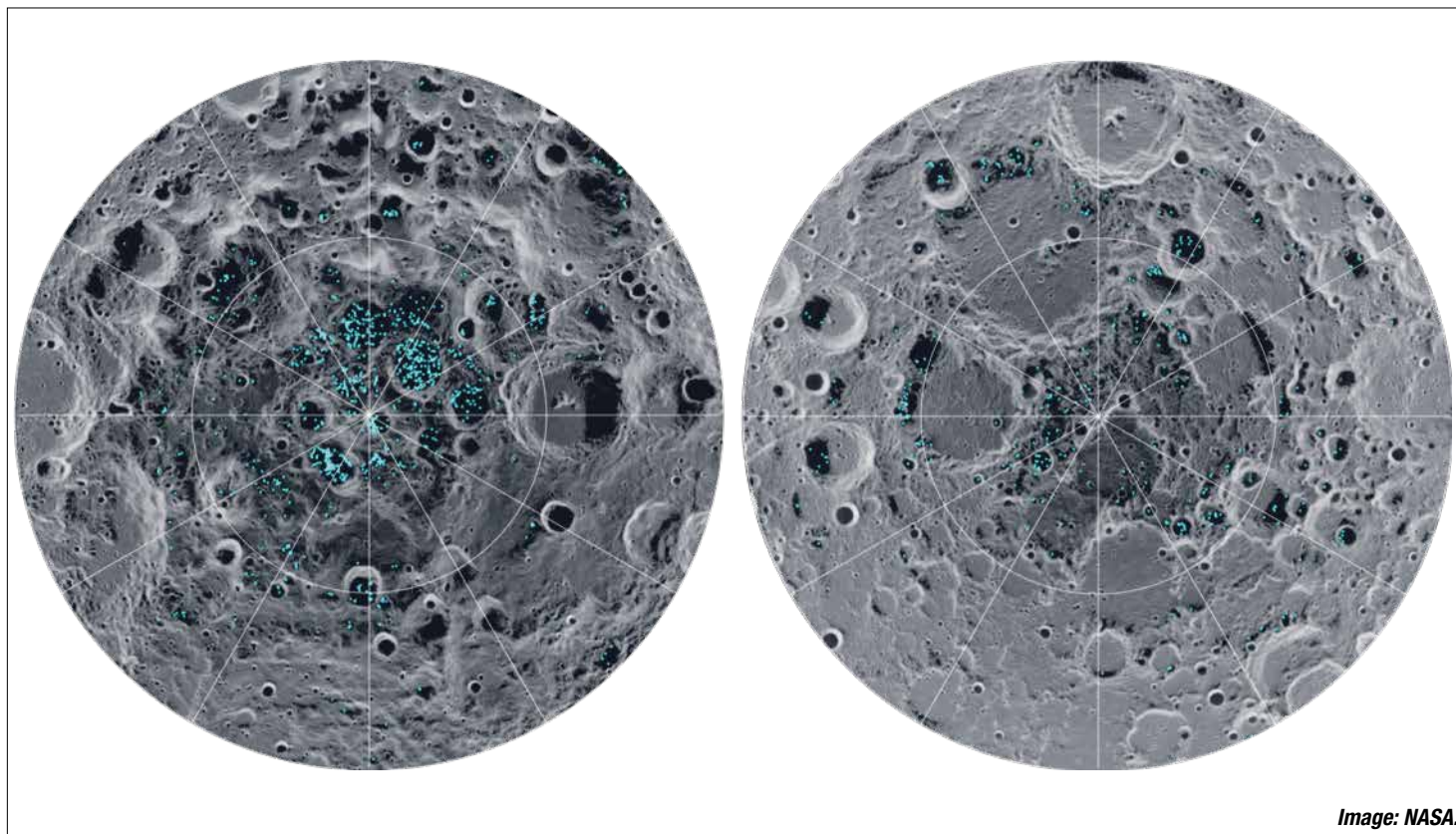


Image: NASA.

The lunar icecaps confirmed in 2018.

GERARD MCARTNEY  
INTERNATIONAL

A GROUP of UNSW engineers are working to assess the commercial viability of mining beyond earth on the moon.

The news followed an announcement made by NASA in August 2018, which confirmed the moon's poles contained significant quantities of ice.

This discovery opened the door for scientists and mining companies to explore the possibility of mining moon ice and processing it into rocket fuel and water for agriculture and human consumption.

UNSW Australian Centre for Space Engineering Research director Andrew

Dempster believed Australia was in a unique position in the global industry because of its mining experience.

"Australia has a natural advantage for off-earth mining – we have some of the very best mining research, technology and automation tools in the world, and the largest mining companies," Dr Dempster said.

Mining moon-ice and converting it to rocket fuel would significantly cut the costs associated with space exploration, and there would be long term possibilities for mining moon ice to growing plants, distil water for human consumption and producing oxygen which, ultimately, would open up the possibility of a lunar colony.

While the global space industry was

expected to grow to more than \$1 trillion in the next 20 years, there were still some terrestrial concerns and perceived risks.

Working with UNSW mining expert professor Serkan Sayaman, Dr Dempster was developing credible evidence that mining water from the moon could be commercially viable by showing that it was possible to create the machinery, energy resources and communications required to start a project that has positive investment returns.

"Once we prove that the technology exists and major risks can be mitigated, I expect that mining companies will see the commercial potential for this sort of venture and put some dollars toward making it a reality," Dr Dempster said.



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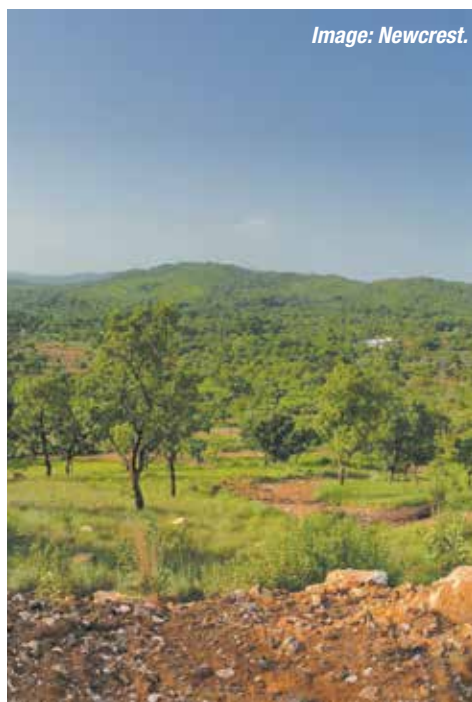


Image: Newcrest.

The Séguéla project in Côte d'Ivoire.

## Newcrest sells Séguéla to Roxgold

GERARD MCARTNEY  
CÔTE D'IVOIRE

ROXGOLD has agreed to acquire Newcrest's Séguéla project and regional tenements in Côte d'Ivoire for \$US30 million.

The Canadian company would pay Newcrest \$US20 million up-front and a deferred payment of \$US10 million following first gold production.

The completion of the transaction was expected in the June 2019 quarter, subject to the approval of Côte d'Ivoire's mining minister, and the renewal of the Séguéla exploration permit.

The Séguéla project was an advanced exploration project on the near-surface Antenna gold deposit, and would become Roxgold's second West African project.

Newcrest managing director Sandeep Biswas said the move to sell Séguéla was strategic.

"This outcome delivers value for Newcrest shareholders and provides what we believe to be the best way to maximise the potential of the asset for the benefit of our local employees, communities and Côte d'Ivoire," Mr Biswas said.

Newcrest would continue its exploration in Côte d'Ivoire through its 50 per cent exploration joint venture with Barrick Gold.

Roxgold said it believed Séguéla had near term development potential because of the Antenna deposit, which had an inferred resource of 5.8 million tonnes at 2.3 grams per tonne of gold for 430,000 ounces.

The company said that the project was potentially "open pit" and close to an existing power grid, transport and water resources.

Roxgold chief executive John Dorward said that the acquisition would provide an additional resource upside and a meaningful addition as a key second asset.

"Rarely does such a large and carefully assembled land package become available from one of the world's leading gold producers," Mr Dorward said.

## Glencore caps coal production



Image: Glencore.

EMMA DAVIES  
INTERNATIONAL

AFTER pressure from investor signatories of the Climate Action 100+ initiative, global miner Glencore has announced its decision to cap coal production at current levels.

In a statement, the Swiss-based coal giant said that it recognised climate change science as set out by the United Nations Intergovernmental Panel on Climate Change, and realised it had a key role to play in enabling transition to a low carbon economy.

"To deliver a strong investment case to our shareholders, we must invest in

assets that will be resilient to regulatory, physical and operational risks related to climate change," Glencore stated.

"To meet the growing needs of a lower carbon economy, Glencore aims to prioritise its capital investment to grow production of commodities essential to the energy and mobility transition and to limit its coal production capacity broadly to current levels."

Commodities of focus included copper, cobalt, nickel, vanadium and zinc.

Glencore – which was Australia's largest coal miner – would 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.

The company also said it would re-assess whether its membership in relevant trade organisations might undermine its support for the Paris Agreement and goals.

The news also followed Glencore's acquisition of several Rio Tinto coal assets last year, including 49 per cent of Rio Tinto's Hunter Valley Operations (thermal coal), an 82 per cent of Rio Tinto's interest in the Hail Creek (mainly coking coal) mine, and 71.2 per cent interest in its undeveloped Valeria thermal coal project.

Glencore's 2019 global production guidance was set at 145 million tonnes, across its Australian, South African and Colombian.

## Black Rock a step closer to production



Image: Black Rock Mining.

GERARD MCARTNEY  
TANZANIA

BLACK Rock Mining has been granted two contiguous mineral licences to begin development of the Mahenge graphite mine.

Mahenge Resources, Black Rock's 100 per cent owned Tanzanian subsidiary, announced it was granted the licences by the Tanzanian ministry of minerals on 26 February, which complemented the environmental permit awarded to the company on 5 September 2018.

The Mahenge project was expected to have a 32-year mine life, capable of delivering up to 250,000 tonnes per annum of 98.5 per cent graphite concentrate.

Black Rock delivered its scoping study in March 2016 and, in June 2016, produced the world's first 99.1 per cent TGC purity by lab flotation.

In May 2018, the company produced a world-first 99 per cent purity from its pilot plant.

Black Rock chief executive John de Vries said that the licences were a significant milestone not just for the progression of the project toward production, but also for the company's social licence.

"Licencing gives all stakeholders comfort that Tanzania wants this project to be developed. Licences is the final step in allowing us to obtain financing to construct the mine," Mr de Vries said.

Black Rock produced eight tonnes of

concentrate from its 90 tonne pilot program that it sent to 24 international customers that would work with the product and validate the quality.

"We remain convinced this is the most compelling graphite development project globally," Mr de Vries said.

"[It is] the only project capable of delivering a concentrate grade of over 99 per cent without the use of acid, the second largest graphite reserve supporting a 32-year mine life at 250,000 tonnes per annum with a study underway to increase this."

"Our next steps are to close out ongoing financing discussions and to complete the detailed engineering to enable the commencement of construction."





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# TAKING SHAPE

**Demand is beginning to pick up for tungsten as China – the world’s largest producer and consumer – begins to scale back production, leaving Australian near-term producers in the box seat. We chat with Australian explorers Tungsten Mining and Thor Mining about their respective projects, and outlook for the year ahead.**

Wet tabling of scheelite from Mulgine Hill to produce a bulk sample of tungsten concentrate (under UV light).  
All images: Tungsten Mining.

## ELIZABETH FABRI

TUNGSTEN is one of the lesser-known commodities, but its reach extends to a number of modern electrical applications, including the vibration device in our mobile phones.

The strongest natural metal on earth has been predominately mined in China, and Europe, up until now, and used in the manufacturing sector for machine tools, a toughener in steel alloys, as well as in ammunition and armour.

Yet despite its varied uses, the commodity had experienced a period of volatility over the last 10 years, including two significant lows in 2009, and 2015/16.

Demand was expected to increase modestly, though, according to Tungsten Mining chief executive Craig Ferrier.

“A sustained recovery took shape in mid-2017 with tungsten being one of the best performed metals through that year and into 2018,” Mr Ferrier said.

“The benchmark price for tungsten, ammonium paratungstate (APT) reached a four-year high of \$350/mtu (mtu is 10 kg of metal) in June 2018 with improving demand and tight supply amid environmental inspections in China cited as key drivers for the price increases.

“The APT price softened through the back end of last year and into 2019, but market analysts remain optimistic for price improvement as demand and supply re-balance post the Chinese New Year.”

Tungsten Mining has a portfolio of tungsten projects in Australia at various stages of development, including its flagship Mt Mulgine project in WA, followed by Big Hill and Kilba also in WA, the recently acquired Watershed project in QLD, and a potential acquisition of the Hatches Creek project in the Northern Territory.



Diamond core with scheelite (tungsten mineral) fluorescing under UV light.

Mt Mulgine was Tungsten Mining’s most advanced project, with a detailed review underway, which would allow for a decision on the production schedule, scale of activities and additional study work required to deliver the development.

Mr Ferrier said the market was looking well balanced for tungsten over the next few years, with new supply coming on stream in Europe that would, to a large extent, replace metal units from the closed Wolf Minerals’ Drakelands mine in the UK.

“Any pick up in global demand or impact from environmental inspections in China are likely to effect the demand/supply balance and have the potential to push prices higher,” Mr Ferrier said.

Thor Mining executive chairman Mick Billing agreed, citing that a relatively modest change in the supply/demand

dynamics could result in a disproportionate change in pricing.

“Pricing levels in 2011 were very high, then in 2015 they slumped to very low levels,” Mr Billing said.

“This probably prevented us from securing project finance around that time.

“We have emerged, however with a more robust project, and a longer mine life. Hopefully 2019 is our year.”

Thor Mining was developing the Molyhil project in the Northern Territory, which once operational would have an open pit mine life of seven years with opportunities for expansion underground.

“Molyhil is shovel ready, we have completed all feasibility and licensing requirements subject to lodgement of a rehabilitation bond with the final mining

management plan once finance is secured,” Mr Billing said.

“We are currently in the process of securing project finance and once finance is locked in, the first production is 12 months from then.”

Thor’s other project, Bonya, would act as a satellite mine to Molyhil.

“Once resources have been delineated, and appropriate licensing is in place, we will mine the Bonya deposits and process the ore at Molyhil,” he said.

Mr Billing said analysts predicted 2 per cent annual growth in tungsten demand through to 2028.

“A number of new projects, are in construction, and some, like Molyhil, are poised to meet that demand,” he said.

“Barracuepardo and La Parilla in Spain are both set to commence production in 2019.”

However, the big issues remained with China, which currently accounted for about 75 per cent of global supply.

“Most of their mines are believed to be very mature, quite deep, and with both ore grades and costs heading in the wrong direction for them,” Mr Billing said.

“China has also closed a number of operations for environmental reasons, and those ‘in the know’ expect more of this.

“If all this is correct then tungsten prices are headed north in the medium term.”

But for now, global demand was about 100,000tpa, meaning tungsten was not yet quoted on the London Metals Exchange (LME), and companies couldn’t hedge or forward sell as they may do with other base and precious metals.

“Spot pricing accounts for ~ five per cent of global trade, yet it is the mechanism which sets western world pricing,” Mr Billing said.





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**Westanks Australia** is a family run and operated business. It all started in 2008 by Ross Cornthwaite, who worked out of a borrowed office and workshop space in Kalgoorlie, where he sold his first refurbished tank.

Coming from the oil & gas sector, Ross identified the need for a temporary bulk diesel storage for the mining industry with visions of servicing anyone with bulk fuel storage needs and started Westanks, a hire company specialising in the supply and installation of bulk diesel storage and dispensing equipment with his two sons Geoff and Brad joining the family business.

Their fleet started with son Geoff building a mobile refuelling trailer and repairing a client's own tank. The hire fleet now consists of 40+ refuelling trailers and 300+ self-bunded tanks ranging from 1000ltr to 200,000ltr, not counting dangerous goods or lube containers.

Technology introduced affordable Fuel Management Systems to all bulk fuel consumers and with Brad leading the technical aspects and fine

tuning the installations of FMS, Westanks again was contracted by major and minor players to retro fit existing fleet or new design concepts.

The AS1940 codes of bulk storage facilities demanded the market move into the self-bunded tank era, and with new tank designs, Ross saw the changes coming and worked with local manufacturers in design and as Ross would say: "I spent money and years filling their order books."

"The wrap tank we see on every major site is the Australian legacy to which no overseas manufacturing can copy cheaply and import, but we have to play the import game to stay with the market. We offer all our clients the options of a local build tank and our import range, guess what? the customer went with the local build over 50% of the time, the big players demand the local build, they know the commercial and structural value of the Australian wrap tanks," Ross said.

The demand of relocating bulk storage tanks prompted the Cornthwaite family to purchase their own prime mover and take control of the product

deliveries, removing third party involvement. This not only enabled the growth of the transport fleet but gave Westanks full autonomy for the mobilisation of any projects secured. When the Prime movers are not being utilised for company use, WTA Transport services Australia nationally with its specialised transport equipment consisting of 4 Prime Movers, 1 Ridged Tilt Tray, Extendable Trailers and Extendable Tilt Trays.

Westanks followed the demand of the bulk diesel storage market and opened branches in Kalgoorlie, Perth, Port Hedland and Adelaide. This created employment in the local areas and today Westanks employs up to 27 people and regular contractors of other trades.

Ross is now preparing the company for his sons to take the reins following his sales accolades of more than 20+ fuel farms installed Australia wide. Clients range from Tier 1 energy and mining companies to the owner operator truck drivers.

Westanks welcomes the opportunity to discuss your Bulk Diesel Storage needs.



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# SPECIAL FEATURES

## AUSTRALIAN POTASH

Images: Australian Potash.

# WORTH ITS SALT

After successfully completing its pilot study at Lake Wells in January, Australian Potash is gearing up to begin producing 150,000 tonnes of sulphate of potash by 2020.

The Lake Wells harvest pond.

### GERARD MCARTNEY

AUSTRALIAN Potash successfully extracted 65kg of 98 per cent purity sulphate of potash (SOP) from its Lake Wells pilot processing facility on 22 January.

First production at a pilot level marked a number of important milestones for Australian Potash; a proven processing pathway to delivering a high-grade SOP product, and the gratification of being the first company in Australia to successfully use the field evaporative method.

According to Australian Potash managing director Matt Shackleton, the field evaporative method lets nature do all the hard work by pumping brine into salt lakes.

