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INSIDE



KALGOORLIE
SUPER PIT
ON MARKET

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WIN ONE OF
TWO ADINA
UNDERGROUND
WATCHES

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MINESITE MAKEOVER

Many mining companies are doing their best to rehabilitate old mine sites. The Eden Anglesea project in Victoria aims to rejuvenate a body of water where a mining pit used to be.

MINESITE REHABILITATION p22



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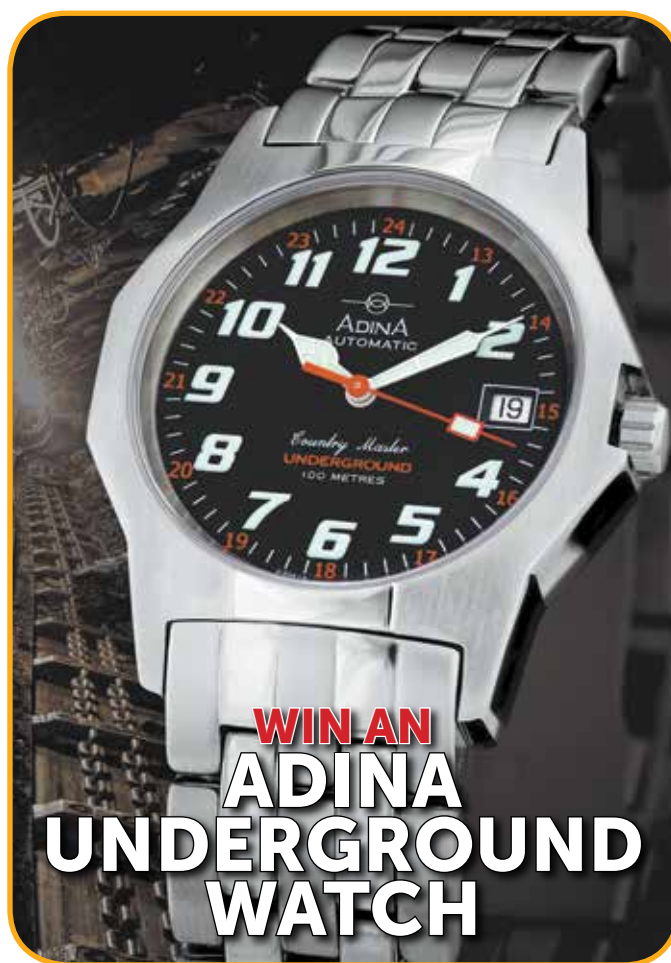
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ACCENTURE EMERGING TECH
MANAGING DIRECTOR (ANZ)

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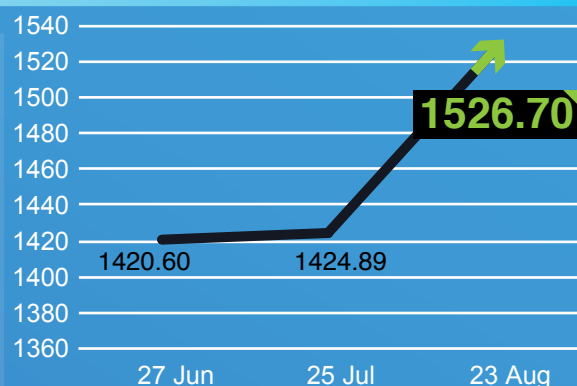
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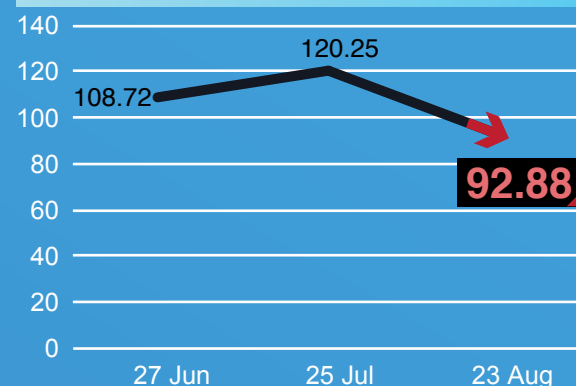
Gold remains strong amid global tensions with investors keeping an eye on the US Federal Reserve as debate continues over whether or not to cut interest rates.



IRON ORE

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62% Fe CFR China

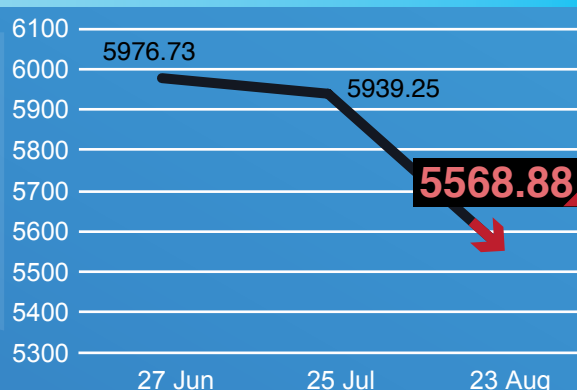
Iron ore fell to a six-month low after US President Trump's inflammatory tariff tweets triggered a price plunge.



COPPER

\$US/t
LME Price

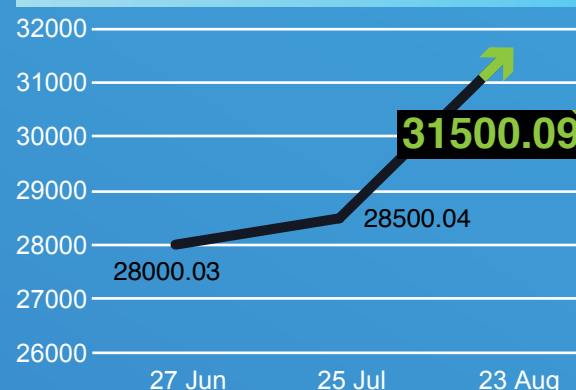
Renewed trade hostilities between the US and China this month resulted in uncertainty around coppers demand causing the price to dip.



COBALT

\$US/t
LME Price

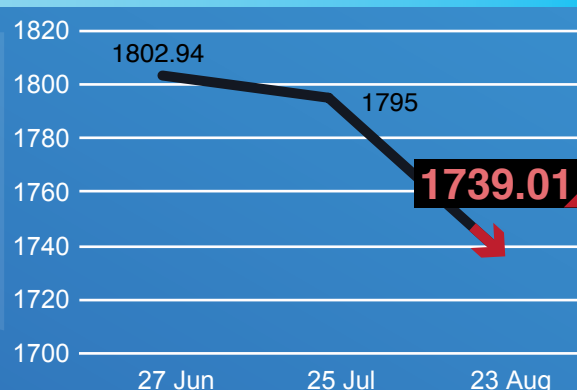
Cobalt prices surged this month after Glencore announced closure of its Mutanda copper-cobalt mine in the Democratic Republic of the Congo by the end of the year.



ALUMINIUM

\$US/t
LME Price

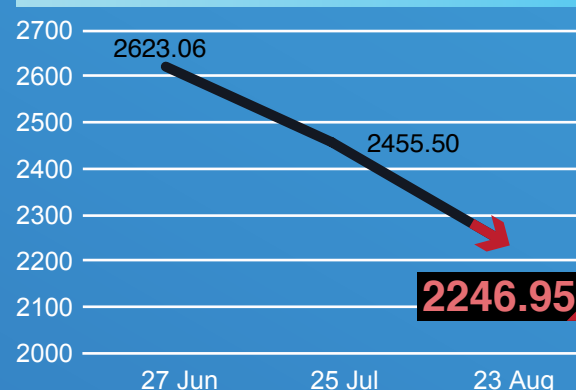
Aluminium dipped slightly and remains under pressure with trade tensions, sluggish demand and high exports from China.



ZINC

\$US/t
LME Price

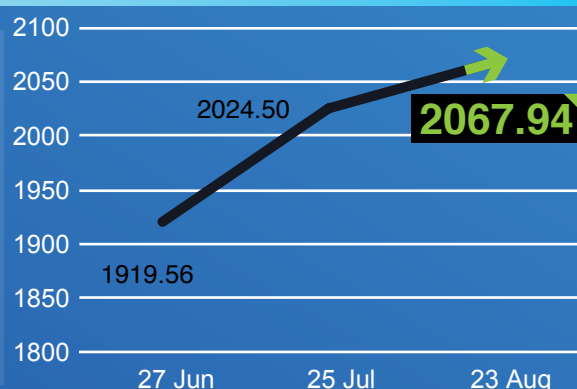
Zinc continues its downwards trend as Chinese smelters remain under maintenance, however prices are expected to rise as smelters restart operations.



LEAD

\$US/t
LME Price

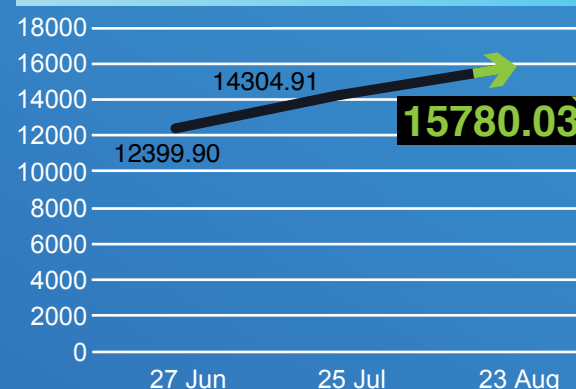
Existing lead stockpiles are adequately meeting supply deficits, and commodity prices managed a small bump due to pick-up in demand from consuming industries at the spot market.



NICKEL

\$US/t
LME Price

Nickel prices continue to climb as demand increased when stockpiles on the London Metal Exchange slipped to below 150,000t this month.



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IN BRIEF

Big payout for BHP members

BHP has delivered a record payout to shareholders after it more than doubled its full-year net profit to US\$8.31b for the year to June 30, in the wake of strong iron ore prices and easing costs associated with the 2015 Samarco dam disaster.

But underlying profit from continuing operations fell by 2pc to US\$9.46b.

The company declared a record final dividend of US78c per share, up from 63c a year ago, for a record full-year dividend of US\$2.35 per share.

Chief executive Andrew Mackenzie said results were helped by the company's new operations services unit, which had reduced staff turnover and cut costs 20pc.

Some analysts had tipped underlying profit of as much as \$US10b and a final dividend of \$US1.20 a share.

Renewal for Lynas licence

Lynas Corp's operating licence in Malaysia has been renewed by the country's government for six months, starting from September 3.

It will be subject to the company required meeting certain conditions, including relocating its cracking and leaching processes, the first stage of its Malaysia operations, to WA, ensuring water leach purification (WLP) residue will no longer be produced in Malaysia.

Lynas Malaysia is also required to obtain consent for the location of a permanent deposit facility for WLP residue within six months.

"We hope the decision will encourage other international businesses to invest in downstream manufacturing in Malaysia," Lynas CEO Amanda Lacaze said.

Rio slides but dividend up

RIO Tinto has reported a 6pc slide in its half-year profit to US\$4.13b (\$6b).

However the giant delighted investors when it said it would pay a \$1b special dividend and raise its interim dividend to \$1.51 a share from \$1.27 a share a year ago, continuing a cash windfall for shareholders.