**“It is not confused by deleterious elements, it doesn’t have calcium or carbonate concentrate, and that’s what allowed us to make such high-quality SOP”**

And compared to the more commonly used Mannheim method that chemically treats muriate of potash (MOP) to create SOP and leaves behind sulphuric acid, the field evaporative method was far simpler, and required fewer chemicals.

“The solar salt method is a much lower cost, organic method; we don’t introduce any deleterious elements, it is low energy and it is a much more economic process, particularly in Australia,” Mr Shackleton told *The Australian Mining Review*.

Australian Potash sunk its production bores into a deep paleo channel that ran under Lake Wells to get its brine.

“We were fortunate in Lake Wells. Once we sunk the production bores into the paleo channel system, the water came out at a rate of knots that was unexpected,” he said.

The production bores at Lake Wells began pumping water at up to 34 litres per second; more than double the anticipated rate.

Mr Shackleton said this could be attributed to the age of the brine itself that was predicted to be 45 million years old but, after carbon dating, was estimated at closer to 200 million years old.

“This produced a very simple and pure brine. It is not confused by deleterious elements, it doesn’t have calcium or carbonate concentrate, and that’s what allowed us to make such high-quality SOP,” he said.

Unlike projects owned by some of its peers, the pressure provided by the Lake Wells paleo channel spared the company from digging an extensive and expensive

trenching system that would have involved more than 200km of trenches.

Once the brine was pumping out of the bores and into the evaporating ponds, it was a matter of waiting until the brine turned into salt before it could be taken to the processing plant.

“We were always confident we could make sulphate of potash, but what did surprise us was that we made such a good quality SOP,” Mr Shackleton said.

### An International Shortage

Sulphate of potash was a standard ingredient found in almost every broad-acre agricultural fertiliser.

As a source of soluble potassium, along with phosphorous and nitrogen, SOP was one of the three primary ingredients plants needed to grow.

The potassium in SOP was fundamental to the development of strong plants— it thickened their cell walls and developed a resistance to rot in the plants.

This thickening of cell walls also helped develop resistance to disease, especially in large fruit trees that were susceptible to fungal spores.

As the living standards in China continued to improve, so did the demand for fresh fruit and vegetables.

This demand for fresh food was coupled with the Chinese Government’s ambitious campaign to heat millions of homes with natural gas, which cut its gas-based fertiliser operating rates to 15 per cent.

These conditions left international fertiliser producers short of supplies, while the demand and price of fertilisers had been steadily rising.

Australian Potash said it had sent samples to potential Chinese partners, Sino-Agri Holdings and Hubei- Agri, to conduct tests, and had signed non-binding agreements with Sino-Agri Holding.

The agreement envisaged sales volumes of up to 100,000 tonnes per annum, or 30 per cent of the estimated production from stage two of Lake Wells project once it was up and running.

Australian Potash had also partnered with The University of Western Australia’s Department of Agriculture and Environmental Science department, which had been conducting experiments on WA farming soil.

“They [UWA] have identified that WA soil is not only deficient in SOP, but that it is critically depleted—it’s almost the last few heart beats for a lot of this soil because it hasn’t had potassium for so long,” Mr Shackleton said.

(CONTINUED ON PAGE 22)



# NOVOPRO applies integrated risk management

## NATIONAL

NOVOPRO Projects is a Canadian company specialising in engineering and project management of mining and industrial projects, including ore recovery via conventional mining, brine recovery from playa systems or via solution mining, utilising natural evaporation ponds or forced evaporation and other processing facilities for potash, lithium and soda ash.

At the heart of Novopro's project development methodology is risk review and mitigation in a constant and iterative fashion at the all stages of project development.

Novopro specializes in identifying the project risks in the early stages through risk review sessions where technological, engineering, commercial, marketing, logistics, or environmental risks are categorised both in terms of likelihood and in terms of severity.

The project execution strategy and budget allocations are then adjusted based upon a live risk register.

This methodology ensures that the focus of the efforts and budgets are targeted towards the most pressing items during the development phase.

While process development is Novopro's primary expertise, additional considerations include the water supply, energy source, logistics position, marketing, project financing, environmental and social sensitivities, including the permitting requirements and how local stakeholders will react to the development.



The Novopro project team posing for the 'highest beam' ceremony for the magnesium recycling plan in Delfzijl, the Netherlands.

The final risk register developed at the conclusion of the project phases are integrated into the final estimates for both capital and operating costs, with additional time added to the project

schedule and additional budget identified to address any remaining risks that can be mitigated. At the very end of the study phase, risks that cannot be mitigated are identified, and handed over to the

stakeholders, who take ownership and address them as the project moves forward.

More information can be found at: [www.novopro.ca](http://www.novopro.ca).

# NOVOPRO

Project Development & Management



NOVOPRO have been involved in assisting a number of clients develop potash projects from their inception, through to Scoping, Pre-Feasibility, Feasibility, financing, implementation, and start-up.

Formed by a group of consulting engineers with extensive project experience, NOVOPRO has succeeded in a steady record of sustainable growth since its inception in 2007.

NOVOPRO's experience has been gained through the development of projects from small brown field expansions up to major multi-billion dollar projects.

NOVOPRO specializes in process design and modelling and provides management and control capabilities to ensure projects are executed within realistic technical, time, and budgetary constraints.



NOVOPRO's field of expertise is primarily the mining and processing of minerals and metals, which include:

- Potash (SOP and MOP), soda ash mining and processing
- Alkaline metal mining and processing (magnesium, potassium, calcium, lithium, sodium)
- Phosphate mining and processing, NPK plant
- Copper and Zinc mining and processing
- Iron ore mining and processing

During project execution, most of the activities take place with an integrated client-consultant team structure, with the following highlighting NOVOPRO's Capabilities:

- Conceptual Design
- Test Work and Piloting
- Field Work
- Establish and Supervise Drilling Program
- Due Diligence Reviews
- Project Engineering
- Program Development
- Capital and Operating Cost Estimation
- Preparation of Cash Flow Projections and Financial Models
- Project Risk Mitigation
- Preparation of NI 43-101 Compliant Reports



(CONTINUED FROM PAGE 20)



The first sulphate of potash produced in Canning Vale.

"We're working with several of the State's largest farming groups who are connected to the farmers who are our end users.

"We're hoping to show them that not only is SOP better than MOP, we actually

want to give them the numbers by which it is better.

"We're doing greenhouse and broad acre testing, analysing the yield, quality and soil biology because we want to meet them and tell them how much it is going

to cost.

"WA is Australia's largest user of potassium because it produces the most grain, there's a massive untapped market here."

## 2019 Outlook

On 11 February, Australian Potash announced it had raised the required \$5.2 million for general working capital to complete its Definitive Feasibility Study (DFS) by the end of the year.

If the company stayed on track for its project deadline, it would be operational and producing SOP by the end of 2020.

The Lake Wells gold project was also ramping up activities.

**"We were always confident we could make sulphate of potash, but what did surprise us was that we made such a good quality SOP"**

In the December quarter, the company entered into a \$7 million earn-in and joint venture agreement with St Barbara covering tenure at the project.

Under the joint venture, St Barbara would pay an initial \$1.25 million followed by \$1.75 million to put towards exploration in the first year.

Subsequent to the remaining payments, St Barbara could earn a 70 per cent interest in the gold project.

However, Australian Potash would retain 100 per cent of the potash and associated mineral rights.

"We are looking forward to building our relationship with the St Barbara team," Mr Shackleton said.

"I am confident that we now have the right people, right companies and right project area in place to generate some significant success at what is one of the State's very prospective and important mineral regions."



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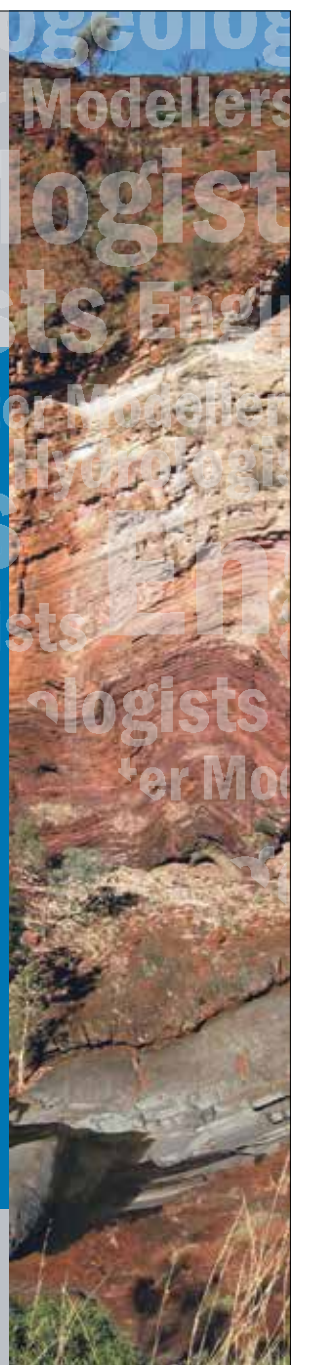
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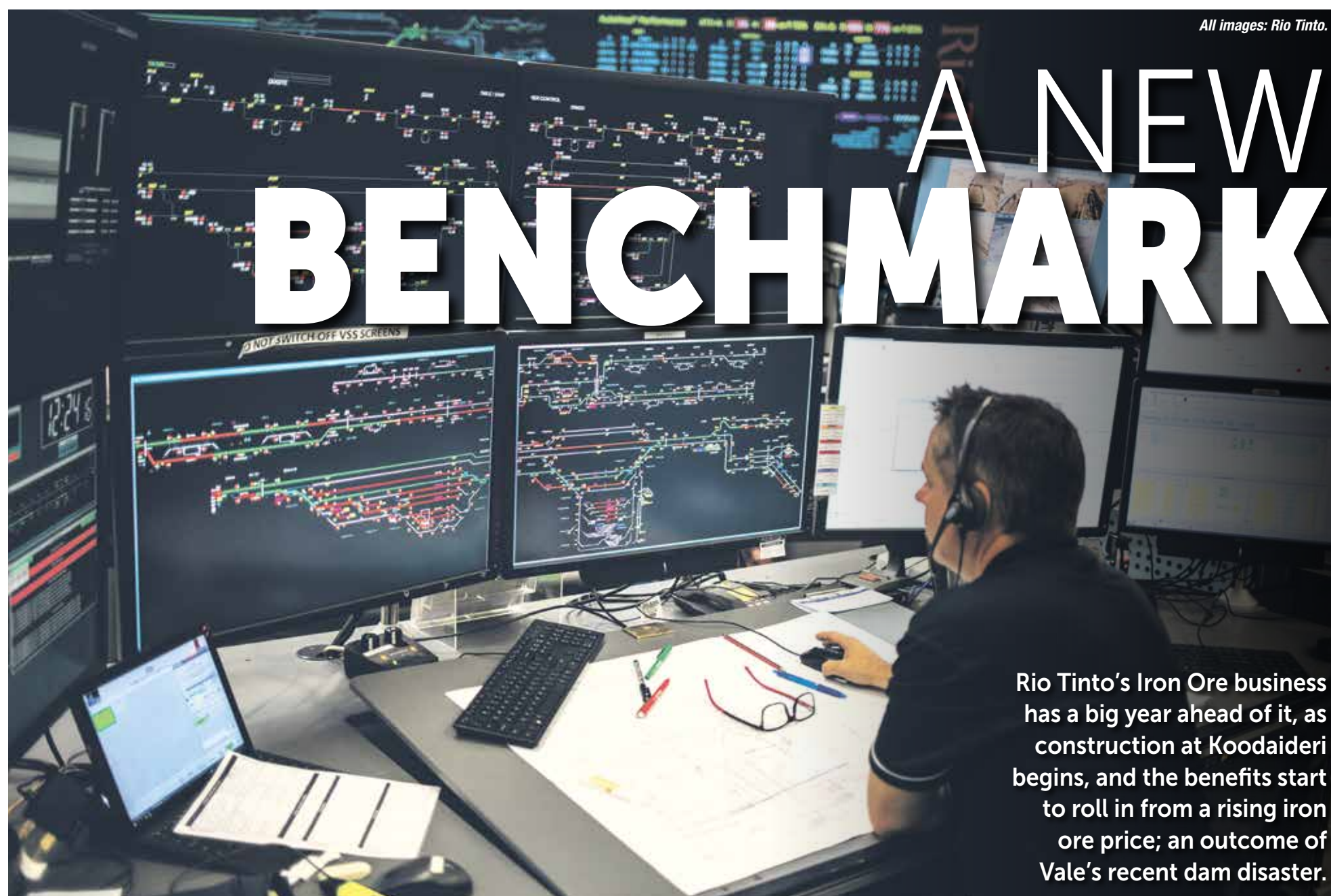
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**Rio Tinto's Iron Ore business has a big year ahead of it, as construction at Koodaideri begins, and the benefits start to roll in from a rising iron ore price; an outcome of Vale's recent dam disaster.**

## ELIZABETH FABRI

FOR Rio Tinto, its principal focus for the near-term was development of its \$3.5 billion Koodaideri project, a replacement for depleting capacity across its Pilbara operations.

Koodaideri – approved by the board late November – will be Rio's most technologically advanced mine to date featuring a digital replica of the processing plant accessible in real time, fully integrated mine automation and simulation systems, and much more.

The 43 million tonnes per annum mine would involve construction of a new processing plant and associated infrastructure, and a 166km rail line connecting to the existing network, with first production slated to begin in 2021.

At a recent WA Mining Club lunch, Rio Tinto Iron Ore chief executive Chris Salisbury described Koodaideri as “a truly tier one asset”.

“Koodaideri will have all our assets networked together and be capable of making decisions themselves – in microseconds,” Mr Salisbury said.

“It will bring together everything we've learned from our decade-old Mine of the Future program, along with a lot of new technology.”

Mr Salisbury said the digital twin aspect of the plant would enable the team to create a mine simulation and quickly test a range of different scenarios, without safety risks or downtime.

“We hope to further improve safety as well: employees won't be required in the pit, because most activities will be automated,” he said.

“In fact, our complete logistics chain is being revolutionised through automation.

“We are advancing towards a networked future where machines can talk to machines, reducing variability through the system.



Rio's Pilbara assets produced 337.8mt of iron ore in 2019, up 2 per cent from 2017.

“We're pretty excited – and as you can tell I'm pretty excited personally.”

To make matters even more exciting for Rio, a \$44 million pre-feasibility study into a Koodaideri Phase 2 had also been approved, which could increase the project's annual capacity up to 70 million tonnes (and beyond).

The company said a final investment decision would be subject to study outcomes and would need to fit in with its “value over volume” approach.

### Overcoming Challenges

Mr Salisbury said the key to any new development deployed across its operations, however, was its people.

“Today Rio Tinto hires many data scientists, mechatronic engineers and software engineers – as well as of course traditional mining engineers,” he said.

“Why? Well, we run the world's largest robot, a 2.4 km long train in the Pilbara

reaching more than 1 million kilometres travelled in full autonomous mode.”

In December, the AutoHaul rail network was successfully deployed in the Pilbara, six months after its first journey.

Rio Tinto Iron Ore Rail, Port and Core Services managing director Ivan Vella said it had been challenging to automate an entire rail network of this size in a remote location, but early results indicated significant potential to improve productivity, increase system flexibility and reduce bottlenecks.

Rio also hosed down any talk of redundancies, assuring the company wouldn't let any people go in 2019 as a result of the deployment of AutoHaul.

However, for many in existing positions, an automated mine and rail network would mean retraining and shifting from one role to another, Mr Salisbury said.

“A truck driver from the Pilbara now monitors a fleet of autonomous trucks from

the Operations Centre; and a fitter now flies a drone to inspect an operating excavator,” he said.

“As you can imagine, at an individual level, this takes considerable learning and re-training.

“Even if the fitter remains a fitter, they are likely to be reaching for a tablet as often as a spanner.

“At a business and indeed, at the resources sector level, an overall shift in core competencies is required.”

He said Rio was investing a lot into its people so they kept abreast of the knowledge curve.

“As one example, we recently partnered with the WA Government and the South Metropolitan TAFE to pioneer a new vocational curriculum on robotics, data analytics and digital techniques,” Mr Salisbury said.

“Our friends across the industry are also supporting this initiative, which is great.

“So all in all, I would say the industry isn't perfect. We've made mistakes, and we've learned from those.

“But we are trying – Rio is trying – in every way, to do the right thing.”

### Local Procurement

Employing local people and businesses was one example of Rio's efforts to do the right thing and give back to the communities in which it operates.

“We know our responsibility goes beyond the good times, beyond the mine gate to a lasting, sustained commitment that helps improve the skills and capacity of the local workforce – and has a direct and positive impact on the financial and environmental wellbeing of every community we serve,” Mr Salisbury said.

(CONTINUED ON PAGE 25)





No crane lifts were required while more than half a kilometre of old belt was removed and consecutively reeled onto four spider wheels.

## Collaboration reduces shutdown time

### NATIONAL

REPLACING conveyor belts is an essential requirement for the safe and efficient operation of any business that handles bulk material.

But productivity and profits almost always suffer because such tasks invariably require a complete conveying system shutdown.

Not surprisingly, the client in this belt changeout project (pictured) was happy to proceed when a collaborative solution was eventually developed with ContiTech's Pilbara conveyor belt changeout team to safely and efficiently replace the entire belt within a couple of days.

"We understood that while some aspects of the work would cost more up-front and need additional time in the planning and preparation phase, the overall time saving benefits for the customer would far outweigh this," ContiTech technical services engineer Scott Marvelley said.

"This conveyor is critical in delivering ore to the port.

"Each hour of gained production time would result in more train unloading, and each trainload is worth literally millions of dollars."

The scope of the project included the pre-splicing of the entire length of the new belt, then replacement of the old belt, pulling from the tail, which ContiTech key account manager Ian Copeland said made the belt changeout potentially difficult.

"But by taking a fresh and innovative perspective on the tasks and methodology, with full consideration for safety and risk reduction, we were able to execute the job incident free and within the promised time-frame," Mr Copeland said.

"Our engineering and operations teams worked closely together to plan and execute the process from beginning to end and we had a very supportive, knowledgeable and proactive client with whom we built a good working relationship right from the start.

"And we had the right equipment for the job and the right mix of skills and experience on hand in both technical and trades."

More information can be found at: [www.contitech.net.au](http://www.contitech.net.au).



**ContiTech**   
The Future in Motion

## Shorter shutdowns mean more time to unload trains

Here's a great example of the benefits possible through client/contractor collaboration and innovation. The project required installation and splicing of 5,460m of 1500mm wide ST3150 17mm x 7mm conveyor belt on a causeway conveyor in the Pilbara. ContiTech's Pilbara team worked closely with the leading iron ore miner client's team resulting in shutdown time being cut from an allocated 144 hours to just 96. And only 12 hours to wind the old belt off and new belt on, with no crane lifts. Furthermore, not a single safety incident during the entire process. Make contact with ContiTech now and start benefitting from expertise like this.

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**ContiTech**



The belt turning station incorporates two 90 degree turn-frames.





In 2018, Rio achieved average pricing of \$57.6 per wet metric tonne on an FOB basis.

On 25 January, the miner announced it awarded its 100th work package to local Pilbara businesses, as part of its program to increase opportunities for WA people.

The program, launched back in 2017, included an online local procurement portal that highlighted upcoming work.

Rio Tinto Iron Ore Pilbara Mines managing director Stefan Buys said the portal “was gaining momentum” and had received more than 3000 expressions of interest from suppliers to date.

Indigenous-owned civil and concrete construction company, Baru Group, was one of the most recent local companies to land work through the platform.

The business was awarded a contract to upgrade the stackers and conveyors at Rio Tinto’s Brockman 2 operation, which included a structural upgrade to the slacker

rail sleepers and conveyor foundations, as well as earthworks.

“Winning this work has a flow on effect for our employees and their families,” Baru Group director Anne Tallon said.

“Rio Tinto’s local procurement portal shows us what jobs are coming up and provides us with enough information so that we can do our own investigation into whether we can be cost competitive as well as if the scope of works are within our capabilities.

“Being successful in these opportunities means that our businesses can grow, our employees and their families can live in the towns they chose to live in, and our communities can thrive.”

2019 Guidance

A surging iron ore price was also expected

Rio’s new Koodaideri project would feature the latest in automation.

to bode well for Rio Tinto through 2019.

As a consequence of a fatal dam disaster in January, Brazilian miner Vale was suspending up to 40 million tonnes of production at its Feijao mine, and an additional 30mtpa capacity while safety checks were completed at one of its other operations.

While tragic, the disaster had seen a significant lift in the benchmark 62 per cent iron ore price, which had risen above \$US90 per tonne, the first time in almost two years.

Some analysts were of the view this could potentially tip over the \$US100/t mark amid the supply disruption, however others believed this would soon settle down to a lower level.

Over the last few weeks, Rio’s stock price reflected market movements, climbing


from \$79.60 a share on 24 January to more than \$95 per share at the time of print, a multi-year high.


Fortescue Metals Group and BHP have benefited too, with their respective share prices on an upward swing, which would deliver a significant boost to revenue over the next quarters.

In 2018, average pricing received for Rio’s ore was \$57.6 per wet metric tonne on an FOB basis (equivalent to \$62.5 per dry metric tonne), a slight decrease from 2017 levels.

While it was unknown how impactful rising prices will be on its average pricing for this year, Rio Tinto had released its production guidance, which was expected to sit between 338 million tonnes and 350 million tonnes, subject to weather and market conditions.

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# Demolition with minimal downtime

## NATIONAL

AWARD-winning demolition and remediation contractor, Liberty Industrial, has completed the second stage of a coal infrastructure dismantling project at the Port Kembla Coal Terminal.

The works formed part of a broader terminal restoration project, following the commissioning of new coal handling machinery at the terminal.

Liberty Industrial was initially engaged to dismantle a redundant coal stacker and coal reclaimer to make way for new machinery, and have now dismantled a further two stackers and another reclaimer at the terminal.

For a demolition of this nature, a complete shutdown of key operational assets, such as coal conveyors, bunkers and ship loaders, would normally have been required.

The works were carried out within the operational coal terminal and required significant planning and pre-shutdown works to minimise the impact on the terminal's operations.

Liberty Industrial devised a methodology that enabled all preparatory works to be undertaken with minimal disruption to the terminal's operations and the dismantling works to be carried out over live operational conveyor lines.

The machines were dismantled in situ with the aid of a 750 tonne crawler crane, and the components subsequently downsized on the ground for recycling.



Dismantling a redundant coal stacker at Port Kembla.

The structures were progressively dismantled in an engineered sequence designed to maintain their structural stability.

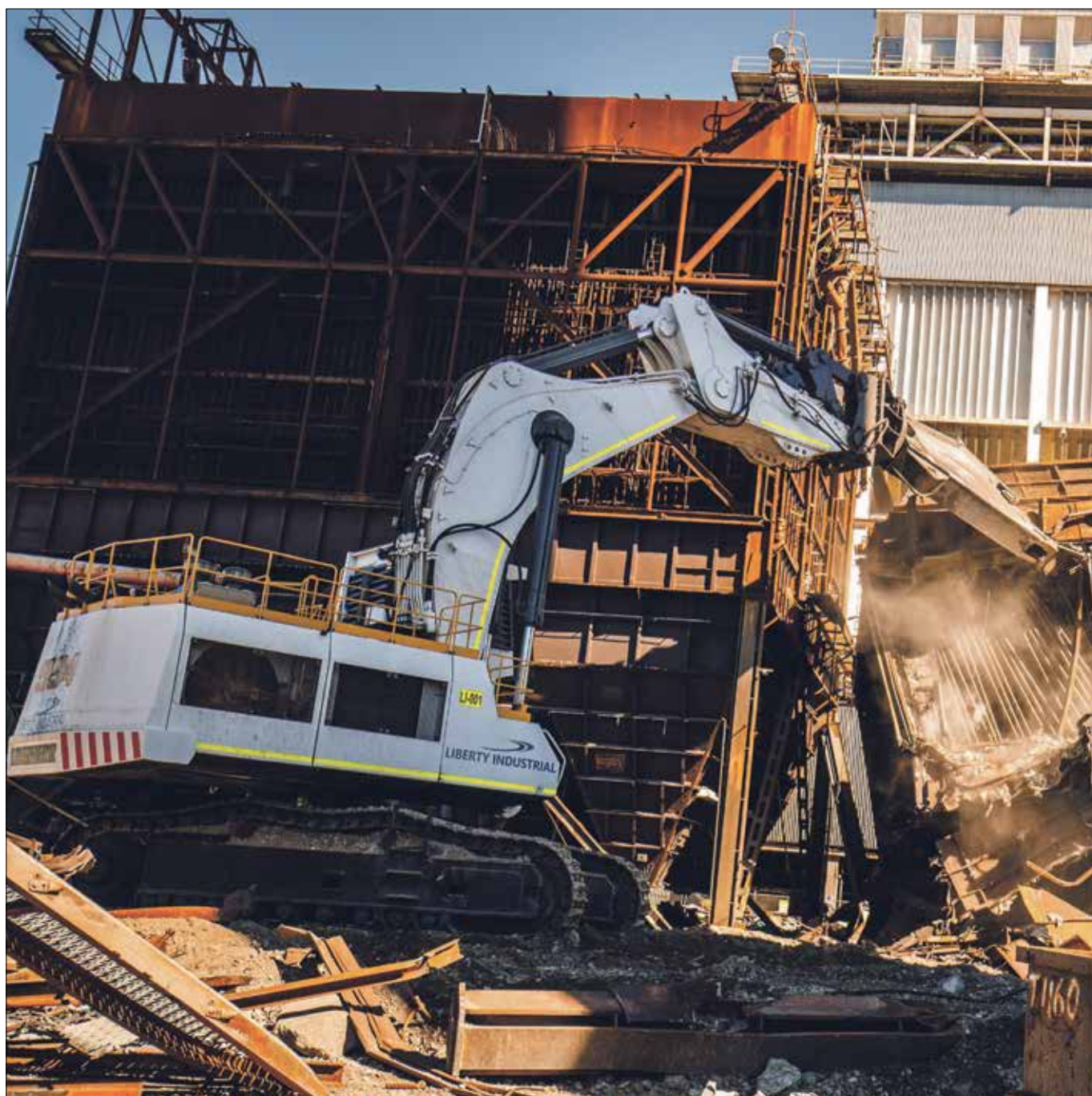
Liberty Industrial carried out a series of heavy lifts, the heaviest being the reclaimer portal gantry weighing 214 tonnes.

Achieving minimal disruption to the operational coal terminal facility was critical to the project's success.

With demolition occurring within close vicinity to operational coal handling infrastructure, extensive planning and coordination were key to the successful completion of the works without

significant disruption to the terminal's operations.

The award-winning contractor received recognition for the delivery of some of Australia's largest and most technically complex demolition and remediation projects.



Liberty Industrial is a leading provider of deconstruction and remediation services.

Liberty Industrial is a leading provider of deconstruction, remediation and site preparation services, serving government, mining, oil and gas, power generation sectors and other heavy industrial companies Australia wide. The company has set itself apart, by developing a solid reputation with clients based on integrity and technical capability. We provide integrated solutions for large scale, technically complex deconstruction and remediation projects, offering a comprehensive range of integrated capabilities including demolition, dismantling, decommissioning and hazardous materials removal, land remediation, site rehabilitation and site preparation services. Liberty Industrial has built a strong reputation for delivering large and technically challenging projects for government and private sector clients and received international recognition for the delivery of some of Australia's largest and most complex demolition and remediation projects ever undertaken. We challenge the status quo and leverage technology to deliver innovative and resourceful solutions that create value for our project stakeholders.

**LIBERTY INDUSTRIAL**



All images: BHP.

# CHANGING LANES

BHP is focussed on transitioning its Nickel West operations to become a global supplier for the battery market and with its newly approved Venus and Yakabindie deposits, the company looks ready to make the move.

## EMMA DAVIES

BHP Nickel West received the green light from the WA Government in late 2018 to develop the Venus ore deposit in the northern goldfields.

The Venus deposit, which forms part of its Nickel West operations, is one of the most significant opportunities for the business with more than 200,000 tonnes of contained nickel.

A BHP spokesperson said first stoping production from the site was expected in March 2019, with production expected to be in full swing by the end of the year.

“This is an underground mining operation which leverages the substantial surface and underground infrastructure already in place at Leinster nickel operation,” the spokesperson said.

“The high-grade material from Venus is expected to feed the Leinster nickel operation mill and concentrator over the next eight years.”

Venus was expected to provide feed for the company’s Leinster nickel operations mill and concentrator, as well as create between 150 and 200 jobs once operational.

Nickel West had also received the final major government approval it needed from the Western Australian Department of Mines (DMIRS) to develop the Mt Keith satellite project; a low cost development which was expected to provide up to a decade of ore for the Nickel West business.

The project (also known as Yakabindie) represented two open-cut satellite mines, Six Mile Well and Goliath, about 20km south of Mt Keith in the northern Goldfields.

There were no maintenance facilities, processing plants or tailings dams to build as Nickel West could use the existing facilities at Mt Keith.

Road trains would haul the ore to the Mt Keith concentrator and waste would be stockpiled locally.

“Dozers have immediately started preparing an initial access road from Mt Keith to Six Mile Well, which will allow operations to start work at Six Mile Well,” BHP Nickel West asset president Eddy Haegel said.

“The most important milestones have now been met. This is a great achievement for Nickel West and a real validation of the terrific opportunities we have in Western Australia for supplying nickel to the battery materials industry.”

Leonora shire president councilor Peter Craig lives in Leinster and said the recent approvals were great news for the region.

**“This is a great achievement for Nickel West and a real validation of the terrific opportunities we have in Western Australia for supplying nickel to the battery materials industry.”**

The Mt Keith satellite project would make use of existing infrastructure.

“Leinster has been supplying nickel to world markets for more than 35 years and with the current development of new resources, Leinster has the potential of being here for another 25 years plus,” Mr Craig said.

“Currently there are job requirements for all levels in open cut and underground mining but Nickel West has a positive effect in generating jobs for the whole goldfields region – not just Leinster.”

BHP also anticipated first production from the nickel sulphate plant at the Kwinana Nickel Refinery by the end of FY19 of about 100,000tpa.

The company was exploring options for a Stage 2, 200,000t nickel sulphate facility and had constructed a mini-plant at CSIRO facilities in Perth, to replicate the final nickel sulphate plant.

Capable of producing 100kg of dry nickel sulphate per day, the mini-plant would test and produce quality, on-spec product for customers in the battery market for use in the lithium-ion batteries that power electric vehicles.

“Nickel West has been one of the major producers of nickel in WA, and with their current recourses both at Leinster and Mt

Keith mines.

“Along with other deposits in the area, the future looks good while lithium battery market stays positive,” Mr Craig said.

## Meeting Demand

The interest in the use of nickel concentrate in battery metals had also been reflected in nickel prices, which rose in FY18 from below \$US10,000 per tonne to current levels at about \$US12,400 per tonne.

BHP’s operational review for 2018 stated that, while exchange stocks of refined nickel metal remain high relative to historical levels, it had been declining across FY18.

“In the near term, supply of nickel from Indonesia (in multiple forms) is expected to grow, which should prevent an acceleration in the drawdown of stocks,” the report stated.

“In the long term, the battery sector is expected to provide strong growth in demand for high-purity nickel supply.”

BHP would also be able to take advantage of the recent announcement of WA Government’s Future Battery Industry Strategy, which aimed to facilitate the establishment of new future battery

projects in WA — assisting and supporting projects through the approvals process.

Nickel West was already in an advantaged position to produce nickel sulphate product with benefits including; access to sulphuric acid from the Kalgoorlie Nickel Smelter; being geographically close to the Asian market; being able to take strategic advantage of Australia’s Free Trade Agreements with China, Japan and South Korea; as well as the capacity for further expansions at relatively low cost.

BHP’s half yearly results, released on 19 February, were also positive and suggested that the company expected a strong performance in the second half of 2019 to offset any negative productivity the previous year.

2019 production would be boosted by the Venus and Yakabindie developments, even despite a fire at the Kalgoorlie smelter in September 2018, which led to a decrease in production for the final quarter.

Luckily, planned maintenance at the Kwinana refinery was moved forward to align with the smelter outage – resulting in unchanged production guidance for the 2019 financial year, which was expected to be in line with FY18.



# International collaboration servicing the industrial sector

## NATIONAL

ACID Plant Management Services (APMS) and its associated business entities offer a diverse range of services to the mining, petrochemical and oil and gas industries.

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### Acid Plant Management Services

With more than 30 years of experience in sulphuric acid plant management, shut-down execution and maintenance services, APMS's unique in-house maintenance procedures and fully equipped onsite workshops minimise downtime and increase plant efficiency.

Capabilities for acid plant projects included; acid plant specialists, acid plant specialised coded welders, acid plant specialised trades and technicians, project management, engineers, QA/QC specialists, welding inspectors, work pack development, rescue personnel and sentries for BA entry.

More information can be found at: [www.acidplantmanagement.com](http://www.acidplantmanagement.com).

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defence, petrochemical, mining, water and oil and gas industries internationally.

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### APMS Storage Tank Services

APMS staff have extensive experience in storage tank inspection, design, engineering, construction, maintenance, repairs and cleaning for all types of bulk storage tanks and associated piping.

With the knowledge and experience of international construction codes and standards, the company provides storage tank inspections to international standards, storage tank maintenance, repairs and alterations, storage tank design, storage tank fabrication and storage tank cleaning.

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## APMS ENGINEERING

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## APMS STORAGE TANK SERVICES

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# RISING UP

The recommissioning of two sleeping giants in Victoria's Eastern goldfields is creating a hive of activity as AuStar Gold restarts production at the Rose of Denmark and Morning Star mines.

All images: AuStar Gold.

## GERARD MCARTNEY

AUSTAR Gold has breathed new life into the Morning Star and Rose of Denmark mines.

The production of gold at the mines is the crown jewel in a series of achievements since 2015 for AuStar Gold.

"There has been a number of milestones in the last two years, firstly recommissioning the Morning Star winder and shaft, then recommissioning the processing plant and demonstrating its capability to recover gold effectively," AuStar chief executive Tom de Vries told *The Australian Mining Review*.

"We have recently undertaken a significant amount of diamond drilling with repeated visible gold hits at both Morning Star and Rose of Denmark mines which is satisfying."

Mantle Mining took over the Morning Star mine and its associated tenements in August 2015, after it acquired Morning Star Gold.

Reflecting the company's status as an emerging gold producer, Mantle Mining changed its name to AuStar Gold in 2017.

In 2018, the company moved through the exploration, development, mining and processing initiatives at both the Morning Star and Rose of Denmark mines, where it was able to produce the first gold pour at the Morning Star mine in May 2018, and the first pour at Rose of Denmark in August 2018.

"The maiden pour for Morning Star was exciting as it really proved the worth of the gravity processing plant at Woods Point," Mr de Vries said.

"By the time we poured gold from Rose of Denmark it was more of the same, but still very satisfying."

In June 2018, AuStar Gold completed its 100 per cent acquisition of the Rose of Denmark mine after the joint venture licence with Shandong Tiane Real Estate Development Group stagnated.

Recommissioning the two mines required considerable work, such as a plant upgrade



A drill sample with visible gold.

"We have recently undertaken a significant amount of diamond drilling with repeated visible gold hits at both Morning Star and Rose of Denmark mines which is satisfying."

at Morning Star that included supporting infrastructure with a high-speed winder, surface and underground power supplies, site offices and accommodation quarters to service both mines.

"The biggest challenge we had was to recover the gold from sulphide concentrate that was left over from the tabling of the dore and from a by-product called middlings, which does not make it to the gold room," Mr de Vries said.

### Rose of Denmark

Exploration for new sources at the Rose of Denmark mine used both percussion and diamond core drilling.

The company sampled 477 assays from the percussion drilling, and said the samples appeared to reinforce the theory that the trends of grade follow identified quartz ladder veins.

In a statement on 8 January, the company said that its diamond drilling program had continued to find high-grade gold intercepts, and that further drilling was required to define the dyke orientation and width, to then be able to drill the line of the dyke.

Diamond drilling was further used to allow for the up and down dip surfaces of the dyke to be appropriately defined, and a second phase was directed within the dyke

to further clarify gold trends.

There was also further drilling at the northern dyke bulge that built on previous drill holes from 2017.

"The diamond drilling above and below the level of the Rose of Denmark adit is defining the shape and geometry of the dyke and is nearing completion," Mr de Vries said.

"We have completed 16 holes in this current phase of drilling with ongoing encouraging results.

"Since December 2017, we have drilled over 40 holes and our knowledge of the ore body continues to grow.

"Rose of Denmark diamond drilling has continued to be exciting, with numerous visible gold hits. Our geologists are expressing confidence that in a month or two they will be able to direct us to a sustainable ore source in that mine."

### Stone's and McNally's Reefs

As the main source of plant feed for the Morning Star mine, AuStar has been exploring the nearby Stone's and McNally's Reefs prospects, where it has drilled 781.7 metres and assayed 594 samples.