The world's second-biggest mining company reported that net profit fell after the company wrote down its investment in the Oyu Tolgoi copper deposit in Mongolia by \$800m.

Cyclone Veronica's deluge on the Pilbara in March was largely responsible for the 8pc fall in iron ore shipments over the half.

Rio Tinto chief executive officer Jean-Sebastien Jacques said as a result, the company would be taking actions to protect the Pilbara Blend and optimise performance across the iron ore system.

Super Pit share for sale



Barrick is unhappy with the performance of the Kalgoorlie gold mine.

GERARD MCARTNEY
WA

AUSTRALIA'S most iconic gold mine, the Kalgoorlie Super Pit, is on the market after Canadian miner Barrick Gold announced it will sell its 50pc share in the mine.

In a conference to investors, Barrick chief executive Mark Bristow said that the company was unhappy with the mine's performance, and not comfortable being the non-operational partner in the mine.

Barrick said that the sale was in line with its strategy of selling off non-core assets that didn't meet key criteria.

Mr Bristow said that while it continued to be a valuable asset, it was the "only asset in the portfolio which

could be performing better".

"Given we are not the operators, it does not fit with our filters as we do not want to be passive investors in an asset that we own."

This is not Barrick's first attempt to sell the mine.

In 2017, a deal with Chinese company Minjar fell through after it failed to raise the \$1.3b required.

The deal would be tempting to many of the cashed-up Australian miners riding the highs of the gold price spike as it has soared past \$2250/oz.

However, analysts have advised caution.

While Barrick's and Newmont's last round of asset sales led to a transformative

round of M&A's for Australian companies such as Northern Star and Saracen Minerals between 2013 and 2015, record gold prices mean the price on assets is not likely to reflect the long-term price of gold.

Newmont Goldcorp, which owns the other 50pc of the Super Pit, has long stated that it would buy out Barrick's half for the right price.

China's fourth biggest producer, Zhaojin International Mining, could also be a contender, after entering into a joint venture with Perth-based PCF Capital to explore WA gold assets.

Barrick reported that production at the Super Pit was up 4pc from the previous quarter to 57koz, due to higher grade ore offsetting lower recovery.

Review to cut red tape

RAY CHAN
NATIONAL

A 12-MONTH review will be carried out by the Productivity Commission to streamline regulation in the resources sector.

It will investigate best-practice examples which remove unnecessary costs for business, while maintaining "sound oversight".

The analysis looks to lift the efficiency of environmental approval to reduce regulatory burden on business, with the aim of ensuring resource projects are assessed transparently and efficiently, while upholding robust environmental standards.

The move follows criticism surrounding the tardiness of getting projects off the ground, such as the protracted approval processes for Adani's Carmichael mine (Qld, eight years), the Wallarah 2 coal project (NSW, 16 years) and Cameco's Yeelirrie uranium development (WA, five years).

The review has been welcomed by resource industry bodies, with the Australian Resources and Energy Group (AMMA) saying it is a significant step towards enhancing the industry's economic, employment and regional contributions.

AMMA chief executive Steve Knott said it was appropriate that identifying and cutting unnecessary red-tape in major project approval considerations is first cab off the rank as part of the process.

"From a sovereign risk perspective, approvals for nationally important resources projects continue to be



It took five years for WA's Yeelirrie project to be given the green light.

embarrassingly slow in Australia," he said.

"Australians should not have to put up with bureaucratic inefficiencies and government duplication that delays, or in some cases disincentives, major projects that bring huge employment and economic benefits to the regions.

"A more streamlined and clear approach for balancing environmental protection with industry growth will help secure investment in new projects that drive Australian jobs and underpin our economy."

Minerals Council of Australia chief executive officer Tania Constable applauded the review, saying faster approvals for mining projects and greater certainty of process would support more highly paid, highly skilled jobs across Australia.

"All governments should work together to end the duplication and overlap between environmental regulations and introduce risk-based approaches for assessments and approvals," she said.

Ms Constable also commented on the Productivity Commission's Trade and Assistance Review 2017-18, which she said confirmed that the estimated effective rate of assistance from tariff and budgetary assistance for mining was negligible.

"The Productivity Commission estimates that the effective rate of combined assistance to mining in 2017-18 was just 0.2pc – the same low rate observed in the previous five years," she said.

"Further, mining incurred a net tariff penalty of \$102m in 2017-18, owing to tariffs imposed on imports used in Australian mining operations."

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Industry needs respect

RAY CHAN
INTERNATIONAL

FORMER Australian Prime Minister John Howard says Australia is indebted to the mining industry, one of the nation's greatest economic success stories.

Presenting the keynote address at the Diggers and Dealers Mining Forum in Kalgoorlie in August, Mr Howard said he could not understand why the coal, iron ore and oil and gas sectors continued to be denigrated.

He said the industry shouldn't have to apologise for its existence, nor allow it to be "demonised".

"I talk of course about the constant attacks in the name of climate change zealous on sections of your industry, particularly but not least the coal mining industry," Mr Howard said.

"There seems to be a collective determination in some sections of the Australian community to vilify what we do best.

"I don't need to remind an audience like this of how much we are in debt to the mining industry for the salvation of the economy of this country after the global financial crisis."

When asked about his opinion on climate change, Mr Howard said he was "agnostic".

He said climate change had become a "substitute religion" and the Australian Government had erred in its policy in providing "too many incentives for renewable energy".

Mr Howard also issued a word of warning about the tense relationship between Australia's key Asian partner, China, and the



Former Prime Minister John Howard addresses the forum.

United States of America.

While it was important for Australia to maintain ties with both countries, he said their respective values and cultures needed to be taken into consideration.

"Australia will always be closer to the United States than it will be with China. That is because we share common values with the United States," Mr Howard said.

He warned that the Chinese regime led by President Xi Jin Ping was more authoritarian than a decade ago, making it more difficult for Australia to liaise between Beijing and Washington.

"The middle class will resent being told what to do. What we are seeing in Hong Kong represents something of a glimpse of the future for the Chinese authorities," he said.



Lynas Corporation, the major producer of light rare earths outside of China, will settle on either its Mt Weld rare earths mine near Laverton or an industrial site near Kalgoorlie for its proposed \$500m upstream processing plant in WA. Lynas CEO Amanda Lacaze said the company aimed to get the local plant running by the end of 2022 or early 2023, with production transitioning from Malaysia in line with commissioning and ramp-up. Its existing plant in Malaysia has become the subject of environmental concern over low-level radioactive waste from the production process, with some parties calling for its closure. But Ms Lacaze said the material had the same low radioactivity levels as a processing residue as it did in its natural state in the ground.



A plethora of Peters and a lack of ladies at the forum concerned Fortescue Metals Group CEO Elizabeth Gaines, who highlighted a lack of gender diversity in the industry, in which women make up just 16pc of the workforce. Ms Gaines said there were more speakers named Peter than there were females. She was proud of the diversified FMG personnel, with almost 20pc made up of females and more than 12pc of direct employees Aboriginal, making the miner one of the largest employers of Aboriginal people in Australia. She said there was a need to build the skills base and diversity, and focus on operational excellence and sustainable investment to deliver substantial economic benefits.



Dacian Gold chief executive Rohan Williams.

Getting the shine back

DACIAN Gold chief executive Rohan Williams says the embattled miner is aiming to regain investor confidence after consecutive production downgrades tarnished its lustre earlier this year.

While confidence in the former rising star of the industry has bounced back a little, Mr Williams estimated it would take about six months to potentially lure lost shareholders back after three quarters of the company's value was wiped out.

"A lot of investors that sold their shares that drove the share price down aren't back," he said.

"We've got to win their respect back, so we've got to demonstrate performance quarter on quarter."

The presentation came as Dacian confirmed that a high-grade discovery was made below the historic Morgans North open pit, which lies near the operating Westralia underground gold mine in Laverton, WA.

The discovery is believed to be hosted by a previously unrecognised banded-iron-formation (BIF) unit that lies in the footwall.

Mr Williams hopes these results will allow for further production at Morgans North.

"We are currently completing several 80 metres spaced holes in the 250-metre gap between our new drilling and the base of the old Morgans North open pit," he said.

"If these drill holes return similar wide-space, high-grade intersections to these seen in our recent drilling programs, then there is strong potential for this discovery to become a new, near-term production source at Mt Morgans."



Nickel West asset president Eddy Haegel.

BHP thinks nickel

BHP is speeding up the development of its Nickel West division to cater for an anticipated growth in sales of electric vehicles.

Nickel West asset president Eddy Haegel told the forum that he expected a compound annual growth rate of between 19pc and 36pc by 2030.

"However, we will not rest waiting for that day to arrive. We are actively developing options to position ourselves for a once-in-a-generation opportunity," Mr Haegel said.

He said nickel was the "workhorse" of battery technology.

"Batteries are becoming larger to improve vehicle range and performance, and within the battery, nickel-based cathodes are taking market share from non-nickel cathodes," he said.

"And within nickel-based cathodes, the nickel in cathodes is increasing to realise better vehicle performance and lower costs, which will drive a significant increase in global nickel demand."

BHP plans to transition to new mines while replenishing its reserves, which have already risen to 1.506mt now.

Mr Haegel said BHP is investing further in Nickel West by launching a greenfields exploration campaign, increasing brownfields exploration, and debottlenecking the Mt Keith concentrator and Kalgoorlie nickel smelter.



Rio Tinto group executive for growth and innovation, Stephen McIntosh.

Dearth of discoveries

RIO Tinto says it wants to work with junior explorers or technology companies to help it identify the next major greenfields discoveries.

Rio Tinto group executive for growth and innovation, Stephen McIntosh, said the door was open.

"We don't have an exclusive licence on good ideas for exploration. We want people to come to us with their good ideas," he said.

At the Diggers and Dealers forum, Mr McIntosh said the company had the funding and "ability to scale in a way that very few organisations have".

Lamenting a lack of exploration discoveries in the mining industry over the past decade, he cited reasons such as industry capability, land access challenges and gaps in targeting capabilities.

Mr McIntosh said consolidation that occurred across the industry from the 80s to the early-mid 2000s also caused a focus on early stage exploration to fall away.

Rio Tinto plans to employ the latest technology to boost exploration, with a focus on finding assets that are in plain sight or hiding under shallow cover.

The company recently generated excitement at its Winu copper-gold project in the Paterson Province of WA, releasing two sets of drilling results from exploration at the site to highlight the promise of the project.

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IN BRIEF

KIRKLAND LAKE GOLD

A SURGE in gold sales has come off the back of a record quarter at the company's Fosterville mine, where it achieved "higher than expected grades".

Sales at the major Victorian gold mine increased 78pc to 133,481oz for the June quarter, against 75,100oz in the corresponding quarter last year.

Kirkland Lake chief executive officer Tony Makuch said the company was positioned to significantly grow production at Fosterville during the second half of the year, with it advancing its key growth projects at Fosterville, including construction of a new ventilation system, paste-fill plant and new water treatment plant.

Kirkland Lake expects production at the site to increase significantly in the second half of 2019, as development advances to depth into the high-grade Swan Zone.

The company's exploration in the Northern Territory included increased underground development in anticipation of a potential resumption of operations later this year.