In December 2018, the company confirmed that the closely spaced drill holes at McNally's Reef identified high-grade quartz-sulphide, and drilling at Stone's

Reef had indicated that there is high-grade mineralised quartz immediately below the surrounding sediments.

AuStar's development plan would initially focus on exposing the reef at McNally's for plant feed, where it will continue to develop along the structure, targeting the highest grade drill holes.

A similar approach to selective mining would also be taken to Stone's Reef.

"Diamond drilling has been budgeted to continue uninterrupted for the next six months. McNally's continues to excite us and needs more drilling to the south, but we also intend to drill South Whitelaw at a historic hole that was declared at 0.55m 76 g/t, there is also Cherries/Morgan's in the upper mine that has attracted our attention and we intend to come back to Stacpoole North in the next six months," Mr de Vries said.

### Outlook

Mr de Vries believed the biggest challenge for the company was always to ensure there was enough high-grade ore to access and mine.

"We feel confident that we are over that challenge and the next hurdle is to now profitably mine at both Morning Star and Rose of Denmark," he said.

"To that end we are developing access to the ore bodies now."

Looking forward, the company had a few goals that build on its previous successes.

"The first is a short term aim to clearly demonstrate that we can successfully explore, mine and process at both Morning Star and Rose of Denmark profitably and sustainably," he said.

"The second is to build our drilled stock to provide continuous supply of ore to the mill, build cash flow and still continue in mine exploration.

"The third is to continue exploration on our highly prospective exploration lease area."



Image: BHP.



# A STRONG FUTURE

Mining at BHP's Mt Arthur coal mine in the Hunter Valley, NSW is expected to continue to 2026, with the company expanding development in a move that will bring about 300 permanent jobs to the region.

## EMMA DAVIES

ALSO known as New South Wales Energy Coal (NSWEC), BHP's Mt Arthur coal mine produces coal for domestic and international customers in the energy sector.

In 2018, the company angled towards optimising the mine design by re-opening its Ayredale pit to gain earlier access to a higher margin resource over the next decade.

BHP also constructed multiple elevated roadways to reduce haulage cycle times and increase productivity, reporting 18.54 million tonnes of saleable coal produced throughout the year – and the outlook for 2019 was even brighter.

Production at Mt Arthur decreased by six per cent in FY18 as improved stripping fleet performance was offset by lower bypass coal and a higher average strip ratio.

In October 2018, Thiess secured a \$1.2 billion contract with BHP to provide mining services at the Mt Arthur coal operation.

This five-year contract built on Thiess' existing agreement would expand the scope of Thiess operations to include additional services as mine operator of the southern end of the operations (the Ayredale and Roxburgh pits).

Under the new contract Thiess would perform mine design, planning and scheduling services, drill and blast operations, overburden removal and coal mining.

"This is the third successive contract that Thiess has secured with BHP at Mt Arthur Coal," CIMIC Group chief executive Michael Wright said at the time.

"It recognises our team's specialist mining capability within the Hunter Valley's complex geology and our team's ability to work flexibly with our client."

The plans to expand both the Ayredale and Roxburgh pits would push the life of the

mine out to 2026, with mining set to start in FY19.

Extensive operations were underway on site including the first phase of the tailings dam Stage 2 raise project, involving the downstream raising of an existing embankment by 10 meters to provide ongoing tailings storage capacity.

Powerlines would also be relocated and the replacement of Mt Arthur's communication tower was planned, subject to final approval.

CIMIC Group Mining and Mineral Processing executive and Thiess managing director Douglas Thompson said the company was looking forward to contributing to the success of the Mt Arthur coal operation.

"We have a proud history in the region and working with BHP," Mr Thompson said.

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

As of 30 June 2018, Mt Arthur employed 985 permanent and fixed-term contract employees and about 518 contractors on a full-time equivalent basis.

The scope of the new developments would create up to 300 permanent, locally-based roles.

About 54 per cent of Mt Arthur's employees resided in the local government areas (LGAs) of Muswellbrook, Upper Hunter and Singleton.

## Production Outlook

In its annual report, BHP said its average realised sales price [from NSW Energy Coal] increased from \$US75 per tonne in 2017 to \$US87 in 2018 due to strong growth in Chinese seaborne demand.

"Seaborne demand from India benefited from disappointing domestic production," the report stated.

"In the short term, Chinese imports are unlikely to repeat their recent strength."

"In the long term, global demand offsetting weakness in OECD countries [due to switch to cleaner fuel sources] amidst slowing demand from China."

Energy coal production was flat at 29 million tonnes as a strong performance at New South Wales Energy Coal was partially offset by the impacts of wet weather and higher strip ratio areas being mined at Cerrejón Coal in Colombia – and production in FY19 was expected to remain broadly unchanged.

NSWEC unit costs were expected to be between \$US43 and \$US48 per tonne in FY19, reflecting mine progression through geological constraints from the monocline transition, higher strip ratios and diesel prices, as well as increased contract mining costs.

Geological constraints were expected to continue into the medium term, with unit costs forecast to remain at about \$US45 per tonne during this period.

As one of Australia's largest active coal mines, Mt Arthur was well placed to take advantage of Chinese seaborne demand with the economic development and urbanisation of the Southeast Asian region in particular also driving strong demand for its coking coal for steel production.

"Coal mining in NSW is currently in a 'sweet spot' with high commodity prices, record levels of exports and increasing demand for our resources from traditional and emerging markets," NSW Minerals Council chief executive Stephen Galilee said.

"According to the independent International Energy Agency, coal consumption in Southeast Asia will more than double by 2040, driven by an increase in demand for reliable and affordable electricity, and deployment of more advanced technology coal-fired power stations."

"NSW is in a prime position to capitalise on this growing demand as the new technology coal-fired power plants being developed in Southeast Asia work best using the type of high-quality coal we produce."

## Community Backlash

While the outlook was largely positive for the coal mine, the local community around Mt Arthur were not convinced the benefits would be passed on to the surrounding region.

In December 2018, BHP announced its new in-house labour hire company Operations Services would move into Mt Arthur – and have declined to comment if this would impact the 300 local roles expected with the mine extension.

The Construction, Forestry, Maritime, Mining and Energy Union (CFMEU) said the move was a blow to local Hunter mine workers, who deserved direct employment at the mine on industry-standard conditions.

"BHP says it is responding to community concerns about casualisation and labour hire – but it is just driving down wages and conditions by other means," CFMEU Mining and Energy Northern District president Peter Jordan said.

"If BHP was genuine, it would offer permanency under the existing Mt Arthur enterprise agreement to current labour hire workers – many of whom have worked for years at the mine as casuals."

Mr Jordan said the jobs being advertised at Mt Arthur had traditionally been performed by the permanent workforce.

"BHP is simply replacing external labour hire with an equally segregated and divided work arrangement under its in-house labour hire company Operations Services," he said.

"Our local workers and communities deserve better."



# Nanotech sets new standard in lubrication



After running global trials, Techenomics has partnered with Nanotech Industrial Solutions to provide the additive tungsten disulphide particle IF WS2.

## NATIONAL

TECHENOMICS International is a global provider of oil analysis, condition monitoring and fluid management services with nearly three decades of experience delivering specialty lubricants to the mining, oil and gas, marine, rail and power generation industries.

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Lubricants played a vital role in the overall health of an engine, and WS2 lubricant additives act like ball bearings between metal surfaces.

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surfaces from coming into contact, reducing friction.

Techenomics International has conducted tests and trials on a global scale, ranging from mining to industrial applications to ensure current and future customers fully understood how WS2 additives save energy, increase oil life extension, reduce component wear, lower fuel consumption and emission suppression.

With many more international trials planned, the company would form accurate case studies which, in the future, would help customers understand the short and long term benefits of WS2 for their assets.

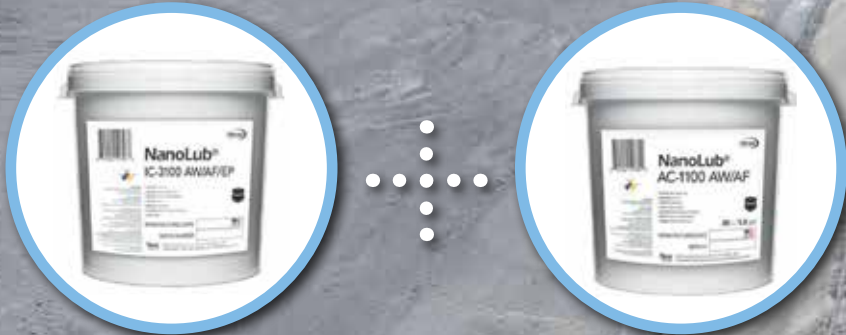
Techenomics specialises in carrying out health checks on oil and lubricants and diagnosing issues before they arise.

More information can be found at: [www.techenomics.net](http://www.techenomics.net).



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# TESTING THE WATERS

The tragic tailings dam disaster in Brazil in January, which killed at least 300 people, serves as another reminder of the importance of water management and safety across the mining sector. While water stewardship efforts have made significant strides in recent years, it is fair to say industry organisations and miners agree more needs to be done.

Virtual Curtain treatment at Baal Gammon mine. Image: CSIRO.

## ELIZABETH FABRI

ON 25 January, the tailings dam collapse at Vale's Feijão mine near Brumadinho, Brazil, sent a torrent of sludge into the miner's administrative area and surrounding Vila Ferteco community.

Traditional mineral processing methods require a significant amount of water to grind, wash and treat ore, and tailings dams have been the primary waste disposal system to store slurry leftover from the plant.

The thick mud, if released, not only can have negative impacts on the environment, it could also pose a major safety risk to on-site workers and nearby communities.

In Brazil, the collapse of two dams in less than four years, has put waste and water management in mining to the front of global discussions.

In late February, Brazil's National Mining Agency ANM said it would ban upstream tailings dams and decommission all existing tailings dams by August 2021.

Mining giants such as Rio Tinto and BHP have spoken up about the tailings issue also, identifying more needed to be done.

Rio Tinto chief executive J.S. Jacques said the entire industry "has a responsibility to do better" and despite releasing a global standard for management of tailings and water storage facilities in 2015, it was again reviewing its global standard.

"We fully support the need for greater transparency which is why we disclosed detailed information on our tailing facilities and how they are actively managed. We will add to this over time," Mr Jacques said.

In a statement, BHP said it would meet with a number of global bodies in February, and welcomed a common, international and independent body to oversee integrity of construction and operation of all tailings storage facilities across the industry.

International Council on Mining and



Image: Anglo American.

Metals (ICMM) chief executive Tom Butler – who represents about 27 global mining companies – was another industry figure claiming things had to change.

Mr Butler said the council was "deeply saddened" by the recent disaster in Brazil, and would work with its members to learn every lesson from this catastrophe.

"We must improve in order to regain public confidence in the way we manage these facilities," Mr Butler told *The Australian Mining Review*.

"The tailings dam failures in Brazil of recent times highlight the scale and complexity of the challenges faced by the industry on water.

"ICMM's water stewardship and tailings management position statements are important steps towards improving members' performance in managing this resource, but recent events show we have much more to do."

Issues related to water were not just in

processing or tailings either – they extended to sourcing safe and sufficient drinking water for workers, managing dust emissions, generating hydroelectric power and more.

Figures released this February showed that during 2016-17 an estimated 75,888 gigalitres of water was extracted from the environment to support the Australian economy – of which mining consumed 693 gigalitres (a 2 per cent increase from the year prior).

Many miners were already exploring water efficiency plans and technologies as part of their business planning.

Challenges cited included water access, the use and treatment of poor quality water, mine dewatering, as well as the management of excess water.

As ore grades declined in mining operations, the amount of water needed also generally increased, which posed another layer of issues.

## International Stewardship

In 2017, the ICMM released new commitments on water stewardship and a practical guide for companies to follow for consistent water reporting.

ICMM chief Mr Butler said competing demands for water and tightening of environmental regulations around the world posed challenges that ICMM had been working to address for more than a decade.

Its commitments set out in 2017 would require members to apply strong and transparent water governance; manage water at operations effectively; and collaborate to achieve responsible and sustainable water use.

Mr Butler said members had implemented the guidance in 2018, and were due to submit their first reports in 2019.

"Improvements will be measured over time against the 2018 benchmark," Mr Butler said.

"These are significant first steps in obtaining consistent and comparable data across ICMM's membership to improve performance on water management wherever members operate around the world.

"The policy also requires members to adopt a collaborative 'catchment-based' approach to water management that involves working with other users to ensure there is enough for all in an environmentally sustainable way."

Mr Butler said while industry understanding and management of mine water quality had dramatically improved over the past decades, the sector was taking a preventative approach, evaluating risks of mine water well before mining begins.

"This way the risk can be addressed early, avoiding the need for chemical treatment, which is vital as mining activities can have a significant impact on the quantity (availability) and quality (e.g. impacts of acid rock drainage – mine water) of water resources," he said.

(CONTINUED OVER)



## (CONTINUED FROM PAGE 33)

“Many in the industry are using water treatment technologies to reduce reliance and increase availability of freshwater to local communities.

“In Peru, ICMC company member Freeport McMoRan built a wastewater treatment plant that uses treated wastewater for its Cerro Verde mine, provides drinking water to 300,000 people in the Arequipa region and improved local water quality, benefitting both the company and the community.”

## Solutions

In Deloitte’s *Tracking the Trends 2019* report released in January, the firm identified water management as one of the key trends rising to the top of mining companies agendas, and one of the greatest constraints to supply.

“In regions around the world, mining companies must now contend not only with risks around water scarcity, but also those associated with excess rainfall, which can result in flooding,” the report stated.

“According to the Climate Disclosure Project (CDP), 25 per cent of mining production, representing up to \$US50 billion in annual revenue, could face water shortages and drought by 2030.

“As competition for water supplies mounts, many mining companies are taking steps to reduce water consumption, treat wastewater so that it can be recycled, and adopt innovations such as dry processing.

“These efforts, however, are often approached as isolated initiatives rather than enterprise-wide opportunities to achieve cost savings, improve environmental performance, and enhance regulatory compliance.”

The report suggested a systematic



Image: Anglo American.

**“The tailings dam failures in Brazil of recent times highlight the scale and complexity of the challenges faced by the industry on water.”**

approach to water management was required – which would approach energy and water in tandem to help mining companies make business choices that optimise the use of both.

Deloitte’s Operational Risk and Sustainability director Michael Wood said historically there had been a clear linkage between the production of energy and water.

“There’s been a bit of a decoupling starting to happen now between energy and water with new technologies coming through such as wind, batteries, solar –

these technologies aren’t necessarily water dependent,” Mr Wood said.

“However, they both go hand-in-hand.”

Deloitte also referenced new initiatives such as dry processing methodologies, reducing the amount of water required to store tailings, and even mining in ways that reduce impacts to surface and groundwater systems.

The company cited Anglo American as a pioneer in this space, which as part of its FutureSmart Mining Sustainability Strategy was gearing towards the development of a waterless mine at its

Mogalakwena platinum mine in South Africa.

Goldcorp also continued to advance its Towards Zero Water strategy, implementing an EcoTails system, which blended filtered tailings with waste rock in transit to create a geo-technically stable product called GeoWaste, which may help it eliminate tailings dams entirely.

Mr Wood said it was also important for miners to “go back to the basics” and understand the true value of water.

“It’s not a free commodity anymore,” he said.

“It may be free on the balance sheet but it’s not free in the eyes of the community and the eyes of stakeholders.

“There’s a value to it, and it’s about understanding that value.”

Mr Wood said as an industry, companies needed to ask themselves how they value water appropriately, and how they disclose that valuation to stakeholders in a consistent way.

He praised the ICMC water commitments framework, and said disclosure like this was a great step.

“Eventually [mining] could be like the oil and gas industry, where they have live readings that get put onto a publically available website, where you can see water quality,” he said.

“Those types of things will start to happen more, whether it will be greater transparency over the public being able to understand what is happening in a particular area and the impact of mining – whether that be positive or negative.

“Having the framework, establishes a method of baselining and comparing and all those types of things.

“Water is an integral part of what we do, and without it we wouldn’t exist.”

# Keeping it cool

## NATIONAL

FOR more than 70 years Aqua Cooler has manufactured products to meet Australia’s tough operating conditions and climate extremes.

Over the years Aqua Cooler has grown to become a dominant industry brand and is recognised as one of Australia’s largest supplier and servicer providers of chilling and refrigeration products.

Aqua Cooler has an impressive installation base nationally exceeding 5000 installs and is also a strong player in the international market.

These markets include Vietnam, Indonesia, Hong Kong and Taiwan, which all use Aqua Cooler in numerous industrial applications.

Aqua Cooler has evolved during the last 70 years and is recognised as a proudly Australian-owned industrial process water chiller supplier boasting an iconic reputation for advanced design and robust performance.

The company was originally established and based in Sydney, and has recently relocated to Brisbane to state of the art facilities where it continues to revolutionise its products and services in direct response to the market’s ever-changing demands.



Aqua Cooler provides custom monitoring systems that allow clients to detect problems before outages occur.

Over time, the business expanded to become a market leader in the design and manufacture of industrial water chiller systems.

Aqua Cooler continues to build on its in-house engineering experience and capacity to customise solutions to meet customer’s specialist specifications and application needs.

Water chiller systems are used in a growing range of industries, such as medical, mining, chemical, food, petrochemical and pharmaceutical in which chilled water supply is required.

In the mining market Aqua Cooler enjoys a dominant market reputation

in addressing a wide range of arduous applications.

Tried and proven in harsh environments across Australia, Aqua Cooler enjoy support from a range of miners including BlueScope, Rio Tinto, BHP, BMA Australia, Mt Isa Mines and more in a wide variety of projects.

Aqua Cooler offers the ground-breaking Aqua Cooler Advanced Monitoring Solution (ACAMS), powered by Metis monitoring.

The ACAMS smart refrigeration system remotely monitor chillers customised to company’s individual needs.

To move from reactive refrigeration

maintenance (breakdown maintenance) to Reliability Centred Maintenance (RCM) with monitoring can cut costs by up to 66 per cent per year.

The ACAMS monitoring system indicates the moment a refrigeration system needs attention, well before expensive repairs and outages occur.

Leaks will happen and are frequently found way too late.

Thanks to advances in technology, every Aqua Cooler installation, new or existing, can be made smart.

With Aqua Cooler’s monitoring system, it is easy to find leaks early – before they cause real trouble.

Having an Aqua Cooler Advanced Monitoring Solution is like having a fridgie onsite 24/7.

Refrigeration trouble frequently happens when no one is looking however, ACAMS boasts cloud-based multi-site monitoring, which means refrigeration systems can be monitored in real time, all the time, from any internet enabled device.

The monitoring system is designed to be an onsite refrigeration expert, potentially saving hours of time driving to a remote site to check diagnostics of a refrigeration system.

Aqua Cooler is supported by local knowledge and offers experienced aftermarket support.

Included in Aqua Coolers range are chillers suitable for multiple duty cycles and applications.

Aqua Cooler are also often able to offer a wide variety of models off the shelf that can significantly shorten lead times and assist customers to meet tight deadlines.



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# Evolution and CSIRO join forces

ELIZABETH FABRI  
QLD

CSIRO scientists have teamed up with Evolution Mining to explore the use of microbes and other methods to remove valuable metals and contaminants from mine wastewater.

Microbes – which are essentially very small (microscopic) organisms such as bacteria – could help either oxidise or reduce metals or other compounds, like sulphate, nitrate or selenate, so they can be removed from water.

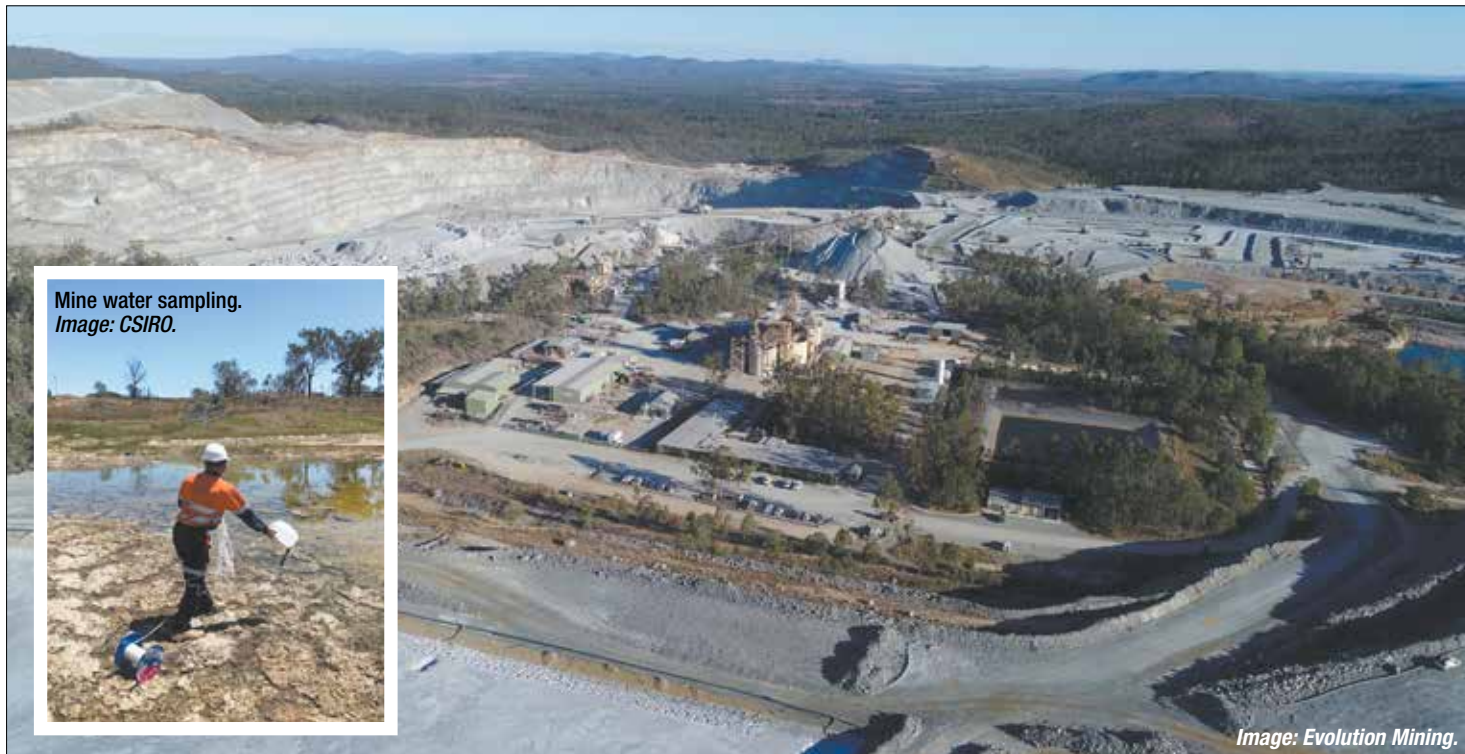
“CSIRO has been evaluating the efficiency of various organic substrates, such as plants saw dust, lactate and ethanol to promote biological sulfate reduction for removing sulfate from mine water,” CSIRO Biotechnology and Synthetic Biology group leader Anna Kaksonen said.

“We’ve also evaluated the treatment of the mine water with hydrotalcite precipitation treatment of Virtual Curtain, also developed by the CSIRO.”

Dr Kaksonen said at Evolution Mining’s Mt Rawdon mine in QLD, the team had been developing biological sulfate reduction based processes for mine water treatment.

“We were approached by Evolution Mining to trial Virtual Curtain hydrotalcite precipitation, which opened an opportunity to explore bioremediation as a compatible treatment that could potentially lead to better results,” she said.

“Additionally, in a strategic CSIRO project we have developed biotechnical



Evolution Mining's Mt Rawdon operation.

processes for removing selenate, nitrate and sulfate from mine waters.”

Dr Kaksonen said CSIRO’s Virtual Curtain technology – which removed various metals from water and neutralised acidity – could be used as a pre-treatment to remove toxic contaminants before biotechnical treatment.

“In this study we have found that the combined use of the Virtual Curtain technology and biotechnical processes gives the best treatment outcome,” she said.

However, Dr Kaksonen said while some mining companies have trialled wetland systems and various biotechnical processes, most mine sites still used chemical treatments to clean up mine water.

She added a constructed wetland could potentially be a cost-effective process to treat water to a stage where it was safe to release back into the environment.

The idea would be to construct a wetland while the mine is operating, which would form part of the mine closure plan.

“Biotechnical processes have many advantages when compared to traditional chemical treatments,” Dr Kaksonen said.

“I think there is potential for using biotechnical system (such as wetlands or bioreactors) more broadly.

“The selection of the process would need to be done on a case-by-case basis depending on the water characteristics, climate and availability of suitable organic substrates to promote biological treatment.”

# Radar level transmitters

## NATIONAL

VEGA Australia is committed to delivering innovative measurement technology that is easy to install and operate with maximum safety and reliability, including the new Radar Level Transmitter for water-supply and sewage industry - the VEGAPULS WL S 61 radar sensor.

Through its development of this new sensor for simple measurement tasks, VEGA drew on its many years of experience, with more than 40,000 VEGAPULS WL 61 sensors already successfully used worldwide in the water-supply industry.

The new VEGAPULS WL S 61 offers a design optimised for use in the water-supply and sewage industry, featuring a wide range of mounting options.

It is also an especially cost-effective radar solution, which can be readily integrated into new and existing installations.

Radar technology offers numerous advantages compared with ultrasonic sensors; radar is independent of weather influences, strong sun, wind, fog or rain, and no compensation is needed for variations in the signal transmission time due to air temperature fluctuations.

With an accuracy of +/- 5 mm, this sensor is particularly suitable for level and flow measurement in water treatment plants.



Radar level measurement made easy.

Its excellent focussing enables its use in pumping stations and rainwater overflow basins, for flow measurement in open channels, and for level monitoring.

The sensor’s robust housing is wear and maintenance-free, and its high degree of protection, IP 68 (2 bar),

also makes it suitable for applications where the sensor may be temporarily submerged.

The new Bluetooth wireless feature allows operation from a smartphone or tablet (and/or a PC with PACTware) when combined with a Bluetooth USB adapter – which makes commissioning

and diagnostics even simpler with corresponding display and signal processing units to display measurements and provide the relay outputs needed, for example, to control a pump.

More information about the VEGAPULS WL S 61 radar sensor can be found at: [www.vega.com/wls61](http://www.vega.com/wls61).





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Looking Forward

**VEGA**



All images: IGO.

# GAME PLAN

AngloGold Ashanti rounded out 2018 on a high as it continues to reap the rewards of its streamlined portfolio.

## GERARD MCARTNEY

AFTER a strong first half, AngloGold finished 2018 with a positive return on its strategy of letting go low performing assets.

AngloGold's two Australian mines, Tropicana and Sunrise Dam, performed exceptionally in the 12 months leading up to 31 December 2018, and after a feasibility study was completed, Tropicana would begin underground mining.

In 2017, outgoing chief executive, Srinivasan Venkatakrishnan closed the South African Tau Tona mine, and in 2018 completed the sale of the South African Moab Khotso and Kopanang mines, and reduced ore reserve development amortisation in Brazil.

Newly appointed chief Kelvin Dushnisky, who transitioned from Barrick to AngloGold on 21 September, continued to promote Mr Venkatakrishnan's vision, recently initiating processes to sell the company's interests in the Cerro Vangaurdia mine in Argentina and Sadiola mine in Mali.

### **"We have a clear set of return and leverage targets that will guide our investments"**

"The portfolio seems a little heavy, so we'll be doing some streamlining," Mr Dushnisky said.

"We're going to be stubborn in our decision making process, and the reality is that some options in the pipeline won't make the grade."

In its Year End 2018 report, the company reiterated its philosophy of "a clear and uncompromising method of allocating capital, which meant that investments may not be made if the returns they offer rank below other available opportunities within the portfolio".

The company's ambition to sharpen its focus on low-cost, high earning projects appeared to be paying off, after it achieved guidance for the sixth consecutive year and reported headline earnings of \$US220 million, up from \$US27 million in 2017.



Sunrise Dam open pit.

After paying a one-time, \$US46 million settlement for a silicosis class action, and \$US25 million in costs associated with restructuring the South African business, the company generated \$US67 million in free cash flow, up from \$US1 million in 2017.

"This is a strong operating performance that shows our commitment to meeting our guidance targets and improving our margins," Mr Dushnisky said.

"We have a clear set of return and leverage targets that will guide our investments."

AngloGold's work to trim the fat off its portfolio had seen the company continue to pull resources out of Africa, but a complete exit from the continent, and its South African home may be a long time off.

The company looked set to stay in South Africa and would not exit the world's deepest mine at Mponeng, that it said would still be operational in 2036.

The redeveloped Obuasi mine was on track to produce its first gold by the end of 2019, and should be at full scale production by 2020.

"Goldstrike was to Barrick what I believe Obuasi will be to AngloGold Ashanti," Mr Dushnisky told delegates at the Mining Indaba conference in February.

"We need those big, chunky engines of growth, which year after year provide

reliable, predictable production and they don't come along very often."

### **Australian Highlights**

AngloGold's Australian projects processed 625,000 ounces in FY18, up from 559,000oz in FY17.

Higher mill-feed grades contributed to a 21 per cent increase in production at Sunrise Dam, which delivered 289,000oz.

A number of one-off capital projects were completed at Sunrise Dam in 2018, such as the construction of the \$28 million recovery enhancement project (REP), a multi-year extension to the tailings storage facility, and the installation and commissioning of two 2MW primary ventilation fans.

This year, the company would focus on stabilising the REP at design levels.

Meanwhile, AngloGold's Tropicana joint venture with Independence Group (70 per cent and 30 per cent respectively) produced its 2 millionth gold ounce in 2018, and had increased its overall production by five per cent in 2018.

A second 6MW ball mill was installed and commissioned ahead of schedule in November, which increased the throughput and improved the metallurgical recovery.

The mine produced 336,000oz of ore, compared with 321,000oz in 2017.

In addition, the joint venture partners'

undertook a pre-feasibility study that confirmed underground mining at the Boston Shaker pit was financially viable and, in December 2018 they announced that a feasibility study into the development of an underground mine was underway, with financial commitment and operations set to start in FY21.

The project was expected to cost about \$100 million to convert the operation from open cut mining into underground.

Once underground, the mine was expected to produce about 100,000oz per year, over the seven year life of the mine.

### **Outlook**

AngloGold expected to produce between 3.25 million ounces and 3.45 million ounces in FY19.

In a recent announcement, the company said production would be back weighted, with a stronger second half expected for Geita and Siguri.

Exploration would remain a key focus in coming months at Tropicana's Boston Shaker underground, Havana underground and satellite targets within the tenement.

After successful intercepts during exploration at Sunrise Dam through 2018, the focus would continue to dip and strike extension and shallow underground potential up-dip of current orebodies.

"In order to create value in the long term, and without resorting to expensive and often complex NMA, it is important to ensure consistent investment in exploration," Mr Dushnisky said.

Other priorities for the company included advancing Obuasi for first production towards the end of the 2019 calendar year.

"We'll continue to place a clear emphasis on getting the basics right, that includes meeting our guidance, always, and strengthening our licence to operate," he said.

"We'll keep a sharp focus on cost and managing capital.

"We'll build on recent efficiency improvements using operational excellence across the business to continue to move down the cost curve."



# Driving efficiencies at Sunrise Dam

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 delivered the Sunrise Dam Gold Recovery Enhancement project for AngloGold Ashanti Australia (AGAA), having previously completed the feasibility study work which established the viable pathway for development of the Recovery Enhancement Project, which was delivered on time and within budget.

GRES is proud to have assisted AGAA in the delivery of the Recovery Enhancement Project, where sulphide mineral recovery and ultra-fine grinding unit processes have been incorporated into the process plant to increase gold recovery.

The High Intensity Grinding (HIG) mill installed is the largest unit of its type currently operating in Australia.

The innovative engineering solutions developed by GRES enable 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



GR Engineering assisted AngloGold in the delivery of the Sunrise Dam Gold Recovery Enhancement project.

diverse range of mineral commodities. GRES 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.

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Red 5 recently celebrated 30 years of continuous production at its newly acquired Darlot gold mine in the Eastern Goldfields, WA, and with positive results from drilling at its King of the Hills mine, the company looks set for a productive year ahead.

## EMMA DAVIES

THE Darlot mine was acquired by Red 5 from Gold Fields in October 2017 and has historically produced almost 3 million ounces of gold – with the company confident the site will continue to produce consistently for years to come.

Red 5's other major operation, the King of the Hills (KOTH) mine, which was acquired from Saracen also in 2017, had seen its resources almost triple to 1.9 million ounces of gold.

"The December quarter has been one of the most exciting periods in our recent history," Red 5 managing director Mark Williams said.

"Operationally, we were able to deliver a strong production performance from Darlot and King of the Hills, while from an exploration and growth perspective we achieved a major breakthrough – identifying what is shaping up as a potentially transformational bulk mining opportunity at King of the Hills."

The December quarter – which marked a full 12 months since Red 5 assumed ownership of the Darlot and King of the Hills assets – saw both mines deliver solid gold production.

"With the ramp-up of mining at King of the Hills completed during the quarter, we were able to achieve a steady-state annualised production rate of greater than 100,000 ounces per annum; a significant milestone for the group," Mr Williams said.

"Our WA gold operations delivered gold production of 26,118 ounces for the quarter, continuing our strong growth momentum and putting us on-track to achieve our forecast production guidance for the 2019 Financial Year of 100,000-115,000 ounces at an All-In Sustaining Cost of \$1350-1550 per ounce.

"AISC for the quarter averaged \$1547 and, with mining now at steady-state, we have commenced the implementation of an active cost review process to help drive lower operating costs across our operations into the future."

## Encouraging Results

Mr Williams said that, without a doubt, Red 5's exploration and resources development programs delivered the most excitement for the quarter.

"After first flagging the potential for bulk mining at King of the Hills in late September 2018, we have since made good progress to define this opportunity, with recent work programs culminating in the delivery of an initial 'proof-of-concept' bulk mining mineral resource for KOTH of 1.88 million ounces of contained gold," he said.

"This initial resource was based on a portion of the prospective granodiorite contact zone, and represents a genuine game-changer for Red 5 with the potential to underpin a significant long-term bulk mining operation."

Based on the strength of the initial resource, Red 5 commenced a strategic review to evaluate the economics of a bulk underground and/or open pit mining operation at KOTH – together with a standalone processing facility on-site.

This review would incorporate the results of the drilling program that commenced during the December quarter.

"Outside of KOTH, our exploration programs at Darlot have also continued to deliver positive results, highlighting the potential to further grow resources and reserves and extend mine life," Mr Williams said.

"Darlot celebrated its 30 year anniversary of continuous gold production in November 2018, with both near-mine and

regional exploration programs continuing to deliver positive results."

The company was also implementing a regional drilling program in early March 2019 to unlock further value along the highly prospective Tarmoola and Ursus Fault systems.

This third exploration program would be conducted parallel with the ongoing underground diamond drill program and assaying of the historical drill core.

"We are very excited about the significant untapped exploration potential at KOTH over and above the exciting new bulk mining opportunity which we are currently pursuing," Mr Williams said.

"The broader tenement package is very under-explored and we believe that the outstanding suite of targets we have defined have potential to develop and grow the current resource base.

"We believe that the geological setting of each target demonstrates characteristics analogous to KOTH and Gwalia-style gold mineralisation and present significant discovery opportunities."

## Bulk Mining

Mr Williams said the 30,000m drilling program at King of the Hills was making solid progress and delivering some exceptional results early, including some of the most impressive broad zones of gold mineralisation ever reported at the mine.

"Our underground drilling program is off to a strong start with these highly encouraging intercepts," he said.

"We have a growing level of confidence in the potential to upgrade and expand the existing 1.88moz bulk mineral resource.

"These drilling results, together with the results being generated from the program of assaying unassayed historical drill

core, are expected to contribute towards future increases in the KOTH bulk mining Resource."

The results from the drilling program included an exceptional intercept of 312m grading 2.01 grams per tonne gold, plus numerous thick composite intercepts of significant gold mineralisation – results which provided further impetus to the bulk mining strategy at KOTH and, together with the assay results, are expected to contribute towards enhancing the tonnage, grade and classification of the KOTH resource.

**"We have a growing level of confidence in the potential to upgrade and expand the existing 1.88Moz bulk mineral resource"**

Mr Williams said that a strategic review had commenced to examine potential bulk mining development options.

"This will include the merits of open pit mining, as well as the economics of building a standalone processing plant at King of the Hills versus continuing our existing truck-to-Darlot business model," Mr Williams said.

"We expect that this strategic review will be completed around the middle of this year, providing us with a clearer insight into how best to move the project forward."