RIO TINTO

BGC Contracting and Monadelphous Group have been awarded \$250m worth of contracts to for work at the Robe River Joint Venture's West Angelas iron ore mine in the Pilbara.

In 2018, Rio Tinto approved a \$579m investment alongside JV partners Mitsui and Nippon Steel to develop Deposits C and D at the WA operation.

BGC's work includes constructing the concrete foundations for the new iron ore facilities, in addition to utilities infrastructure and heavy and light vehicle road networks that will connect the existing processing plant with the deposits.

Monadelphous will supply and install the structural, mechanical, piping and electrical and instrumentation works associated with the construction of new iron ore facilities, as well as modifications to existing plant.

DEVEX RESOURCES

SIGNIFICANT copper sulphides (chalcopyrite and bornite) associated with a porphyry intrusion have been discovered during the company's maiden reconnaissance mapping and rock chip sampling program at the 100pc-owned Bogong Copper-Gold Project in NSW.

Devex has made a strong start to the Bogong exploration campaign, with rock chip results from both outcrop and historical shafts returning individual values of up to 10pc copper and 0.47g/t gold with mineralisation extending over 500m of strike.

The Bogong Project is located within the Lachlan Fold Belt, a major geological province which hosts the world-class copper deposits Cadia-Ridgeway (Newcrest Mining) and Northparkes (China Molybdenum Co Ltd).

Manganese at Meeka

RAY CHAN
WA

MORE promising manganese hits have been discovered from the second phase of exploration drilling at Bryah Resources' flagship Bryah Basin project near Meekatharra in WA.

A total of 83 holes for 2081m of reverse circulation (RC) drilling was completed at four sites: the Brumby Creek, Black Hill and Black Caviar prospects and the historic Horseshoe South manganese mine.

The drilling program was funded by OM (Manganese), a wholly-owned subsidiary of OM Holdings, under a \$7.3m agreement signed in April in which OM has the right to earn up to 70pc of the manganese rights at Bryah by spending \$7.3m on exploration.

Drilling results from Brumby Creek Prospect (using an 18pc manganese cut-off grade) include 23m at 25.8pc manganese, incorporating 3m at 31.2pc manganese, 2m at 30.4pc manganese and 2m at 32.8pc manganese.

Other highlight assays included 7m at 26.5pc manganese and 9m at 18.6pc manganese.

Bryah managing director Neil Marston said the results were extremely encouraging, with significant extensions to manganese mineralisation already identified in the initial phase.

"We have extended the zones of manganese mineralisation to the west of the prospect as well as identifying new manganese areas up to one kilometre along strike to the south," he said.

"This drilling further demonstrates the potential to discover new manganese



Drilling for manganese at the Bryah Basin.

deposits from surface and under shallow cover over a wide project area."

Final drilling results from the remaining sites will be reported as they become available.

The company is also preparing a technical report and budget for OMM to consider, ahead of its commitment to the next the stage of on-ground exploration pursuant to the terms of the agreement.

The Brumby Creek Prospect was identified during ground reconnaissance last year, with rock chip sampling revealing five rock chips assaying above 40pc manganese, peaking at 48.5pc.

A total of 35 holes were drilled for 1092m in the first phase. In this latest program, a further 41-holes were drilled for 1199m and extended mineralisation to the south and west of the prospect.

Horseshoe South is the largest historic manganese mine in the region, having produced about 1mt of high-grade manganese ore from 1948-1969 and 2008-2011.

Bryah anticipates that the cash flow from manganese production will fund its copper and gold exploration across the tenements.

Ravensthorpe mine could re-open

EMMA DAVIES
WA

IT may be third time lucky for First Quantum Minerals' nickel operations at Ravensthorpe in WA.

The owners of the mothballed mine say they will move to re-open the site if rising demand for the metal continues.

In its quarterly results posted at the end of July, the Canadian mining giant said it hoped to restart the nickel and cobalt operation by early next year, with the value "sensitive to longer term nickel price assumptions".

The mine, originally owned by BHP Billiton, first closed in 2009 because of the global financial crisis, leading to the loss of 1800 jobs.

First Quantum grasped the opportunity to buy the asset off BHP in 2010 for \$493m, a fraction of the US\$3b it cost to build and commission the facility, and brought it back into commercial production by December 2011.

But it too was forced to close the site six years later amid a global downturn for the commodity, with about 450 employees and contractors losing their jobs.

At the time, First Quantum reported that the cost to suspend operations and enter care and maintenance was about \$10m, with additional annual maintenance of about \$5m.

The care and maintenance costs during the June quarter and first half of this year



The Ravensthorpe nickel mine when it was operational.

totalled \$5m and \$9m respectively.

In the report, First Quantum also confirmed it had completed drilling of its nearby Shoemaker Levy ore body deposit, and had almost finished upgrades to its processing facilities.

Prices for nickel have surged since early this year, fuelled by a shrinking supply of the commodity, with global sales of the metal plummeting from about 500,000t to

below 150,000t in August.

While most of the nickel is used in the production of stainless steel, the metal is also a component of batteries to store renewable energy and power electric cars, seen as a long-term driver of the market.

The restart of the Ravensthorpe mine is expected to potentially offer hundreds of jobs to the local community and beyond.

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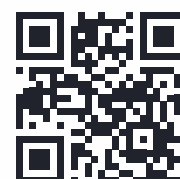
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IN BRIEF

MINERAL RESOURCES

MINERAL Resources is one step closer to the US\$1.15b sale of its 50pc stake in the Wodgina lithium project in the Pilbara, after Chinese regulators greenlit Albermarle Corporation's proposal.

In a statement, the company said it had been notified by Albermarle that unconditional approval had been obtained from the China State Administration for Market Regulation (SAMR).

Completion of the transaction remains conditional on the approval from the Australian Foreign Investment Review Board (FIRB), and third parties with interests in the underlying tenements.

LYNAS CORPORATION

RARE earths producer Lynas has begun stockpiling rare earths amid a volatile market that has kept prices low.

The company blamed a soft automotive market in China for the trend, and said that in the volatile conditions, it remained committed to its strategy of reserving the NdPr project in the Northern Territory for its strategic customers.

"Demand is growing strongly within this key customer base and Lynas will continue this strategy of reserving production to meet the current and future needs," the company said.

ADANI

FORENSIC accountant Professor Sandra van der Laan has told the ABC that Adani "looks to me like a corporate collapse waiting to happen".

Prof van der Laan said that the accounts showed that the owners, which recently received approval for its mine in Queensland, had contributed less than \$9m in equity to the business, while total liabilities exceeded total assets by more than half a billion dollars.

"Effectively on paper they are insolvent," she said. Prof van der Laan famously predicted the collapse of ABC Learning in 2007.

NEWMONT GOLDCORP

THE world's largest gold miner, Newmont Goldcorp, looks set to join Rio and BHP in the automation revolution at its Boddington gold mine in WA.

In the company's quarterly earnings call, incoming chief executive Tom Palmer said the company was close to making a decision about a major rollout of autonomous trucks at the site.

"We recently advanced our autonomous haulage study, with the potential to reach a full funds decision later this year," he said.

"If approved, the project is expected to improve cost and mining productivity by converting the fleet of 39 haul trucks to autonomous operation."

Nickel delivers for Nova



A truck carries ore from the underground Nova mine.

RAY CHAN
WA

INDEPENDENCE Group (IGO) has capped off a solid 2019 financial year with metal production exceeding guidance at its Nova operations in WA's Fraser Range.

According to IGO managing director Peter Bradford, on-going optimisation at Nova had delivered nickel production rates that exceeded the averages determined in the feasibility study for each of the last five quarters.

The company's nickel production for the financial year totalled 30,708t at the Nova site, outperforming the company's initial estimate of between 27,000t to 30,000t.

IGO's copper production at the site also exceeded guidance at 13,693t, above the 2019

financial year guidance of between 11,000t to 12,500t.

Mr Bradford said the positive performance underpinned IGO's potential downstream processing opportunity to produce battery grade nickel sulphate at Nova.

"Nova is the lowest cost nickel producer in Australia and one of the lowest cost in the world despite by-product credit pricing head winds," he said.

IGO also reported 132,495oz of gold production at the Tropicana joint venture in the June quarter, taking yearly total at the site to 518,172oz, within its 2019 guidance range of 500,000oz to 550,000oz.

"The better than guidance production performance at Nova and on guidance production from Tropicana for the 2019 financial year reflects the quality of our

assets, and more importantly, the consistent high performance by our world class operating team at Nova and the JV team at Tropicana," Mr Bradford said.

IGO, alongside its joint venture partner AngloGold Ashanti Australia, also commenced the development of the Boston Shaker underground mine, with the firing of the first blast for the portal taking place in May.

The mine has an estimated capital cost of \$105m, with expectations to mine about 1.1mt per annum of ore reserves. It is due to produce first gold in the September 2020 quarter.

"IGO enters financial year 2020 positioned to progress its strategy to become a globally relevant supplier of metals critical to energy storage and renewable energy," Mr Bradford said.

Savage River back on track

RAY CHAN
TASMANIA

GRANGE Resources has returned to full production rates at the Savage River magnetite iron ore project for the remainder of 2019.

The miner said it had established access to the main ore zone from the west wall of North Pit and had commenced mining high grade ore.

Pellet production is expected to be about 1.2mt for H2 and 2.1mt for the full year. Forecast sales are expected to be about 1.3mt for H2 and 2.2mt for the full year.

The exploration decline is progressing to plan and is on schedule to be completed by the end of 2019, while the third stockpile is being excavated and a two-stage ventilation fan has been installed for the extent of the decline.

Diamond drilling has begun with the first hole completed for an advance of 650m, the first of two to provide decline development information.

Grange is also considering sub-level caving methods at Savage River, which will be reviewed as part of its underground pre-feasibility progress study, expected to conclude in the first quarter of 2020.

Grange chief executive M. Honglin Zhao said the team would continue to focus on



The North Pit at Savage River.

sustained delivery of high-grade ore to support full production rates for the balance of 2019.

"Progress on the feasibility study for potential underground mining continues to plan and will inform our life of mine planning," he said.

The development is a turnaround for the Tasmanian-based producer, which experienced low production and product sales in the March quarter, a period in which the

company focussed on minimising the overall impact to achieve full-year production.

The Savage River mine has a projected life beyond 2030.

Grange produces a high-quality iron ore pellet with low levels of impurities that support reduced environmental impacts for end users.

Grange is also a majority joint venture partner in a major magnetite development project at Southdown, near Albany in WA.

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IN BRIEF

NORTHERN STAR RESOURCES

NORTHERN Star Resources has enjoyed a record quarter and full-year of gold sales underpinned in part by the progress made at Pogo, the Alaskan site it acquired for \$375m last year.

The company sold 232,042oz of gold at an all-in sustaining cost (AISC) of \$1238/oz during the June quarter, and 840,580oz at \$1296/oz in the 2019 financial year.

Northern Star chairman Bill Beament said the progress made at Pogo vindicated the belief in the ability of the site to form the company's third pillar, after the Kalgoorlie and Jundee operations.

"We are confident that Pogo's increasing rates of mine development and rising stopping tonnages will deliver higher gold production and lower costs," Beament said.

LINDIAN RESOURCES

FIELD work recently completed at Lindian Resources' Gaoual Bauxite Project in Guinea has identified a significant areal extent of extreme high-grade "conglomerate-bauxite" mineralisation.