Production guidance for the March 2019 quarter had been adjusted to take into consideration a mill maintenance shutdown planned in February, however production was still expected to be in the range of between 24,000 and 28,000oz at an AISC of between \$1450 and \$1650 per ounce with the bulk mining of the KOTH site expected to be completed in the June 2019 quarter.

"We feel like we could be on the cusp of something really big at King of the Hills," he said.



# Celebrating 45 years of business

## NATIONAL

CJD Equipment reached its milestone 45th anniversary in February.

What started in 1974 in Guilford, WA, now has 19 metropolitan and regional locations across Australia with more than 500 staff.

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CJD offers parts and servicing for construction equipment and trucks, and its branch and dealer network spans from Australia's capital cities to regional country towns, providing 24/7 sales, parts and service support from more than 500 highly experienced staff with knowledge and skills that are unsurpassed in the industry.



CJD is able to service customers Australia-wide through its network of branches and dealers.

CJD Equipment attributes its success to its focus on customers.

The company built its ethos around a strong customer-centric focus, and its values of service, support and expertise, have helped it to create a national

network over the last 45 years.

More information can be found at: [www.cjd.com.au](http://www.cjd.com.au).

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# KNOWLEDGE HUB

Now in its 38th year, the Minerals Investment Week will look to the future of the industry to discuss the challenges and opportunities that rapidly advancing technology and volatile markets present.



Image: Informa.

## GERARD MCARTNEY

FROM 20-21 March, the Minerals Investment Week will see global representatives from mining companies meet at Crown Perth to discuss the future of the industry.

The five conferences participating included the Global Iron Ore & Steel Forecast Conference, the Mineral Sands Conference, the Lithium & Battery Metals Conference, the Asia Pacific Nickel Conference and the Pilbara Copper and Gold Forum.

### Global Iron Ore & Steel

Iron ore and steel industry leaders from around the world will meet to discuss and consider the outlook for 2019 and into the future.

WA Mining minister Bill Johnston would open the conference, followed by keynote addresses from a senior executive at BHP, and Fortescue Metals Group chief operating officer Greg Lilleyman.

“With numerous new mine and expansion projects about to inject hundreds of millions of dollars into the Pilbara region, the Global Iron Ore & Steel Forecast Conference 2019 will focus on exploring the iron ore boom 2.0,” conference organiser Informa said.

The focus would be on topics such as iron ore and steel market outlooks and updates; the creation of value in a changing market; China’s changing iron ore demands and the restructuring of the Chinese steel industry; and the practical aspects of managing a second iron ore boom.

FIFO and worker’s camps, engineering requirements, skills shortages and cost inflation would also be discussed at length.

Individual seminars would range from a panel discussion about the changing role of iron ore quality, to the five-year future of steel and iron ore, to a lecture on

the influences of innovation and electric vehicles on steel demand, and more.

### Mineral Sands

The 20th annual conference would offer analysis of the latest market updates, where industry heavyweights weigh in on major developments and outlooks.

The two day event offered “exclusive insights into Tio2 and zircon.”

Informa said key topics included project and operation updates, logistics and infrastructure, export trends, raising capital and project financing.

Opening with a lecture by ARTIKOL (UK) managing director Reg Adams titled *Mineral Sands in an Age of Uncertainty and Volatility*, the conference would continue to dissect and explore the future of mineral sands through individual seminars on the global zircon and Tio2 market; the Chinese market; case studies of the Fingerboards mineral sands project; and the Avonbank demonstration plant; to a closing lecture by Dr Kathie McGregor titled *Processing Options for Full Value Recovery from Titanomagnetite*.

“With a positive outlook for mineral sands products, this well-established event is the only Australian conference offering a comprehensive analysis of the latest industry updates,” Informa said.

### Lithium and Battery Metals

After the success of last year’s inaugural event, the Lithium and Battery Metals Conference was back to cut through the oversupply-undersupply rhetoric and discuss what the future holds for the battery sector.

“A global shift is underway as countries legislate an end to internal combustion vehicle sales and the automotive industry prepares for the next generation of electric vehicles to hit the roads with 2025 pegged

as the tipping point in EV uptake as their costs dip below conventional vehicles, causing demand to surge,” Informa said.

Day one would give a comprehensive breakdown of the major battery commodities, lithium, graphite, cobalt, copper and nickel, and where they fit into the current market.

There would be a “roundtable discussion from leading analysts on the current state of the sector, demand trends, oversupply vs undersupply, and what we can expect over the coming year,” Informa said.

Day two would focus on the future of electric vehicles and clean energy.

There would also be a notable lecture from Dr Xiao Lin, associate professor of the institute of process engineering at the Chinese Academy of Science focusing on novel technologies and the whole life cycle of lithium, “from ore utilisation to spent battery recycling,” Informa said.

The outlook for the raw materials critical for electric vehicles, and the future of lithium, would be discussed at length by some of the world’s leading lithium and battery metals experts.

### Asia-Pacific Nickel

For the first time at Minerals Investment Week, there would also be a conference discussing the emerging division of nickel into two distinct commodity markets.

“As energy companies move towards batteries for large-scale storage and the automotive industry prepares for the next generation of electric vehicles to hit the market, the nickel industry has seen a surge in demand,” Informa said.

“This, combined with the traditional steel market continuing to strengthen, has resulted in the nickel industry in the Asia Pacific region hurtling towards a new era.”

The conference would respond to the state of flux that the nickel market has found itself in as the growing demand for

long-term and large scale battery storage competes with the traditional stainless steel market.

Day one would look at the impact that the changing market, and the possible emergence of two distinct commodity markets, would have on the future of nickel.

Day two would run through a case study of the West Musgrave project and talk about collaboration, give market updates and close with a lecture on the global trends and environmental issues in nickel mining.

### Pilbara Copper and Gold

The inaugural forum is a one-day event dedicated specifically to the Paterson province in the Pilbara.

“This is the only forum which will provide the latest update on activities in the Paterson region,” Informa said.

The Pilbara Copper and Gold forum would offer a deep dive into the exploration challenges and look at the possibilities of airborne electromagnetics.

It would also give an equity market viewpoint of the Paterson range, an outlook on copper, and discuss the role that electric vehicles have in driving the demands of the future.

“It’s no longer just buzz and speculation around the Paterson province – the region is a hotbed of exploration, and interest has been well and truly reignited,” Informa said.

“This one-day forum [will] ascertain the real from the hype and discuss the possibility that the Paterson province could potentially be the next Mt Isa,” Informa said.

The speakers at the forum included West Wit Mining exploration director Dr Andrew Tunks; Carawine Resources managing director David Boyd; and CSIRO senior research scientist David Annettesat, among many more.



# GOLDEN TICKET

WA-based junior Echo Resources is well-placed to begin operations at its Yandal project with key infrastructure already established, significantly reducing its timeline to production.

The Bronzewing processing plant [currently in care and maintenance] can be made operational within six months.

All Images: Echo Resources.

## EMMA DAVIES

ECHO Resources is rapidly moving from explorer to developer at its 100 per cent owned Yandal gold project in the Eastern Goldfields, WA.

The project has existing mineral resources of 1.7 million ounces and ore reserves of 856,000 ounces, which Echo is confident it will continue to expand through the application of modern exploration techniques.

Echo chief executive Victor Rajasooriar said that the company was on track to complete Yandal's revised Bankable Feasibility Study in the March quarter—which will dictate the project financing strategy.

**“One of the clear advantages of our Yandal project is the amount of infrastructure we have already established on site around our Bronzewing processing hub”**

“Depending on the outcomes of that study and our ongoing discussions with potential project financiers, the Echo board will then determine the pathway which will ultimately dictate the timeline,” Mr Rajasooriar said.

“But ultimately our intention is to take the project through development and into production as soon as it's feasible to do so.”

The mine plan would see the company refurbish its nearby Bronzewing mining and processing facility, currently on care and maintenance, to aid in Yandal's rapid transition into production.

The Bronzewing facility could process 2 million tonnes per annum, and studies



undertaken by Echo demonstrated the facility could be refurbished for about \$17 million.

“One of the clear advantages of our Yandal project is the amount of infrastructure we have already established on site around our Bronzewing processing hub,” Mr Rajasooriar said.

“We have an existing tailings dam facility which is capable of storing 17mt of tails (nearly 10-years of future production), an operating airstrip, 240-person camp, power, water and communications infrastructure,

along with an extensive network of access and haulage roads.”

Mr Rajasooriar said the refurbishment of the processing plant would take up to six months to complete.

“We'll make significant cost and time savings by using this existing infrastructure which, in turn, drives a low capital intensity and much faster payback period,” he said.

“This helps to lower the risk of the project and will free up funding faster so we can get on with the job of finding the next 1 million ounce deposits within our 1600sqkm land

package.”

Mr Rajasooriar joined Echo's executive team in November 2018 as a mining engineer with more than 20 years' operational and technical experience, but he was humble regarding the influence of his appointment towards recent success.

“Echo was already well advanced with its Feasibility Study work and project financing for the Yandal project when I joined in November, so my role has really been in taking a leadership role in ensuring we deliver on the strategy set by the board,” he said.

“Echo has a strong team that's been bolstered by the recent appointments of Richard Hill as chief financial officer, Wayne Foote as project manager and Travis Craig as general manager geology.”

Mr Hill was previously the chief financial officer at Egan Street Resources and brought experience with feasibility study completion, project construction and development, mine operation as well as corporate combination and integration activities.

“We feel we're well placed now to transition the company through financing, construction and into production,” Mr Rajasooriar said.

## 2019 Outlook

While the focus remained on fast-tracking Yandal into production, Echo was also actively exploring the region to add incremental, near surface ounces to further enhance a planned restart of the Bronzewing processing facility in 2019.

The company recently completed a drilling program at the Mt Joel prospect in the hopes that exploration will lead to an increased mine life for the Yandal site.





The Bronzewing processing facility is set to be refurbished for the Yandal project.

“We’ve seen consistent intersections of good grades over large widths and these results will all contribute to an updated mineral resource estimate due before the end of the March quarter 2019,” Mr Rajasooriar said.

“Our objective has been to add additional high-quality oxide ounces to our resource base which can be included in the first four-years of the mine plan for the Yandal project.

“We’ve still got some work to do at Mt Joel but we’re confident that it will make an important contribution to the overall project.”

The prospect was just 12km northeast of the Bronzewing processing hub, with discontinuous gold mineralisation extending more than 8km.

Significant results included 16 metres at 24.1 grams per tonne gold from

26m (MJRC119) with consistent gold mineralisation at shallow levels.

**“We feel we’re well placed now to transition the company through financing, construction and into production”**

Mr Rajasooriar said the company had also gathered extensive geological data, which would aid in further exploration of the system.

“With an exploration budget to be funded by production, we are excited about the deep exploration potential of the area,” he said.

Once the Yandal BFS was finalised and project financing completed, Echo would be in an excellent financial position to make the leap from explorer to gold producer.



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equipment have been standardised to ensure that the company is able to hold a comprehensive parts inventory.

This allows it to respond quickly and efficiently to any mechanical issues, minimising downtime and maximising production.

Recently, Three Rivers Drilling has been diamond drilling for Echo Resources’ Mt Joel project as part of Echo’s strategy to provide incremental, near surface ounces to enhance the restart of the Bronzewing facility in 2019.



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# Adrad releases two new Procore products

## NATIONAL

ADRAD is Australia's largest manufacturer and supplier of industrial and automotive aftermarket engine cooling and air conditioning parts.

As a manufacturer, Adrad has the experience and knowledge to recognise innovation and superior design; which the company uses to carefully select high-quality products from manufacturers worldwide.

The Procore range of replacement radiator modules to suit Caterpillar equipment is one example.

As they are not simply aftermarket replacement parts — these enhanced products surpass original equipment performance.

Following extensive analysis of original modules, Procore identified and eliminated weaknesses by modifying the design and materials.

Original units have a single end tank with a baffle and rubber gasket to separate the coolant, and over time this gasket can deteriorate, leading to bypass leaks that reduce the efficiency of the radiator.

The Procore unit has separate tanks on the AMOCS module which prohibits the problem of bypassing that can lead to overheating.

Materials used in construction have also been improved.

Tank walls and headers on the folded cores are 30 per cent thicker than original equipment (OE) specification and centre mounts are more than 20 per



Procore AMOC and Folded radiators are engineered for superior performance, strength and durability.

cent thicker.

Deep-drawn tube-to-header contact provides 150 per cent more contact than the OE design.

Adrad's range of Procore radiator modules has been expanded to 17

products, with two new units recently added; radiator module part #CMC3006 suits track-type tractors D9T, D10N, D10T and D10R, while part #CMC3007 suits track-type tractor D10T.

These high-quality aftermarket units are available from Adrad distributors

across Australia including Natrad, Adrad Radiator Experts and leading radiator workshops.

More information can be found at: [www.adradradiators.com.au](http://www.adradradiators.com.au) or by calling 1800 069 610.

# Quality pumping solutions

## INTERNATIONAL

ANCHORED by strong values, Truflo Pumping Systems form close partnerships with its stakeholders, and as a team consistently meet its client requirements.

Working across a range of industries from mining to construction, Tru-Flo is recognised as a leading global pump manufacturer specialising in the development and engineering of pumping strategies and design solutions for mobile and permanent pumps for more than 20 years.

The Tru-Flo brand has become acknowledged with a guarantee for quality, dependability and maximum performance.

Included among its many world class products is the Vac-Assist Self priming Pumps – widely used by larger mining companies that demand extremely reliable high-performance pumping.

Some of Tru-Flo's range include the



Image: Truflo Pumping.

Truflo are market leaders in both open and underground mine dewatering.

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in meeting diverse client demands, assisted clients in achieving their goals, objectives, and in most situations surpassing expectations.

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# Metso chosen for equipment flexibility

## INTERNATIONAL

WHILE working three sites on a fixed production schedule, mobile crushing and wash plants offered Riverbend Construction Services the ultimate in freedom and flexibility.

Utilising Metso's proprietary Bruno simulation software early in the buying process, the business could troubleshoot site-specific challenges and determine the best configuration for maximum results.

Driving the customer's decision was getting the right equipment and support for greater crushing efficiency.

Riverbend Construction Services was contracted to drill, blast, and crush hard granite at the three quarries in North Carolina.

Riverbend had the difficult task of reaching peak production at each location without the footprint available for stationary crushing equipment.

Riverbend owner Duff Boyd chose Metso's line of mobile Lokotrack crushing units to solve this unique challenge.

"We'll come in here (each site) and build a bunch of inventory, fold up shop, pack it up, head to the next site, do the same thing," Mr Boyd said.

Since his client wanted everything broken down to -1/2" after crushing in the pit, he simplified the end material production process by connecting multiple units together.

He lined up the Metso LT300HP for secondary crushing with the LT220D for tertiary crushing.

After that, material is fed to an ST4.8 washing screen.

"With Metso offering the LT220D, it removed the need for five pieces of equipment," Mr Boyd said.



More information can be found at: [www.metso.com](http://www.metso.com).

The machines have proven to be dependable, flexible, and mobile to allow one solution to be shared between all three sites.

### Choosing the right partner for the job

Choosing Metso for the job meant weighting a few factors.

"Number one, can it do the job? The equipment has to be physically capable of producing a quality product that meets specs," Mr Boyd said.

"And secondly, you have to have the

support. You can have the best piece of equipment in the world, but if you don't have the support, then I'm not interested.

"And that's where the local dealer, Stowers, and Metso come in. Metso's support is unmatched."

Metso's proprietary simulation software, Bruno, was another factor that helped Riverbend choose the equipment best suited to their needs.

It used the Bruno software to input its unique site challenges, model exactly what equipment would work, and even how best to configure it.

"They can plug in their models, whether it be the LT300HP, or the LT106, and plug it all in and hit 'go'," Mr Boyd said.

"With Metso, they understand their equipment. It's not just a generic AggFlow program, it's unique to Metso, and the accuracy is impressive."

The combination of the right equipment, both OEM and local dealer support from Stowers, and experimenting with production options in Bruno made Metso the only solution for this production process.

"It's that total package that makes it very desirable to buy," Mr Boyd said.

# The flocculant and innovation specialists

## NATIONAL

FLOERGER started manufacturing polyacrylamides in 1968 in Saint Etienne, France.

During the 1980s, a continuous expansion program led to the construction of new production lines every year, and saw SNF build the largest flocculant manufacturing plant in the world.

In 2000, SNF created 30 subsidiaries that provide highly skilled, on-site technical support globally.

SNF manufactures speciality chemicals for the mining industry with focus groups for specific processes, such as alumina refining.

In addition to its core flocculant line, SNF's range also covers products for solid-liquid separation at any stage of the

mining process, anti-scalants, impurity removal agents, grinding aids, dust suppressants and filtration aids, all of which can be used to deliver reduced operational and energy costs, improved water recovery and reduced environmental impact.

As part of its innovation strategy, SNF dedicates 2 per cent of its annual turnover to R&D, with more than 100 new products every year.

The company collaborates with customer research laboratories and prominent universities worldwide, where it focuses on customer needs and driving innovation in new products.

SNF is one of the world's pre-eminent producers of water-soluble polymers.

With a capacity of more than 1 million tonne per annum (mtpa), the company has established itself as a global leader in polyacrylamide manufacture.



More information can be found at [www.snf.com.au](http://www.snf.com.au).



# Opening doors for mining

## NATIONAL

SINCE its formation in 1994, ASSA ABLOY has grown from a regional company into an international group with about 47,000 employees and operations in more than 70 countries.

The group's strength is its variety of traditional and new products that can be combined to create a large number of different door environments, different climates, different types of buildings and differing security and safety requirements.

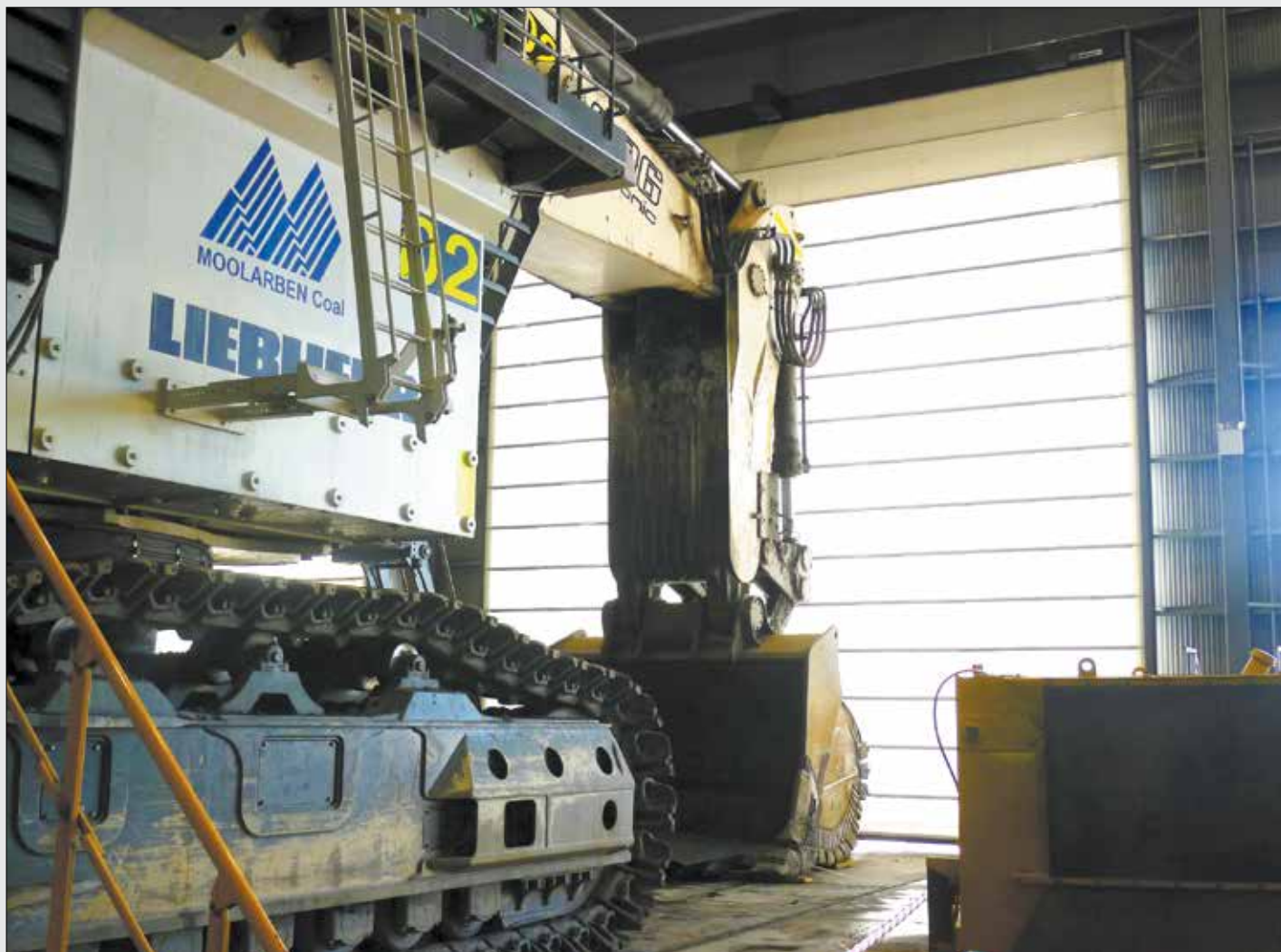
Tough conditions demand strong entrances.

Whatever the size, and however high the requirements, ASSA ABLOY can supply products that cover almost any opening, including truck shops, wash bays, and maintenance facilities.

"We offer a great deal of experience with automated mining doors," ASSA ABLOY Entrance Systems Australia Mining and Aviation Segment national sales manager John Boyle said.

"We have successfully provided doors to the mining industry, from Svalbard Island deep in the Arctic north to the dry plains of the Atacama Desert in Chile.

"Suitable for extreme sizes and tough



ASSA ABLOY creates quality products for for any door environment.

conditions, the robust design and high quality have ensured reliable, long-lasting results."

The product range included automatic swing, sliding and revolving doors, air curtains, gate automation, garage doors, high-performance doors, industrial doors,

docking solutions and hangar doors.

"Our hangar doors are best suited for extreme sizes and extremely tough conditions and our high-performance doors are best suited for high cycle, high speed, and extremely tough conditions," Mr Boyle said.

"We also offer world class services and engineering experience and have sales and service offices located in every major mining region in the world."

More information can be found at: [www.assaabloyentrance.com.au](http://www.assaabloyentrance.com.au).

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# RD3 remote monitoring device improves efficiency

NATIONAL

RAMMER delivers innovative solutions to improve profitability, safety and performance.

The company has launched its purpose-developed RD3 remote monitoring device for its 'Excellence Line' of rock breakers,

RD3 is the first ever remote monitoring system for hydraulic rock breakers.

It provides real-time data on operating hours, correct usage, service intervals and exact location of the equipment.

RD3 uses the MyFleet Telematics service to remotely track and monitor rock breaker usage, making it ideal for operators, rental companies and dealers.

The cloud-based system enables the rock breakers to be viewed and monitored with Google Maps and all the data is accessible 24/7 by logging into the My Fleet platform.

The main benefit of the system is that it enables owners and managers of fleet to know exactly where their equipment is and optimise it at its location.

It also provides information on their equipment and how it is being operated, enabling enhanced application knowledge and operator education.

With the RD3 data from the MyFleet platform, owners and managers can achieve advanced fleet management compared to standard tools and make processes more efficient, which contributes to the overall profitability of the business.



More information can be found at: [www.rammer.com](http://www.rammer.com).



## ADVANCED FLEET MANAGEMENT WITH RD3 TELEMATICS

RD3 device is the first ever remote monitoring system for hydraulic rock breakers providing real-time data on operating hours, correct usage, service intervals and exact location of the equipment.

All Rammer Excellence line of rock breakers have integrated smart technology for easier fleet management and more efficient processes.



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# Keeping mines cool

## NATIONAL

IT is well known that there are a number of safety issues in regards to underground mining in Australia and around the world.

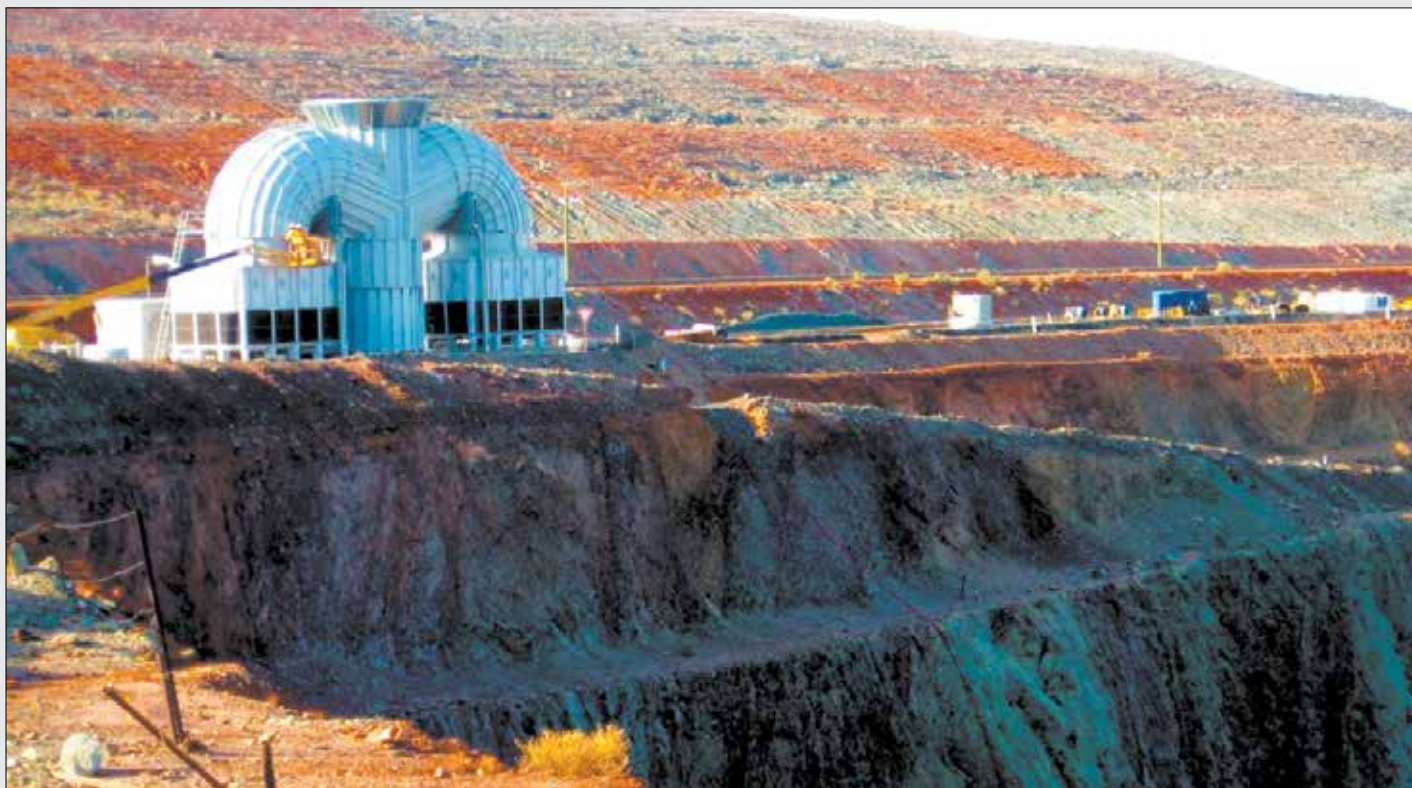
One of the hottest topics associated with this form of mining is the high risk of heat illness which can lead to a loss of productivity, health issues and high worker turnover rates.

Auto compression, strata heat, water, people, explosives, oxidation, compressed air equipment, electric and diesel machinery are all heat load sources in underground mining that can result in operating temperature conditions well above safe working limits.

Often excessive heat load problems can be controlled through various ventilation techniques — but if the heat loads are too high and safe working limits are exceeded, then the only means of maintaining acceptable working temperatures is through correct application of refrigeration.

Most mines in Australia make use of Bulk Air Cooling (BAC) prior to entry of the mine's air intakes.

This method is ideal where most



Gordon Brothers — engineering peace of mind since 1917.

of the air cooled will be utilised and has the advantage of all maintenance activities on the refrigeration system being surface based.

If the mine is very deep, or only a small proportion of the air chilled on the surface is of benefit, then other forms of cooling may be considered.

There are two main refrigeration systems that can provide the refrigeration required by the bulk air coolers; vapour compression systems and absorption systems.

Vapour compression refrigeration systems are the most common refrigeration system for the mining

sector offering high COP's (coefficient of performance), flexibility, and versatility; refrigerant vapour is compressed, condensed, expanded, and then evaporated in a continuous cycle.

Absorption refrigeration systems are similar to vapour compression systems except that, instead of a refrigerant passing through a compressor, it now passes through a generator, an absorber, and an absorbent pump.

The primary advantage of absorption systems is they can be driven by waste heat or low cost forms of heat, which supply the energy for the internal chemical reactions to take place instead of electrical power.

The waste heat required can be obtained from a variety of sources such as exhaust heat generated from gas and diesel power station exhausts and jacketing, and via the burning of coal seam methane.

Through the installation of bulk air cooling equipment utilising vapour compression and absorption refrigeration systems, it is possible to provide the required cooling to maintain safe working temperatures for employees, maintain or increase production, and take a mine to new depths.

Readers that would like to know more about industrial refrigeration can visit [www.gordonbrothers.com.au](http://www.gordonbrothers.com.au).

# Air conditioning improves safety

## NATIONAL

AIR conditioner failure, especially in remote locations with extreme weather, can cause millions of dollars in down time, affect safety, affect morale and cause many more unforeseen problems.

Mining and heavy transport vehicles are often exposed to constant dust, dirt and debris that can clog the air conditioning system.

Summer heat and rugged terrain combines to create excessive airborne dust and debris that can cause respiratory and other long term health problems, and also excessive operator fatigue and discomfort.

Air conditioning systems are complex units that include control systems, vacuum lines and a refrigerant system.

Airflow is vitally important to any air conditioning system, and it is essential that it is maintained regularly.

In both the short and long term, poor maintenance is an expensive strategy and air conditioning, just like any other component in a machine, needs regular maintenance or it breaks down.

With the right system and regular maintenance, costly downtime due to failure can be avoided.

Cabin pressurisation is a solution to dust ingress that works anywhere that dust is an issue, and is a much more comfortable and long term solution than a dust mask.

By creating a constant positive



Lyons are inducted and preferred on mine sites.

pressure in the cabin, a pressurisation system creates a pressure barrier that stops dust from entering the cabin.

With 25 years' experience, Lyons Auto Electrical and Air Conditioning can fit, replace, repair and refurbish pressurisation systems in vehicle cabins, control rooms, caravans, switch rooms, crusher cabins and skid steers.

Lyons Auto Electrical and Air Conditioning is inducted, approved and preferred on mine sites.

The company provides customised services and has the technical expertise and established resources to supply almost any mining, transport or construction industry need.

Lyons constantly sources new and

innovative air conditioning, filtration and pressurisation systems, as well as known brands such as Red Dot, Sigma and Icepack.

Lyons has a mobile fleet service and extensive service and repair facilities that can handle everything from large four wheel drives to prime movers and mining equipment.



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Image: CBM.



The CBGuard X-ray monitoring system in use.

# Conveyor belt monitoring goes digital

## NATIONAL

CBM has recently introduced the CB Guard Live X-Ray to its product arsenal.

The software has the capability of generating intelligent, holistic analysis of any kind of threat to a belt, including damage that is not visually identifiable such as broken or corroded cords; and irregularities such as holes, bubbles,

foreign objects and even insufficient belt cleaning.

CB Guard software can identify, store and scan each individual splice, and any deviation would automatically trigger an alarm, or even stop the belt

This means that through timely detection, the CB guard can prevent severe, costly accidents.

CBM's steel cord scanning system was

designed as a standalone system, but works as an integral part of a condition based monitoring system.

The system can detect steel cord, carcass damage, and splice irregularities through non-destructive testing.

The company's fabric belt scanning system is also non-destructive and can determine the belt's palm print to give recommendations for repairs that may need to be made.

CBM is an independent belt manufacturer, and with nearly 40 years' experience it is the world's longest serving conveyor belt monitoring provider, servicing the mining industry since 1980.

Its reputation has been built on providing honest, expert advice through a comprehensive understanding of the harsh conditions faced by the people who work in the mining industry.



Conveyor Belt Monitoring

CBM Extending the safe working life of all conveyor belting



### CBM can provide

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- Fabric belt scanning
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# Become a qualified drone operator

## NATIONAL

THE Civil Aviation Safety Authority (CASA) in Australia requires a Remote Pilot Licence (RePL) to operate a drone (or Remotely Piloted Aircraft — RPA) that weighs above 2kg and is being used for commercial purposes.

In just five days, National Drones Institute can provide the training to qualify for both a RePL and an Aeronautical Radio Operators Certificate (AROC), which is required to operate a drone in controlled airspace.

National Drones Institute is an all-in-one service for RPAS training to obtain a Remote Pilot Licence (RePL) and RPA Operator's Certificate (ReOC), providing official training courses and commercial aerial activities for amateurs and professionals alike.

All its RPAS training courses are CASA-approved, ensuring the quality of its instruction and conformance to industry requirements and standards.

National Drones offers consultancy services to a number of organisations throughout Australia, including law enforcement agencies, as well as universities and government organisations.

This consultancy can range from internal training, through to fleet selection and risk mitigation, and internal policies and procedures.

National Drones, as a fully insured specialist provider of drone aerial



National Drones Institute offers a five day Remote Pilot Licence course.

survey services, continues to evaluate and test the latest technology that ensures clients benefit from these on-going developments.

The company is interested in partnering with like-minded enterprises embracing the uses of this technology, especially in developing up improved

client workflows solutions in medium to large organisations.

More information can be found at: [www.nationaldronesinstitute.com.au](http://www.nationaldronesinstitute.com.au).



**Baseline Training Pty Ltd is proud to partner with National Drones Institute – your all-in-one service for Drone operator training to obtain a Remote Pilot Licence (RePL) and RPA Operator's Certificate (ReOC).**

National Drones is a Civil Aviation Safety Authority (CASA) certified aerial solutions provider, with highly skilled operators located throughout Australia. Studying with the National Drones Institute means you're part of the National Drones alumni; having direct access to professional operators across the country, state of the art equipment and the latest, most up to date software systems available.



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# Corrosion resistant submersibles

## NATIONAL

CONVENTIONAL cast iron and lower grade stainless steel pumps are literally eaten away by the acidic water found in gold, zinc, copper and nickel mines, but the Tsurumi SFQ series 316 cast stainless steel submersibles are designed to handle corrosive liquids.

"Tsurumi Pump realised that cheaper grades of stainless steel don't last under these corrosive applications.

Their design uses a high grade of 316 cast stainless steel because of its ability to resist corrosion," Australian Pump Industries' Tsurumi division manager Neil Bennett said.

"Reports from Tasmania are that these pumps are working well in copper mines."

The SFQ range includes two-inch and three-inch three-phase pumps with heads to 44 metres and flows to 2000 lpm.

They feature a high-capacity semi open style impeller that will perform in even the toughest conditions.

The SFQ series of submersibles are unique in that even the stator housings are cast and machined 316 stainless steel.

Casings, impellers and suction covers are also cast 316 stainless steel.

The grade of stainless steel used has a higher content of carbon for strength.

It also has a high proportion of nickel and molybdenum for improved corrosion



Australian Pump Industries Tsurumi division manager Neil Bennett checks out the Tsurumi SFQ cast 316 stainless steel pumps.

resistance.

No welds are required, which means no pitting and reduced oxidation.

This material is also capable of withstanding abrasive liquids.

"Our experience has been that

Tsurumi pumps provide trouble-free reliable operation in corrosive applications around the world," Mr Bennett said.

Tsurumi incorporate a number of features that enhance the life expectancy of the pump and cut maintenance costs.

These include a unique anti-wicking cable gland; water is prevented from wicking down inside the cable and the motor is protected even if the cable is damaged or the end accidentally immersed.

All Tsurumi pumps have a double silicon carbide mechanical seal.

Both seal surfaces are submerged in an oil chamber, well away from the pumped liquid.

A patented oil lifter ensures the mechanical seal faces are always lubricated and cooled, even if the pump is installed horizontally.

Tsurumi Pump developed the product range in response to requirements in the Japanese market for super tough pumps for the chemical industry.

Like all Tsurumi pumps, they are backed by a three-year warranty against faulty material or workmanship.

A comprehensive free literature pack is available, as well as application data, support and a free advisory service, from the Australian Pump Industries mine engineer team.

Further information about Australian Pump Industries can be found at [www.aussiepumps.com.au](http://www.aussiepumps.com.au) or by calling (02) 8865 3500.

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# Customised filtration systems



Manifolds during fabrication.

## NATIONAL

DIX Engineering's experienced team has an international reputation for excellence in the field of engineering, completing projects in Australia, Asia, North and South America and Europe.