The discovery lies within the Lindian Resources project area south of the township of Gaoual in the Futa Jallon-Mandingo bauxite-bearing province in West Africa.

Lindian has signed an exclusive option agreement with KB Bauxite Guinea SARLU and its sole shareholder Guinea Bauxite to acquire the Gaoual Bauxite Project.

Lindian managing director Shannon Green said it was "undoubtedly" a significant discovery for the company.

"There are a number of considerable similarities between this conglomerate-bauxite discovery and the well-documented Sangaredi bauxite deposit, which produced high grade bauxite," he said.

DARK HORSE RESOURCES

DARK Horse Resources has reported widespread gold and silver mineralisation at its Las Openas gold project in Argentina, with channel sampling unearthing up to 54.2g/t gold and 739g/t silver.

The mineralisation was identified from 34 channel samples that were cut over 2km of strike at the Presagio zone.

Zinc, lead, copper, molybdenum and manganese mineralisation were also present at varying grades in the majority of samples.

The channel sampling program followed a first phase drilling campaign which uncovered five mineralised vein systems at Openas, with Presagio the most promising target.

It borders the Indio Belt, which hosts numerous multi-million ounce gold deposits.

Lead the way at Shan North



Samples being taken at the Shan North site.

RAY CHAN
MYANMAR

ASSAY results from the first hole to be tested at Myanmar Metals' Shan North target have produced highly promising lead mineralisation results.

The site is within the world-class Bawdwin mineral field in Myanmar, currently under care and maintenance, and being developed by the Bawdwin Joint Venture, a consortium between Myanmar Metals (MML), Win Myint Mo Industries (WMM), and EAP Global.

MML holds a stake in the project under a production sharing agreement with WMM and Mining Enterprise No 1, a Myanmar Government business entity.

An updated Mineral Resource estimate is currently being undertaken, incorporating results from more than 7000m of additional drilling completed since the last estimate was

announced in February this year.

This new resource estimate is planned for completion in August.

MML executive chairman and CEO John Lamb said the company currently enjoyed a 100pc success rate from target identification to the discovery of new mineralised zones.

"This is quite remarkable. Our exploration methodology has been validated and we believe our four high priority targets which remain untested by drilling have been further de-risked by the discovery of Shan North," he said.

"Bawdwin already hosts the world's largest primary lead resource but as drilling advances outside the historical mining envelope, we see the potential for material resource growth becoming clear.

"These latest results improve density and confidence within the known ore zones, demonstrate extensions in several places and,

importantly, show continuity along strike, so that Bawdwin is beginning to look like a very large, continuous mineralised trend rather than a series of lenses or lodes."

Initial scoping study of the project was completed in November 2017, while scoping study of the China Pit (Starter Pit) finished in August 2018.

A pre-feasibility study (PFS) of the project, focused on Starter Pit, proposed to begin pilot-scale mining activities in 2019 and full-scale operations in 2021.

Once operational, the Starter Pit is forecast to be the third biggest-producing lead mine and one of the biggest-producing silver mines.

"In October we will seek to start an intensive exploration drilling program but the focus for the next quarter will be the underground scoping study, an updated MRE and in-fill drilling in the Starter Pit," Mr Lamb said.

Venture markets safer batteries

RAY CHAN
NATIONAL

LITHIUM Australia is forming a business partnership with leading Chinese battery producer DLG Battery Ltd to launch a new range of lithium-ion batteries (LIB) in the Australian market, with a focus on industry-scale energy storage systems (ESS).

The new marketing division, Soluna Australia, will provide technical support, customer service and, importantly, a range of lithium-iron-phosphate (often referred to as lithium-ferro-phosphate or LFP) battery options for greater safety and superior performance in ESS applications.

Extensive market enquiries have identified strong demand for flexible and tailored LIB and LFP solutions in the ESS sector, which will be the prime focus of Soluna, in which Lithium Australia holds 50pc equity.

From a new Australian-based facility, Soluna will supply and service a range of energy-storage products – from residential energy-storage through to industrial energy-storage units.

Custom products, in particular for applications such as large-scale storage (including microgrids), will be provided to bespoke specifications.



Lithium Australia's Brisbane facility, which will provide cathode power feedstock.

Lithium Australia managing director Adrian Griffin said the alliance with DLG provided an opportunity to establish Soluna as a leading Australian-based provider of LIBs and technical solutions "to the fast-growing ESS market that sits in our own backyard".

"In addition, Lithium Australia is well on the way to meeting the requirements that will enable VSPC to commercialise its cathode materials and provide Australia with access to purpose-built LFP battery storage, the safest and most effective option

for energy storage systems," he said.

Established in Shanghai, China in 2001, DLG is a leading manufacturer of LIBs, with extension to the downstream battery pack business, and has become a well-known supplier of green energy solutions across China.

The DLG business encompasses many areas, including LIBs, battery control systems, consumer batteries and a range of other battery-related research, design, manufacturing, sales and service activities.

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MAKING THE GRADE

Australian ingenuity is being put to the test at one the world's largest deposits of zinc, lead and silver.

CRC ORE principal mining engineer David La Rosa on site at Minera San Cristóbal.

RAY CHAN

A SUCCESSFUL full scale production trial of Australian-developed grade engineering techniques is paying dividends for a South American mine and its local workers.

Once fully implemented, it is expected to generate an additional \$451m in profit and reduce the site's energy consumption.

Located in the south-western Bolivian province of Nor Lípez, and owned by Sumitomo, Minera San Cristóbal (MSC) is the country's largest mine.

Operating since 2007, it produces about 1500t of zinc-silver and lead-silver concentrates each day.

To achieve this result, MSC needs to move a daily average of 150,000t of rock – a mixture of some valuable minerals and a lot of costly waste.

With a team of 1400 workers, the mine is an important employer supporting the livelihoods of many people over the long term.

Searching for innovation

But while the mining operation is vast, it in turn is part of something even bigger.

MSC is a subsidiary of Sumitomo Corporation, one of Japan's largest business consortiums, employing more than 70,000 people and operating for more than 400 years.

Part of MSC's vision involves developing a model mining operation through safe operations, at low cost, with innovative technology.

Co-operative approach

Through its wholly-owned subsidiary Summit Mining International, Sumitomo is a participant of the Cooperative Research Centre for Optimising Resource Extraction (CRC ORE).

Based in Brisbane, CRC ORE works to minimise the impact of declining grades and radically improve the productivity, energy and water signatures of mining operations.

CRC ORE is jointly funded by essential participants including mining companies such as Sumitomo; Mining Equipment,



The MSC minesite.

Technology and Services (METS) companies; research organisations; and the Australian Government. The centre is a trusted, independent technology broker and facilitator, driving collaboration across all its activities.

One of CRC ORE's key solutions developed for the mining industry is Grade Engineering, which deploys a range of waste rejection technologies that integrate with a suite of separation technologies relevant to ore specific characteristics.

A deeper understanding of the ore body can be achieved, leading to the ability to exploit inherent ore deposit heterogeneity and variability.

For mining operations such as MSC, this is an innovative approach to the early separation of ore from waste material and minimises the impact of declining grades and productivity.

Trial success

CRC ORE and MSC teams conducted site studies and analysis in 2017 to determine the level of opportunity available at the mine by deploying Grade Engineering, and a great deal of potential was evident.

Since late 2018 CRC ORE and Sumitomo

have been working together on a full scale production trial of Grade Engineering using screening at MSC.

A Metso Lokotrack ST2.8 mobile screening plant that can process up to 450t/hr was deployed on-site to assist in providing a production scale testing capability.

The trial focused on upgrading mineralised waste from the pit to determine if Grade Engineering could efficiently produce a new economic stream of valuable material that could then be combined with run-of-mine feed through to the concentrator and produce a positive Net Smelter Return (NSR).

CRC ORE chief executive officer Ben Adair said initial results of the trial are impressive and encouraging, with 66pc of value now contained in just 25pc of the Grade Engineered mass.

"So far, results show that by applying Grade Engineering to areas previously designated as 'mineralised waste', the value of Grade Engineered feed to the mill can be increased by over 2.5 times," Dr Adair said.

"This has the potential to convert this waste material into high grade ore-feed with associated opportunity to increase metal production and reduce process power and water intensities."

A 15-20 percent reduction in energy has

been evident in the mine's Semi-Autogenous Grinding (SAG) mill when processing a combined Grade Engineered and direct Run-of-Mine (ROM) feed.

Long-term benefits

The success of the trial has led to consideration by Sumitomo to deploy Grade Engineering techniques to extend the life of the mine.

MSC operations director Dave King said the opportunity for MSC and the local community and principal asset of employees is huge.

"The big benefit of Grade Engineering is its potential ability to extend the life of the mine and add over \$451m in profit to its value," Mr King said.

CRC ORE participants and the wider mining industry are keenly watching how the MSC trial unfolds.

To fulfil its goals of knowledge transfer and for its technology to directly benefit the local mining industry, CRC ORE has recently commenced similar production trials at Australian mining operations.

More information about Grade Engineering can be found at crcode.org.au/grade-engineering.



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CHARGING THE BATTERY

With the 2018 slump still fresh in the memories of investors and producers alike, lithium looks set for a rocky ride as it waits for its payday. Jade Cove Partners chief executive Alex Grant spoke with the *Australian Mining Review* about lithium's current predicament and its long awaited payday.



Image Albemarle.

Lithium will play an integral part in the EV revolution, but the battery metal has lost a lot of its sheen in 2019.

GERARD MCARTNEY

LITHIUM will be the biggest player in the coming electric vehicle revolution, but the tech metal has fallen on tough times of late.

The fall in prices, like so many of Australia's export resources, has been dictated by China, where oversupply has led to price drops large enough to counter the stable and even rising prices in other countries.

Mr Grant said over-supply has spooked the market, but also that lithium is not alone.

"Everyone is talking about oversupply of 6pc spodumene concentrate, for sure," he said.

"This has crashed the price of some lower grade lithium chemical products, and most importantly, hurt market sentiment towards the entire industry.

"Young developers are having a hard time raising capital for their new projects, which could cause huge problems for supply of lithium for electric vehicles in the coming years.

"Similar stores are playing out in cobalt and high grade nickel products but for other reasons."

The *Australian Resources and Energy Quarterly* predicts that Australian lithium production will increase from an estimated 272,266t in 2018-19 to about 335,000t in 2020-2021, citing rising production value and new refineries.

The report forecast Australia's total export revenue to grow to \$1.4b by 2021.

The present lithium oversupply can be seen as a side effect of miners' attempts to position themselves to meet the anticipated rapid increase in demand in the near future.

"The fact that supply is being triangulated against future demand makes it somewhat unlikely that oversupply will correct in the very near future," the report said.

"However, demand growth is likely to outstrip supply by around 2023."

Slash, burn and impairment

US lithium giant Albemarle has announced that it would drastically scale back its Australian development plans.

The company abandoned its 75000tpa expansion at the Kemerton lithium hydroxide plant near Bunbury in southwest WA, and after it restructured a deal with MinRes at its Wodgina project in the Pilbara, it scrapped plans for a 50,000tpa lithium hydroxide processing plant.

Albemarle also owns 49pc of the Greenbushes lithium mine in southwest WA which is currently undergoing expansion.

Galaxy Resources has also had a hard time of 2019, flagging a non-cash impairment charge of \$A222m-\$274m, following a review of the inventory of lithium at its flagship Mount Cattin mine in WA.

The hard rock advantage

Worldwide lithium production is shifting toward the use of hard rock deposits such

as spodumene ore as the lithium hydroxide produced from hard rock is more suitable for use in high-nickel products such as batteries.

Hard rock is also less reliant on water than brine, and the high volume of water required for brine production means that it has become a contentious issue in some South American regions.

These factors, along with many more will likely see hard rock lithium production dominate the global growth in production, and Australia looks set to be at the centre of this production.

Mr Grant believes that spodumene will be hit the hardest, however, and that junior producers were cautious.

"They're 'taking it slow' to avoid having to raise capital at unfavourable capital market capitalisations," he said.

"This would dilute current shareholders a lot more compared to if share prices were higher."

While prices are not expected to rise considerably, Australia's output is.

Australia currently has no domestic use for spodumene, and falling prices will likely frustrate producers over the coming years.

On the contentious subject of the heavy rare earths war that is raging between the US and China, Mr Grant was quite confident that the EV market would not be affected, should it become a protracted siege.

"The EV boom in China is unlikely to have issues in that case, which is where a huge portion of the EV industry is located," he said.

"But non-Chinese cathode material manufacturers might have serious issues here."

New supply chains

With the supply chains between China, Japan and the EU markets, and China and Chile to the Korean markets, dominating the market, Mr Grant said that new projects will open up new supply chains once the 'lithium winter' is over.

"Lots of new Argentine brine projects and Nevada clays are both very exciting to me," he said.

"I think these might be major lithium producing regions, and I think there will be a number of other projects around the world servicing local supply chains too, such as European lithium projects for cathodes in Germany and Eastern Europe."

The future of lithium post-2030 has raised concerns from analysts as EV sales are expected to plateau around the same time large-scale lithium recycling begins.

But that may be of little consequence when considering the current supply of the battery metal against the anticipated demand of the 2020s.

"We'll need a heck of a lot more lithium out of the ground before lithium recycling becomes relevant," Mr Grant said.

"I will be surprised if more than 80pc of it gets recycled past the 2020s, so the remaining 20pc of demand for lithium, which is much larger than what it currently is, is a much larger demand for lithium compared to today."

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Image Yancoal.

STEADY AS SHE GOES

Mount Thorley Warkworth is a dual operation of two pits, Mount Thorley and Warkworth, both operated by Yancoal. 2019 will see a pre-feasibility study into an underground expansion, and the company is hoping to see an increase in prices for its thermal coal offerings.

Yancoal is Australia's biggest pure-coal producer.

GERARD MCARTNEY

FOR almost 40 years, Mount Thorley Warkworth has been producing coal just out of Singleton in the Hunter Valley region of NSW.

The two open cut mines – Mount Thorley (Yancoal and POSCO, 80:20 respectively) and Warkworth (Yancoal, Nippon Steel and Mitsubishi Materials, 84.5:9.5:6 respectively) – operate side-by-side and use dragline truck and shovel methods to produce medium and high-ash thermal coal and semi-soft coking coal for export.

Yancoal is a Chinese state-owned organisation, and is also Australia's largest pure-coal producer.

The organisation operates five mines and manages five others across NSW, Queensland and WA, with a 50pc share in the Middlemount JV.

2018 was Yancoal's first full year of attributable production from Mount Thorley Warkworth, following the 2017 acquisition, with the dual operation producing 17.6mt of ROM coal, 12.1mt saleable coal and had an estimated 315mt total recoverable reserves at April 2019.

At the end of Q2, the mine had produced 9.1mt of ROM coal, up 7pc from 8.5 in Q2 2018, however saleable coal had only increased from 6mt to 6.1 for the same period.

For the quarter, Mt Thorley Warkworth produced 4.5mt of ROM coal, up 7pc from Q2 2018, and 3mt of saleable coal, similar to the results of Q2 2018.

The company said that it had identified coal that could support expansion into an underground operation.

"The initial concept has a potential production output of 6mtpa of ROM coal," it said.

"Studies are underway that underpin a

"We are making positive progress regarding the potential development of a proposed 6mt per annum underground mine at Mount Thorley Warkworth."

A new underground expansion could see Mount Thorley Warkworth produce an extra 6mtpa.

pre-feasibility study due to be submitted to the board for review in the first quarter of 2020."

Yancoal chief executive Reinhold Schmidt said that it was an exciting time for the mine.

"We are making positive progress regarding the potential development of a proposed 6mt per annum underground mine at Mount Thorley Warkworth, with exploration drilling for the prefeasibility on the target seams completed at the end of 2018," he said.

Thermal coal price pressure

China, as well as Japan and Korea, are key markets for Yancoal's thermal coal, and the trade wars have not spared it, reflected in the lower thermal coal sales for the period.

But while the price volatility due to Chinese import restrictions looked likely to be a persistent feature of the 2019 coal market, Mr Schmidt remained confident that market fundamentals would remain positive.

"Market conditions affected the realised

price we were able to achieve in the second quarter, but the team continues to secure offtake for the saleable product," he said.

"At the halfway point for the year, Yancoal remains on target for the 2019 operational goals.

"The annualised attributable saleable coal volume is 35.6mt compared to the target of about 35mt."

Opposition mounting

Coal mining is suffering from increasingly bad publicity in NSW, and the Hunter Valley region has been met with continued opposition from environmental groups.

Organisations such as Lock the Gate and Hunter Renewal say that the Hunter Valley must transition away from coal before the world does if the region is to survive.

In its report, Lock the Gate slammed the proposed 11 new mines and mine extension programs which it says would threaten NSW's strategic farmland and water resources.

"Taken together, 11 new coal projects

threaten farmland, bushland and water supply in NSW. Together they would extract more new coal than Adani's controversial Carmichael coal mine in central Queensland," the report said.

And the outcomes of a compliance blitz by the NSW resources regulator has put the mine on its toes after an inspection recognised ongoing delays in the progression of rehabilitation areas, limited records to address risks to rehabilitation, and limited documented measures of actions to improve progressive rehabilitation performance.

Lock the Gate Alliance spokesperson Georgina Woods said it was unacceptable for the miner to be failing on its rehabilitation and environmental management.

"This is especially true at a time when there is mounting concern about what legacy the mining industry is going to leave the people of this valley," she said.

"When rehabilitation falls behind or is done poorly, it leads to an increase in air pollution and leaves future generations with the burden of cleaning up the mining companies' mess."

Horizontal directional drilling

NATIONAL

MAXIBOR has successfully carried out the install of 4x180m electrical conduit PN12.5 HDPE at Yancoal's Mount Thorley mine.

The project was completed using one of Maxibor's Vermeer 100x120 horizontal directional drilling (HDD) rigs.

The bore hole was established by reaming at progressively increased diameters of 180mm, 300mm, 400mm and ultimately to the full width of 550mm, enough to accommodate the four 180mm pipes.

The ground conditions were significantly harder than expected, with testing showing the rock strength at 61.8mpa compared to the originally anticipated 25mpa.

While this slowed the progress of the drilling operations, the works were still able to be completed within the client's delivery window.

Fracturing of the rock in certain sections caused some loss of drilling fluids, which needed to be compensated for by an increased use of fluids to maintain optimal conditions in the bore hole for the cutters and rods.

Use of HDD on mine sites provides mine owners with solutions which are safer, are much less prone to damage by other site activity, and minimise impact on other infrastructure e.g. roads.

As many other asset owners are



With most Maxibor staff accredited to work on mine sites, plus the regular toolbox talks and stringent plant and equipment testing, Maxibor yet again completed a project without incident.

increasingly discovering, HDD provides a lower lifetime cost of maintaining infrastructure assets.

While the Mt Thorley bores were relatively short in distance, Maxibor's rigs

can undertake bores up 10 times as long to provide in-ground water and power infrastructure solutions.

Maxibor is more than happy to discuss with those involved in the mining sector

how HDD can provide a solution to their mine site infrastructure needs.

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A LASTING LEGACY

The slogan in the new advertisements from the Minerals Council of Australia (MCA) ring true – there really is more to Australian mining – and miners like Alcoa can work together with local communities to ensure land is rehabilitated and usable for generations to come.

The Eden Anglesea project will centre around a body of water where the mining pit used to be.

EMMA DAVIES

MCA chief executive Tania Constable believes Australia is a leading jurisdiction in sustainable mining practices, including mine rehabilitation and closure.

“The implementation and performance of the Australian mining industry in rehabilitation is continuously improving, driven by ongoing investment in rehabilitation practice,” Ms Constable said.

“There is no ‘one size fits all’ approach to mine rehabilitation but over many years, the industry has worked closely with government and research institutions to develop and share improved practices.”

Ms Constable said that leading practice approaches start with establishing a final closure design that balances the needs of government and local community.

“Rehabilitation should be integrated into life-of-mine planning, and wherever practical implemented progressively as the mine develops,” she said.

In practice, good management means understanding environmental values before mining, evaluating the potential risks and applying the ‘avoid-minimise-mitigate’ environmental management hierarchy to reduce the mining footprint throughout the mine-life.

Sustainable Minerals Institute (SMI) principal research fellow and associate professor Claire Côte has engaged extensively with mining operations in Australia, Africa, Chile and Canada to address water and sustainability issues, documenting and implementing leading practices and said that mine rehabilitation planning is all about the long term goal.

“It’s all about integrated planning and taking into account environmental requirements for rehabilitation from day one and planning the life of mine around rehabilitation and closure requirements,” Professor Côte said.

“Mine sites really need to think long term.”

End land use

Australian mining companies have significant in-house expertise in rehabilitation and closure planning and where necessary, nationally and internationally-recognised specialists are also engaged to review and provide input into rehabilitation and closure programs.



Alcoa ceased mining activities in 2015 and if all goes to plan, the Eden Anglesea project will begin development in early 2020.

The industry’s approach to land rehabilitation has improved significantly over past decades – an evolution driven by sustained investment in land rehabilitation techniques, evolving corporate values, community expectations and government regulation.

“Mining activities are comprehensively regulated under state-based mining, development and planning legislation which is continuously evolving in line with community expectations,” Ms Constable said.

MCA also shares and promotes best practice and the rehabilitation work of Australian companies to increase community awareness of the work that’s being done.

“This has included our ‘There’s more to Australian mining’ campaign which focuses on effective mine rehabilitation and how mining and farming work together,” Ms Constable said.

SMI senior research fellow Phill McKenna said many mines in central Queensland are located in agricultural areas, so aiming for grazing as the final end land use was quite a logical goal for mining companies.

“If you can plan for some of those end land uses from the start you can maximise resources and get the best outcomes in terms for the money put in to rehab,” Mr McKenna said.

The key is to understand the end land use goal and the difference between restoration and rehabilitation.

“Restoration is essentially the process to the full recovery of an ecosystem and all the functionalities and services associated with that ecosystem,” Mr McKenna said.

“Rehabilitation is really just a partial recovery of some of those ecosystem services.