The company is constantly evolving the business to meet customer and market conditions and offers specialised filtration systems for the mining industry.

Dix's stainless-steel screen filters are manufactured from high-strength 304-grade stainless steel as standard and 316 on request, which ensures exceptional

corrosion and wear resistance, providing many years of reliable service for the cleaning of process and waste water.

The eight standard filters in Dix's range cater for flows from 375 litres per minute to as high as 10,000 litres per minute.

All screen filters are fitted with manual or automatically operated brushes for flushing.

Every filter is hydrostatically tested to twice its normal operating pressures before leaving the factory.

Dix Engineering also has a range of media filters. Filtration is achieved by forcing water through a media bed of sand

or gravel, with filtration rates as low as 20 microns or less achievable depending on media used.

These stainless-steel tanks are available in sizes ranging between 230mm and 1200mm diameters, and can come in modular form to meet customer specifications.

"Azud filtration systems are also distributed and extend the range of our screen and media filtration systems with automatic disc filtration systems and Azud Luxson suction scanner filters available," Dix Engineering store and sales manager Steve Watson said.

The company offers an extensive range of 316 stainless steel repair bands and cast irrigation fittings, at competitive prices around the country.

Special fittings can also be designed and manufactured to order, either fabricated or cast in the Renmark foundry.

Dix Engineering also provide fabrication and installation services and recently purchased a state-of-the-art fully computerised plasma cutter capable of cutting mild steel and stainless steel with high definition, precision and accuracy.

More information can be found at [www.dixrenmark.com.au](http://www.dixrenmark.com.au).



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# Mercury and battery recycling specialists

## NATIONAL

CMA Ecocycle is Australia's first and most experienced EPA licenced mercury recycling company.

Based in Campbellfield Victoria, CMA Ecocycle's plant uses European made high-tech recycling equipment to process large and complex volumes of mercury containing wastes.

The company can recycle materials such as mining and mineral processing waste, activated carbon, mercury containing chemicals, switches and control equipment, PPE, soils, sludges, filters, amalgam and other mercury containing waste.

CMA Ecocycle is commissioning Australia's first state-of-the-art battery recycling, sorting and processing plant.

Australians use more than 400 million batteries every year, and 95 per cent of these end up in landfill.

When disposed in landfill, batteries can leak toxic substances such as lead, mercury and cadmium into the environment.



CMA Ecocycle can recycle all batteries and any mercury containing waste.

CMA Ecocycle has provided thousands of businesses across Australia with recycling solutions, accepting all types of batteries by utilising computer-controlled sorting machines that separate batteries

according to their size and chemistry.

The company can store, collect or provide specialist wheelie bins to dispose of single use, rechargeable, lead acid, button cell, HEV, PHEV, EV eBike and

grid-scale batteries.

CMA Ecocycle also has operations and branches in all States and Territories of Australia with dedicated company owned transport.

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# Aussie hydraulic pump breakthrough

## NATIONAL

AUSTRALIAN Pump Industries (Aussie Pumps) has reported a huge market response to the release of its new GMP hydraulic range of self-priming pumps.

The breakthrough in using lower capacity hydraulic motors enables vehicles and plant with smaller sealed systems to benefit from the advantages of these installations; the new hydraulic motors use only 22cc of hydraulic oil per rev but compensate with a higher 150 bar pressure.

This means that more trucks and plant can now use an existing hydraulic system to drive the pumps.

Tanker manufacturers and drill rig operators have been quick to convert to the compact pumps with their clear advantages over conventional engine drive alternatives.

With smaller footprints and flexible installations these pumps also deliver major cost and time savings on service.

“In remote, dry locations it can be a constant battle to keep engine drive pumps from dusting,” Australian Pump Industries Tsurumi division manager Neil Bennett said.

“Hydraulic drive pumps are far more robust and require virtually no maintenance.”

The company claims that going hydraulic has huge benefits for drill-rig and tanker operators in the mining industry.

Hydraulic power means an easy installation in tight locations and clients can add to that design flexibility, with drive shafts being eliminated by hydraulic hoses transferring power to the pump.

All feature open non clog-style impellers and are classified as “semi-trash” design.

They self-prime through a vertical lift of six metres and come with a front mounted cleanout port, which means that debris can be removed from the pump



The Aussie GMP's hydraulic drive heavy duty semi-trash pumps have revolutionised the market for tanker and drill rig pumps.

body without disassembly of suction or discharge lines.

The pumps come with heavy-duty cast-iron foot mounts and are mounted on skids or rails, depending on the size, and a heavy-duty bell housing provides the mounting place for the hydraulic motor.

Casappa gear motors were chosen for their reliability, low cost and rugged design.

The motor is protected from the pumped liquid by heavy duty silicone carbide/alumina mechanical seal faces with nitrile rubber elastomers – Aussie pumps also offers options of tungsten

carbide with viton.

The pumps feature excellent flow/pressure characteristics.

The standard semi-trash pumps offer the ability to handle spherical solids of up to 39mm.

They can push up to 2200 litres per minute and offer heads as high as 55 metres.

“Our experience with tanker operators is that they love the compact design and dust free closed circuit,” Mr Bennett said.

“The elimination of small petrol or diesel drive engines not only saves fuel and space, it also dramatically cuts

maintenance costs and down time.

“Our prices for hydraulic drive pumps, all built to ISO 9001 certification, are very reasonable compared to diesel drive.”

The company is working on developing 316 stainless steel and even nickel aluminium bronze versions of the same product.

These will be offered to the mining industry for applications where really corrosive liquid is required.

Further information, including free technical data, is available from Australian Pump Industries or authorised distributors throughout Australia.

## METS IGNITED CHIEF EXECUTIVE IAN DOVER

METS Ignited is an Australian industry-led organisation that aims to help Mining, Equipment, Technology and Services (METS) companies connect with the industry, and grow. Elizabeth Fabri spoke with METS Ignited chief executive Ian Dover about what the team had been up to in its recent Accelerator programs, and advice for companies looking to adopt new technologies across their business.







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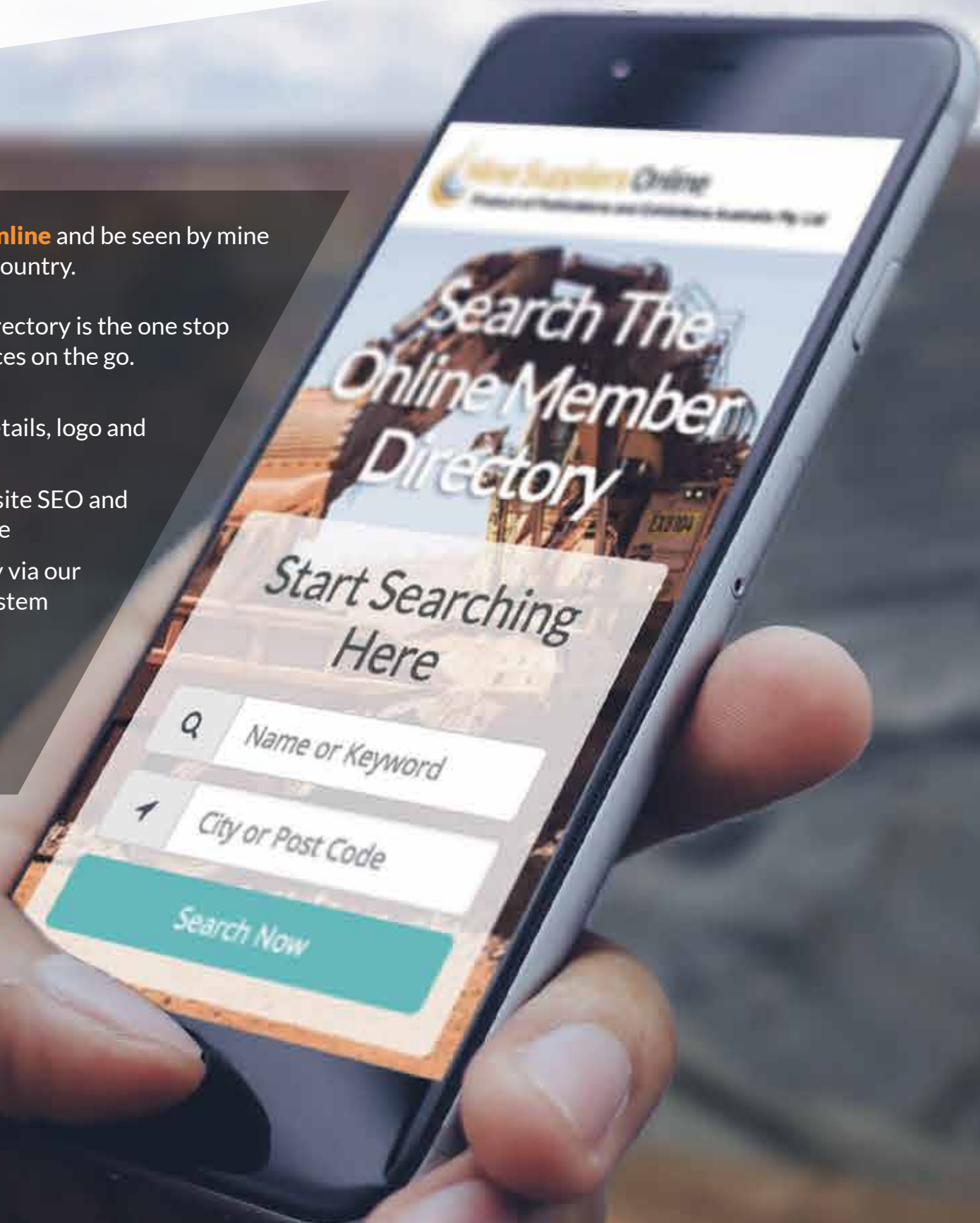
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## METS IGNITED CHIEF EXECUTIVE

# IAN DOVER

METS Ignited is an Australian industry-led organisation that aims to help Mining, Equipment, Technology and Services (METS) companies connect with the industry and grow. Elizabeth Fabri spoke with METS Ignited chief executive Ian Dover about what the team had been up to in its recent Accelerator programs, and advice for companies looking to adopt new technologies across their business.



**Q. Take us through your recent Accelerator programs across Australia, and how impactful they have been for industry?**

We began with the Igniting METS Accelerator pilot in late 2017. Igniting METS was an Australian-first joint initiative between METS Ignited and the QLD Government to assist Mining, Equipment, Technology and Services (METS) companies.

The accelerator sought to bring SMEs with innovation to be scaled together with leading resources sector corporates focussed on innovative solutions, to drive greater industry collaboration and commercialisation outcomes for METS SMEs.

From an applicant field of 47 SMEs and start-ups, we used an industry panel to select the final cohort of eight SMEs with recent innovations.

Five of the eight SMEs were from outside the metro area, confirming the importance of our METS accelerator reaching into the regions.

Within eight months of completing the accelerator, there was more than \$12 million in new contracts or investment signed.

This was sufficiently successful to warrant a second major accelerator, RISE, this time in Perth as well as in Brisbane.

RISE is an accelerator program for scale-ups with solutions in both the mining and energy resources sectors.

Further, we have been piloting a series of regional pre and mini accelerators to help flush out the promising innovations from the regions.

**Q. In late 2018, three Australian companies participated in the METStech Passport program in Chile. How did this go?**

The METStech Passport program was the first of its kind between Australia and Chile.

Three Australian companies – Conveyor Products and Services, Minnovare and Matrix Materials – took part in a two-week exchange in Chile, meeting with industry and government to discuss opportunities for expansion.

It was very successful, with the exchange program providing the Australian companies with direct exposure to the mining industry in Chile and resulting in new contracts.

**Q. What are some of the exciting new technologies you are seeing being developed in Australia?**

New technologies and innovations are coming from across the mining value chain.

There is a wide range of productivity technologies emerging such as optimisation, integration of information to help make better decisions faster, removal of paperwork, artificial intelligence and machine learning to improve the control of complex processes.

For example, Resolution Systems from South Australia is collaborating with Petra Data Science from QLD to deliver large uplifts in haul truck productivity and is now extending those improvements into load and haul optimisation combined with mine to mill data integration.

Resolution is in a unique position with its MaxMine platform with an unprecedented load and haul deep data set and a purpose built AI platform to analyse it.

MaxMine has been able to answer questions and identify issues never before addressed.

Insights provided have identified the value of a digital twin.

Petra Data Science is developing this digital twin, which will integrate mine load and haul optimisation with mine to mill optimisation, thus delivering substantial productivity gains across the mining and processing value chain.

Imdex and Orica are working on a

collaborative project to characterise blast holes while they are being drilled.

This will help define automated spatial domains of the physical properties and fracturing inferred from the drilling data.

These spatial domains will then be supplied to blasting systems, which will create complex blast profiles and drill designs to achieve optimised particle size distribution, noise, dust and fly rock minimisation and heave.

This will result in more efficient and productive blasting enabling greater yields and productivity from the mining process.

Both of these projects are being supported jointly by the mining industry and METS Ignited through the Collaborative Project Funds program.

**Q. What advice would you give to mining companies that may feel overwhelmed when looking at all the technologies out there?**

When considering integrating innovation, companies should consider the following:

- Where in our operations will investment deliver the greatest overall improvement in performance outcomes? It is advisable to run the models and direct 80 per cent of your innovation investment there.

- Don't forget that there may be a huge positive impact on environmental and social licence for the company... it is probably not all just about productivity. How do you value this in your business cases?

- What are the optional technologies or business models that will impact this/these specific parts of the operation? A company should gather this information before deciding what to invest in.

- Look around at what other similar, or even dissimilar, miners are doing with their innovation investments.

- Engage in some workshops with

innovative SMEs to provide them with one of your intractable challenges... work out how they think about solving your problems because they may have some really enlightened insights.

**Q. What are the biggest challenges facing the METS sector?**

Among the challenges facing the METS sector are a lack of capabilities around ensuring sustainable success in the export markets and the integration of digital technologies in their products, services and operations. The Australian METS sector is a \$90 billion industry with world-leading technology, however, many Australian SMEs are unaware they are part of this large and diverse sector. Greater awareness and cohesion in the sector will lead to greater outcomes for the individual companies.

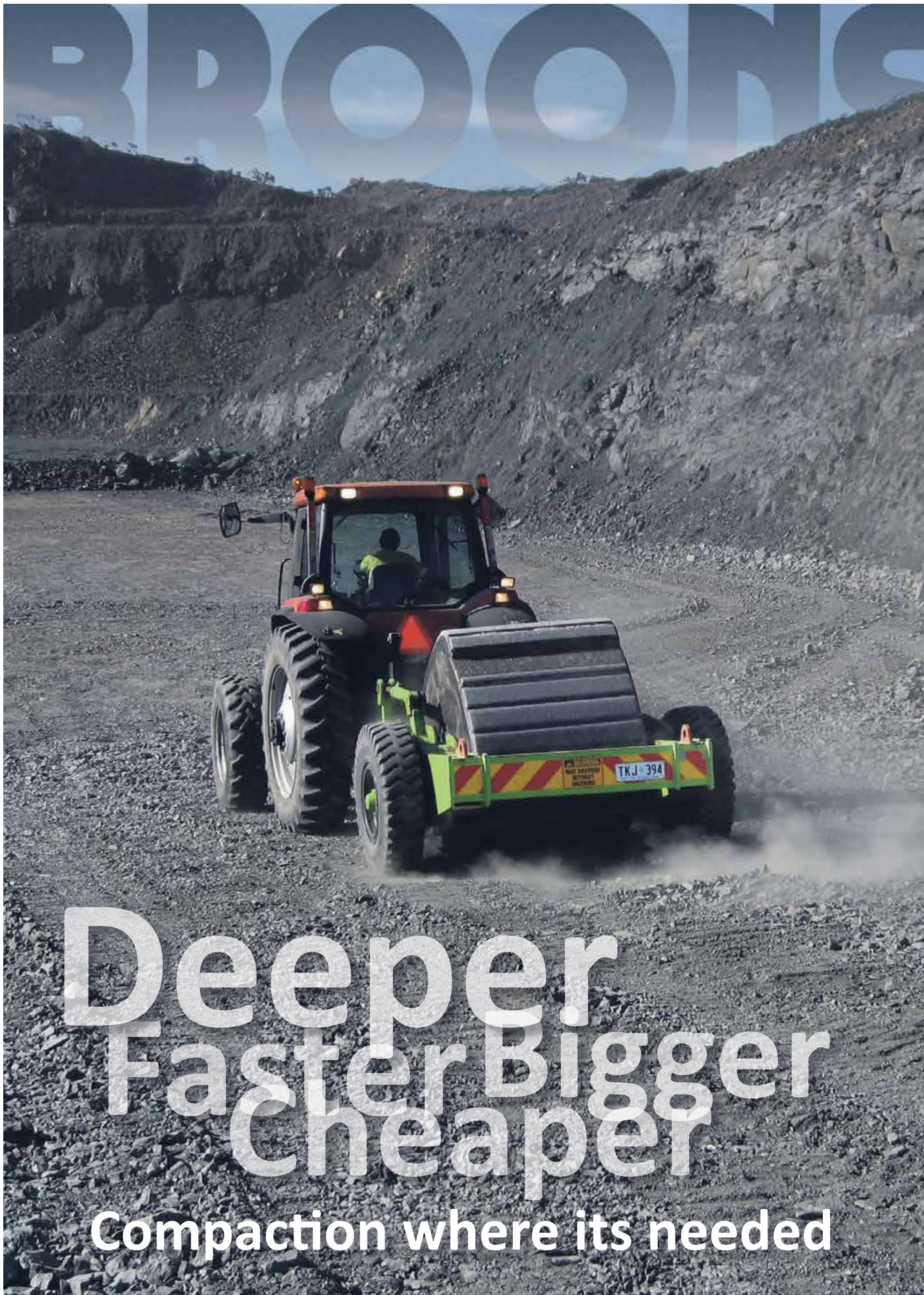
**Q. Tell us what METS Ignited has planned for the coming year?**

METS Ignited is focussed on supporting the METS sector to further develop and grow. We are concentrating on a few key initiatives covering analytics automation and robotics; raising the amount of money the mining and METS sector put to industry-guided research; facilitating further collaboration between miners, METS and researchers to develop solutions to the existing massive problems; and reaching out to a larger number of METS companies with our education and skills development initiatives.

**Q. Final thoughts?**

Perhaps the most pressing challenge for Australian mining and METS sectors right now is where we will find young people to take the industry into the digital age. Australia's youth has left the sector over the past few years so we need to work out how to make the industry attractive to our youth again.





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