“With grazing, the previous land holder will typically come in and start using the site within a pastoral context but when you’re looking at native ecosystems, it’s a lot more complex to achieve tree and shrub density and species richness.”

Mr McKenna said that mine sites will typically aim for a novel or hybrid ecosystem within all the constraints of the environment and budget.

“They’re aiming to create an ecosystem to the highest standard and the highest levels, but it can be virtually impossible to recreate a native ecosystem back to its full function,” he said.

The Eden project

Mr McKenna pointed to Alcoa as an example of bauxite mining areas that are probably close to full restoration.

“Some of those areas would be the most successful examples of rehabilitation in the country,” he said.

Alcoa asset manager Warren Sharp said that the company has always had lofty goals about the legacy it wants to leave behind from mining operations, and a key example of this is the unique Eden Anglesea project in Victoria.

The company has teamed up with the Eden Project — an educational charity, social enterprise and visitor attraction in an abandoned mine in Cornwall in the UK.

“We had a mind to open up the land to alternative uses that might be beneficial to the community,” Mr Sharp said.

“People are very excited about the concept, what Eden can bring, and they are very excited about educational opportunities, the opportunity to put a wonderful ecosystem at Anglesea on the map in an environmental way.

“They’re also excited about sustainability opportunities and economic opportunities.”

Mr Sharp said the operating mine provided around 80 jobs but the Eden project would bring around 300 permanent and local jobs to the region.

“The economic impact is really significant,” he said.

“It’s quite a wonderful story to go from long term mining to an environmentally and educationally based outcome that has so many more jobs and more to offer the community.”

Community feedback for the project has been overwhelmingly positive, with 800 people attending community consultation events and 3000 people engaging online.

“It was probably the first time we’ve talked to the community about something that could happen on our land that was very tangible,” Mr Sharp said.

The main concerns flagged were around traffic management and congestion.

“We want to make sure that any offerings at Eden are done in a way that is sympathetic and empathetic to the businesses in Anglesea so that it doesn’t take away from the local businesses,” Mr Sharp said.

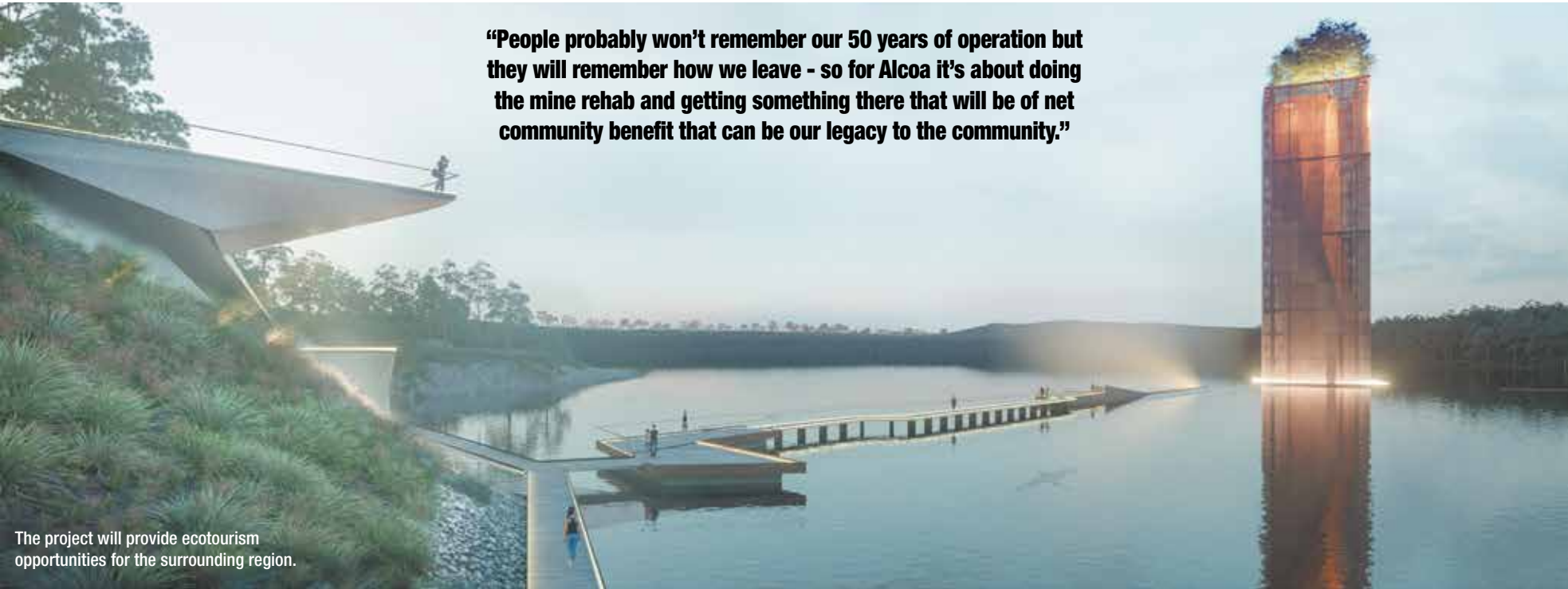
“People wanted to know how we would build in renewable energies, the right educational opportunities for local and regional schools and how we’d get the infrastructure in place.”

Corporate responsibility

Ms Constable said that Australian mining companies (like Alcoa) understand land rehabilitation is fundamental to responsible mining.

“The Australian minerals industry recognises its responsibility as a temporary custodian of land to contribute to sustainable land use outcomes,” she said.

“Mining rehabilitation is critical to ongoing community acceptance and the ability to successfully rehabilitate mined areas is fundamental to the industry’s social licence to operate and a foundation for demonstrating the industry’s commitment to operating responsibly.”



Mr Sharp echoed this sentiment, stating that Alcoa intended to rehabilitate the mine to the highest standard with or without the involvement of the Eden project.

“We had a really great relationship with the community over 50 years, we had the privilege of being in the area and we are patently aware of that,” he said,

“People probably won’t remember our 50 years of operation but they will remember how we leave — so for Alcoa it is about doing the mine rehab and getting something there that will be of net community benefit that can be our legacy to the community – that’s really important to us.

“We hope the project will be great, not just for Anglesea, but for Victoria and maybe even Australia in terms of being an exemplar of what can be done.”





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Restoring the Hunter Valley

NSW

ESTABLISHED in 2007, MRS Services Group's (MRSSG) civil and earthworks division is a leading supplier of mining rehabilitation services across the Hunter Valley.

With a large fleet and highly experienced operators, MRS has a proven track record of producing high quality works within timeframe and budget.

The company boasts excellent back-end systems that ensure the reduction of costs and increased profitability, and a large diversified base of highly skilled employees.

This is paired with MRSSG's commitment to staying nimble, responsive and innovative and to remain focused on its customers' changing needs.

MRSSG has held an ongoing contract for over nine years at Glencore's Bulga open cut operation and is currently in the third year of the current three-year contract.

The scope of work includes the provision of labour and necessary equipment for clearing and rehabilitation works.

This involves the felling and mulching of vegetation, stripping of mulch and topsoil ahead of operations, the bulk push of overburden dumps to achieve final landform, and the rehabilitation of completed overburden dumps, among others.

At Glencore's Mangoola operation, MRSSG has held the rehabilitation



MRSSG has a proven track record of getting the jobs done on time and within budget.

contract for the past seven years with about 100ha/yr rehabilitated.

The works consist of the provision of all labour, equipment and rehabilitation and the scope includes topsoil emplacement, gypsum spreading, ripping and seeding, placement of stag trees and wood piles.

MRSSG's services include – but are not necessarily limited to – clearing, mulching and stripping, bulk shaping of overburden dumps to achieve final landform, rock raking, contour and diversion bund construction, drop structures, topsoil respread and conditioning, habitat tree

placement and reseedling.

In addition, MRSSG provides pit service support including dam and sump desilting, road construction and repairs and water management.

For more information: info@mrssg.net.

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The Port of Geraldton plans to maximise existing infrastructure over the next decade.

EMMA DAVIES

THE Mid-West Ports Authority (MPA) is playing the long game, increasing throughput by maximising its existing infrastructure, ensuring that when mining projects in the region come online, the Port of Geraldton will be ready and waiting to be that vital link in the mining supply chain.

Mid-West Ports Authority chief executive officer Rochelle Macdonald said there was a huge amount of opportunity that the port can realise in the next 10-15 years.

“In the past 10 years we’ve actually seen a doubling of the trade going through the port of Geraldton so it’s not unrealistic to see the trade increasing quite significantly going

forward,” Ms Macdonald said.

“We’ve got iron ore, base metal concentrate, mineral sands, and some new products, rare earths lithium and potash coming to the port. Then we’ve also seen a steady increase on grain exports that will also have an impact on our development future.

“Depending on what the market does the maximisation footprint plan might take 30 years but it might only take 10 years.”

The port has existing berth facilities able to accommodate between 50,000t to 12mt per annum but they are only being utilised at around 50pc; so the first stage in the plan is maximising current infrastructure — then the port will reassess its capabilities.

Ms Macdonald said any new infrastructure

development would occur after the current footprint had been maximised and that it would align with new mining projects in the region.

“There’s almost 20 new projects in various stages of development that we could see being commissioned within the next five years, however we do understand that mine development is slow,” she said.

Some of these projects will take quite a long time to come to fruition.

“It’s really about aligning what we do to meet the demands of the market and the demands of the customers,” Ms Macdonald said.

MPA business development manager Ian Hind said the market could change drastically in a short amount of time.

“In the mining space the commodity prices and exchange rates have moved in the last 12 months to a much more favourable climate,” Mr Hind said.

“The landscape has changed very quickly.

“Projects that two or three years ago were kind of on the backburner are all getting reviewed and reactivated again.”

And the Port of Geraldton plans to be ready to cater for any projects coming online.

“We are working hand in hand with mining operators.

It’s a marriage,” Mr Hind said.

“We understand what their needs are, they understand what our limitations are and we work together to achieve a good outcome.”

Immediate analysis of passing airstream

WA

EQUIPMENT used for regulatory reporting purposes, such as high volume samplers, can be of little to no use in helping to manage and control dust emissions.

The pump and filter of high volume samplers produces only one 24-hour time weighted average, and even that result has to be determined in a costly laboratory process often days after the sampling session.

Results obtained with these systems are an all-embracing, non-specific historical record.

Other equipment report negative airborne particle values regularly and sometimes for extended periods of time.

This results in no alerts of potentially fatal occurrences.

Much of this type of equipment is often influenced by environmental factors outside the control of the company concerned.

It has been demonstrated that successful dust management strategies using Turnkey Osiris monitors put in place by various Australian companies have a beneficial direct impact on results required by the Regulatory Reporting Authority.

Controlling and managing dust emissions requires immediate information on what is occurring as a process, or while



Turnkey Osiris airborne particle monitors and iGAS airborne gas sample the passing airstream every one second.

the practice is in progress.

Managing dust emissions is the designed response to a practice or process that is monitored to give consistent suppression or containment to the process or practice.

Turnkey Osiris airborne particle monitors and iGAS airborne gas detectors are purposely designed to sample the passing airstream every one second.

Alerts and alarms can thus be generated and propagated immediately.



TURNKEY ENVIRONMENTAL MONITORS

Turnkey Instruments Ltd, UK, is recognised as a world leader in photometric technology. On-going R&D will shortly see the release of the next generation of Turnkey airborne particle monitors. Currently the instruments have European certification through

MCERTS to EN 45011. In Australia, Osiris instruments are the only airborne particle monitoring instruments to have successfully completed the demanding requirements of EN12341 – the International Equivalency Standard.

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DIGGING DEEP

A breakthrough report on the effects of dredging has helped build confidence for environmental regulators.

The sharing of monitoring data by industry with scientists enabled the re-use of existing data and extract information to be re-analysed in different ways to improve our understanding of pressure-response relationships associated with dredging.

RAY CHAN

A REPORT on one of the largest single-issue environmental research programs in Australia, compiled after gaining unprecedented access to industry dredging data, has been recognised as a ground-breaking step forward for environmental regulation.

“Strategic Integrated Marine Science: Dredging - new knowledge for better decisions and outcomes”, a synthesis of research from the WA Marine Science Institution Dredging Science Node, was released by WAMSI CEO Luke Twomey at the AMSA Conference in Fremantle, WA, recently.

The findings from the five-year study are expected to contribute to increased confidence, timeliness and efficiency of the environmental approval and regulatory processes associated with dredging projects, ultimately expected to reduce the cost to government and industry.

Over the past decade there have been a number of large scale dredging projects in WA alone.

As part of the environmental approval of these projects, the dredging proponents collected considerable amounts of environmental monitoring data for two main purposes: to support the environmental impact assessments and to support compliance monitoring of the environmental approval conditions (through implementation of dredge management plans).

According to WA Environmental Protection Authority chairman Tom Hatton, it's estimated that monitoring and management costs can exceed \$100m on a major dredging program in addition to the predictive uncertainty of risks to the environment itself.

“This program has delivered on its promise in full and in a form that has increased the confidence, timeliness and efficiency of the environmental approval and regulatory processes associated with dredging projects,” Dr Hatton said.

Woodside Energy chief environmental scientist Luke Smith said the \$19m program – \$9.5m of which came from industry offsets – had delivered a valuable set of information on environmental dredging thresholds.

“The Dredging Science Node was valuable for industry and the state – it provides important technical data to improve our environmental impact assessments and support industry approval documentation,” he said.

“By bringing together the key stakeholders – state, industry, ports and research agencies – we maximised the available funding and the scientific knowledge that came from the Node.

“This knowledge will support better and more concise dredging-related environmental impact assessments moving forward.”

Project details

The WAMSI Dredging Science Node was a strategic research initiative that evolved in response to uncertainties in the environmental impact assessment and management of large-scale dredging operations and coastal infrastructure developments.

Its goal was to enhance capacity within government and the private sector to predict and manage the environmental impacts of dredging in WA, delivered through a combination of reviews, field studies, laboratory experimentation, relationship testing and development of standardised protocols and guidance for impact prediction, monitoring and management.

For the five most recent capital dredging projects in WA, some \$250m was spent by industry on the collection of environmental monitoring data before, during and after dredging.

The Node's 114 scientists from 26 research organisations gained unprecedented access to environmental monitoring data on four large-scale capital dredging projects in the Pilbara region: the Pluto LNG project at Burrup Peninsula (Woodside), Cape Lambert A and B projects (Rio Tinto), the Gorgon project at Barrow Island (Chevron), and the Wheatstone project at Onslow (Chevron).

This included information on both the physical environment (e.g. water quality and sediment deposition) as well as the biological environment (e.g. the health of the coral reefs, seagrass beds and other benthic habitats).

There was considered to be great value in learning from these successive dredging projects and applying that knowledge to future projects but, until recently, this has been hampered by the fact that the data was treated as ‘commercial in confidence’ and hence not available to other proponents and the scientific community.

The reports states that a corporate commitment to share monitoring datasets can lead to accelerated learning and improvements in impact prediction methodology, greater certainty in decision making and a

streamlining of approvals processes and monitoring requirements.

Since 2010, approval conditions in WA require that proponents make the Node's environmental monitoring data publicly available.

But that left two underlying issues, according to the report.

Firstly, there was no capacity within government to collate and analyse the data so the ability to value add to the existing knowledge base was limited. Secondly, there remained a large amount of valuable data collected pre-2010 that could be of enormous value.

A desktop exercise identified past, present and future (pending approval) dredging projects in tropical northwest Australia and evaluated the potential of any available monitoring datasets, ancillary studies and other relevant information.

The respective proponent companies were approached individually to negotiate access to data.

These negotiations were complex, requiring considerable time and effort, with multiple levels of approval within each company, partly due to fear of potential legal implications (the potential for post-project discovery of non-compliance issues and associated issues of liability and indemnity), but all eventually agreed.

Data sharing agreements were developed between WAMSI and the companies to govern the use of the datasets for relevant research activities.

This constituted an unprecedented breakthrough, as environmental monitoring data of this detail and scale had never been made publicly available before in Western Australia.

Access to these valuable monitoring datasets enabled the scientists to turn data into information for use in many different individual projects and themes, and provided an immense source of detailed information that would feed into improving the ability to predict and manage the effects of dredging.

WAMSI Dredging Science Node leader Ross Jones said the group had brought together a raft of scientific literature on sediments in the water column in relation to dredging.

“Little of the available research on sediments was able to be used by dredging proponents and regulators to adequately assess risk, so we have designed the Node as a

tool that gives industry and regulators greater confidence to better predict environmental outcomes around dredging,” Dr Jones said.

Dr Twomey said the more than 55 scientific publications produced by the Node so far was an extraordinary achievement for the investment, and would go a long way towards much more informed debate and decision-making on how best to predict and manage the potential impacts.

Dredging results in use

Key findings from the project have been incorporated in the newly published Maintenance Dredging Strategy for Great Barrier Reef World Heritage Area Ports by the Queensland Government, a dredging management plan for maintenance dredging in Darwin Harbour (INPEX), a series of Sustainable Sediment Management Studies underway at various ports in northern Queensland (commissioned by the North Queensland Bulk Ports Corporation), and in a forthcoming publication by PIANC on Best Practice Guidelines for Dredging and Port Construction near Coastal Plant Habitats.

Internationally, relevant findings of the Node are being incorporated into dredging programs in the USA, the Netherlands, Monaco, South Africa, Kazakhstan and Saudi Arabia.

The new insights from the program are now being translated into improved dredging guidelines that will serve to streamline monitoring by focusing on the relevant and most sensitive aspects and help to improve the effectiveness of management approaches to minimise the hazards from dredging.

New guidelines for dredge plume modelling are being developed by CSIRO. The guidelines focus on establishing a consistent and sound approach to the modelling of dredge plumes for predicting the pressure field of suspended sediments when seeking environmental impact assessment approval.

The WAMSI Dredging Science Node has been shortlisted for the WA Department of Mines, Industry Regulation and Safety's 2019 Golden Gecko Award for Environmental Excellence, which recognises outstanding contributions to innovation and environmental outcomes in the resources sector.

The report and full industry data findings can be downloaded from: www.wamsi.org.au/



Mobile dredging services

NATIONAL

DREDGING Systems has been working as waterway engineers across Australia since 1995 and specialises in quality, cost-effective dredging for the mining industry.

Dredging Systems director Anto Pratten said the company excels in both hydraulic (cutter-suction pumping) and mechanical (excavator bucket) dredging.

“Our highly mobile equipment operates in mine tailings dams, industrial ponds and effluent ponds,” he said.

“We also operate remotely controlled dredges that are specifically designed for cleaning out lined dams.”

The team has various systems to dewater / dry the dredged material.

Dewatering bags for smaller volumes and portable mechanical systems for larger volumes.

The company has the expertise and equipment to clear material build-up from settlement ponds and mine tailings dams.

“Our highly mobile equipment can ‘walk’ or be craned into tight-access industrial ponds or anywhere that water-flow rates need to be increased,” Mr Pratten said.

“We specialise in removing and disposing of silt, clay, rock and weed and we can work in shallow, muddy water, with equipment that pumps or excavates material to dewatering equipment.”



Dredging Systems offers highly mobile dredging equipment for mining operations.

Dredging Systems’ equipment is transportable by truck anywhere in Australia.

The amphibious dredges can operate as either cutter-suction dredges or

floating amphibious excavators, with the ability to pump mud, silt or sand up to 1000m — and a booster pump is available for further distances.

The dredges are ideal for quickly and

efficiently clearing mine tailings dams, ponds, creeks, marinas and rivers.

For more information about Dredging Systems and its services, visit: www.dredgingsystems.com.au.



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The multi-purpose dredges are transportable by truck anywhere in Australia and all our equipment is built to mine specifications.

We also supply remote dredges for lined dams.





Professionally-taken photos can help improve a company's business. The following examples were taken at Glencore Qld mines by Rob Parsons of Through the Looking Glass Studio, Qld.

Worth a thousand words

SOME mining companies may not realise it, but professional photography is imperative for the mining industry.

So claims Rob Parsons, who has 20 years' experience in photography, videography, drone and time-lapse image making.

Rob has worked with the mining industry for more than 15 years, helping to develop professional imagery for clients such as Glencore, xStrata, Leighton Contractors and BHP.

"I often get asked by miners 'why do we need professional photography? We aren't an arts business'," Rob said.

"This always perplexes me. 'Well, you are a commercial business aren't you?' I answer.

"Once I get the nod, I then proceed to explain how photography is often the first impression someone gets of their business.

"And as we all know, first impressions can either make or break a business.

"Professional images also have a multitude of uses that keep returning your investment."

Rob said it was well-known that there is a direct link between utilising high quality images in marketing, and the growth of sales.

Miners may be wanting to attract new staff members, business partners, shareholders or clients, and an average-looking image could be the reason that an individual is deterred from the business.

"If a potential share holder wanted to have an introduction to a business, the first place they would look would be the website," Rob said.

"If the shareholder was impressed with the professionalism of the images and content, then the likelihood of a sale would increase.

"If the website had mediocre images and weak content, the share holder may look elsewhere for business."

Rob said the power of an image should never be underestimated.

"No matter what the image is, quality will always be noticed," he said.

Another aspect to consider is maintaining professionalism in the industry.

"Do you dress your best for an important business meeting?" Rob said

"Do you do your due diligence before embarking on a new business partnership? Do you make a first impression about a business based on their professionalism?"

"If the answer is yes, then it means the miner understands the importance of a professional appearance on all fronts.

"If you put in the effort to maintain professionalism in all other aspects of your business, then why let the business down by not maintaining professional imagery?"

"With the right professional photographer, you could make the right impression straight away."

Rob said the mining industry, in particular, was blessed with a lot of potential for great imagery.

He said there was something beautiful and surreal about the authentic nature of the outback, its people and the wondrous landscapes.

"Some of my favourite images in my career have come from candid moments while photographing miners and the mine site's landscape," he said.

Rob offered some tips on what to look for when sourcing photographers.



For the best results, look out for these qualities:

- Experience working with mining industry and rural and remote areas
- More than 10+ years of photography

experience for reliability

- Use of high quality cameras and editing tools
- Easy to communicate with
- Willing to work to your needs and wants

New parental leave standard



KCGM'S Mt Charlotte site's expectant parents, senior leaders and key community partners got together to launch the new parental leave policy.

KALGOORLIE Consolidated Gold Mines (KCGM) has announced significant changes to its parental leave policy, joining its Joint Venture owner Newmont Goldcorp in setting a new industry standard within Australia.

Under the new changes, employees are now eligible for 22 weeks paid parental or adoption leave, plus a four week return-to-work payment. Additionally, 10 days paid secondary carers leave will be provided.

These changes will help address the gender pay gap that often occurs when parents are out of the workforce for extended periods.

KCGM also continues to offer eligible employees access to family-friendly flexible

work arrangements when back at work.

Ten days paid domestic violence leave will also be made available, providing critical financial support to affected employees who may be victims of violence at home.

KCGM's Parental Support Business Resource Group (BRG) celebrated with the site's own expectant parents, senior leaders and key community partners at a launch event at the end of July, with Mount Charlotte Underground Mine's Cassidy Headframe lit up with pink and blue lights for the occasion.

KCGM's Parental Support BRG team leader Julia Rowatt said the new procedure sets KCGM apart as an employer of choice.

"The Parental Support BRG's mission is to improve parental support for all employees," she said.

"We also work with those currently on parental leave to assist them in staying connected with the business and ensure a smooth transition back to work.

"We're thrilled that KCGM has become an industry leader in parental and other leave needs.

"Our employees all live locally and it's important that KCGM is a family-friendly employer, enabling flexibility to get the best from home and work life in Kalgoorlie-Boulder.

"These changes will be instrumental in supporting and retaining current KCGM employees, as well as in attracting new employees to our business."

Additional parental leave benefits will include:

- Superannuation and long service leave accruals will be paid on return to work;
- Both primary and secondary carers, regardless of gender, will qualify;
- People in a de facto relationships, regardless of diversity of sex or gender; and
- A graduated return-to-work on full pay and return to work incentive payment.



The iconic EarthEater landmark at Capella.

Capella on bucket list

NEW life has been breathed into a landmark at the Central Highlands town of Capella in Queensland, with the refurbishment of the mine dragline bucket at the entrance to the Capella Industrial Park.

CQMS Razer, Gerada Engineering, SunCity Signs and the Central Highlands Regional Council joined forces to restore the EarthEater dragline bucket to its former glory as part of CQMS Razer's 40th anniversary year activities across the region.

CQMS Razer chief executive officer John Barbagallo said the EarthEater dragline bucket was an important part of the Capella landscape, representing the ongoing presence of the mining industry across the region.

"40 years ago, CQMS Razer began its story in Central Queensland and with the support of the local community, local government, mining operators and our

incredible staff, we have been able to grow into the global mining technology and productivity leaders we are today," he said.

"We're proud to be able to bring this original EarthEater dragline bucket back to its former glory and we encourage local residents and tourists travelling through the region to stop by and check it out."

Visitors to the Capella dragline bucket are encouraged to share their photos via social media with the hashtags #Capellabucket, #CR40yrs, and #CentralHighlandsQLD, and in doing so help promote the region.

The CQMS Razer EarthEater dragline bucket began its Bowen Basin open cut coal mining life on December 14, 2001.

The bucket was used on a Marion 8050 dragline and during its life dug and moved more than 83mt of overburden at the mine site.

The dragline bucket weighs more than 41,000t and had a capacity of 46.4cu m.

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Woodside and Murujaga Corp partner in \$4m rock art centre

RAY CHAN

WOODSIDE Energy has announced a \$4m contribution to the Murujaga Aboriginal Corporation (MAC) to fund the construction of the Murujaga Living Knowledge Centre (MLKC) on the nationally heritage-listed Burrup Peninsula of WA.

Woodside chief operations officer Meg O'Neill said the contribution to the MLKC was part of the company's \$34m commitment to heritage, cultural and arts projects in the region under the Burrup Conservation Agreement, signed by Woodside and the Commonwealth Government in 2007.

"MAC's proposal to develop the MLKC at Conzinc Bay as a world-class ecocultural facility for the display and curatorship of rock art will attract Australian and international visitors," Ms O'Neill said.

"The centre will help maintain, promote and celebrate the rich and ancient cultural values of the Burrup. It will also greatly assist the Indigenous Ranger team at the Murujaga National Park, which Woodside has also supported under the Burrup Conservation Agreement, to better monitor and protect this culturally significant country.

"The Conservation Agreement was a milestone in collaboration with the Dampier



The centre will help maintain, promote and celebrate the rich and ancient cultural values of the Burrup.

Archipelago's NgardaNgarli people, who have inhabited the Murujaga region around Woodside's Burrup Peninsula gas processing operations for tens of thousands of years."

The international significance of the region's rock art was recognised by the decision of the traditional owners and the Premier of WA to pursue World Heritage listing for the Peninsula.

"Woodside has operated gas processing facilities on the Burrup for more than 30 years, and our support for the World Heritage listing reflects this successful co-existence of heritage and industry," Ms O'Neill said.

MAC CEO Peter Jeffries said the corporation had an ambitious plan for the centre and wanted it to showcase the rich cultural heritage of the Burrup, putting the

world's largest art gallery on the map.

"An iconic Living Knowledge Centre will be constructed to tell stories from the stones and guide visitors through the ancient land that is Murujaga," he said.

"We are planning to establish a versatile eco-accommodation facility that will allow people to immerse themselves in both the cultural and natural environment.

MINERS

AT THE MOVIES

SO you're back from your FIFO stint at the mines, and wondering what to watch at the movies? Here are some of the current and recently-released films you might want to catch at the cinemas or on a DVD.

ANGEL HAS FALLEN

Gerard Butler, Morgan Freeman

THE third in the 'Fallen' franchise has hit the screens, indicating there's an audience out there for the adventures of a White House president constantly trying to avoid assassination.

The "angel" in the title refers to the American leader's guardian angel, Secret Service agent Mike Banning, played as always by Scottish slugger Gerard Butler, with his best American accent.

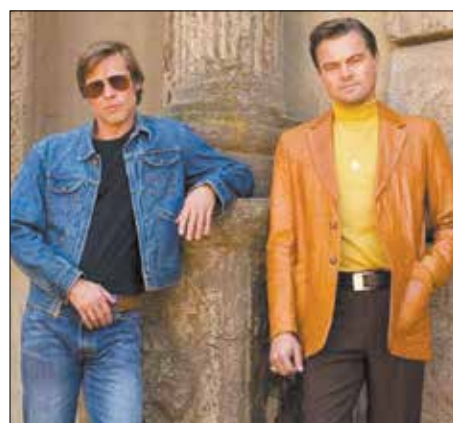
This time around, the plot concerns an attack on Allan Trumbull (Morgan Freeman), who's become POTUS after serving as speaker and vice-pres in the first two chapters.

After a well-staged hit kills off an entire presidential defence team except

Banning, he is charged with the attempted murder of Trumbull, who is left in a coma.

If anything, the movie suffers from predictability: it seems as if the identities of the people who have framed Banning have been telegraphed from the start, and it comes as no real surprise when they are revealed.

Based on the strength of this film though, we can expect more in the series — at least until the box office has fallen, of course.



One Upon A Time ... In Hollywood is now showing.

ONCE UPON A TIME ... IN HOLLYWOOD

Leonardo DiCaprio, Brad Pitt

ACCLAIMED director Quentin Tarantino's latest offering recounts the days in the life of a fading TV star in the flower power era of 1969, half a century ago.

But while some have chosen the

occasion to celebrate the 50th anniversary of the moon landing or commemorate Woodstock, Tarantino chooses to spend the summer of 2019 revisiting the Charles Manson killings, a crime that shook the show business community in Los Angeles.

Indeed, the theme of violence recurs throughout, with many of the sundry characters glorifying bloodshed and brutality, and allying it to the free-killing culture in which they were brought up.

In the movie, Tarantino ratchets up impending carnage and then releases the tension in a gorefest of stabbing, shooting, chopping, bashing, and even charbroiling.

The central characters are actor Rick Dalton (DiCaprio) and his stunt double Cliff Booth (Pitt), who have to contend with washed-up careers, while the spotlight also shines on the sweet and innocent starlet Sharon Tate (Margot Robbie), who in real life was a Manson victim.

All in all, as the film's title implies, the movie functions as a fairy tale, as a wistful tribute to a bygone era and an analysis of a time in which guys like Rick and Cliff are about to be swept aside by a future they can't comprehend.

LATE NIGHT

Emma Thompson, Mindy Kaling

PLAYING a haughty British late night host who scoffs at lesser mortals from her podium of privilege, Emma Thompson

is Katherine Newbury, a woman whose show is a television fixture that has been on the decline for a decade, and the poor ratings show it, forcing the network to consider a replacement.

Blindly led by an apathetic assortment of white male writers on autopilot, Katherine caves in to criticism that there are no women staff members, demanding that a female is employed to inject new life.

Cue Molly Patel (Mindy Kaling), a young Indian-American chemical plant worker with aspirations to be a comedienne but without experience in network television, who gets fortuitously hired because the indolent chief writer can't be bothered to interview anyone else.

Somewhat predictably, Molly imbues fresh ideas which succeed, including getting Katherine to become more social-media savvy, and forcing the peremptory presenter to get over her dislike of leaving the studio.

There are many other twists and turns to the story, of course, but the winning factor here is the chemistry between Thompson and Kaling, which makes them a lovable pair as they conspire, clash and come together to help restore Katherine's popularity.

While her co-star supplies the kindling, it's the veteran actress, flitting between arrogance and affection, who bellows the flames of the movie into something that's slightly more than just an average sitcom.

Reviews by RAY CHAN

Awards recognise industry leaders



AMMA board member and Woodside chief operating officer Meg O'Neill presents the Contractor Workforce excellence award to Pilbara Resource Group director Scott Dryland.

RAY CHAN

LEADING individuals and organisations of Australian resources and energy industries were celebrated in Melbourne in early August.

Presented at the gala dinner of resources and energy group AMMA, the awards celebrated leadership, innovation and excellence in the sector.

The event is the industry's annual workforce celebration which puts the spotlight on the sector's high-achievers, in front of industry leaders and peers.

AMMA chief executive Steve Knott praised the high level of award winners across five categories covering key workforce-related areas of the industry.

He said the initiatives and programs implemented by resources and energy employers reinforced Australia's standing as a global leader in key workforce areas.

"These are the people and organisations driving our industry to ensure a brighter future for all Australians," he said.

Contractor Workforce Excellence award: Pilbara Resource Group

Pilbara Resource Group has developed a range of strategies and a positive employment engagement model to deliver a high performance, safety-focussed workforce.

Working on some of Australia's most remote project sites, the company looked outside the box on communication, upskilling and training.

This included replacing standard HR practices with initiatives that resonated with Aboriginal workers, securing a 75pc retention rate.

Workforce and Workplace Relations Innovation award: Fortescue Metals Group

Fortescue identified an opportunity to offer employment to highly skilled and professional veterans to address the company's shortage in sourcing skilled heavy diesel fitters.

The company developed the Rapid Trades Upskilling Program, a four-week course to build on the veterans' experience, qualifying successful participants with relevant work licences.

Since the launch of the program, 82 veterans have commenced work with



Presenting the Workforce and Workplace Relations Innovation award is Paul Cooper, CEO of Mining, Asia Pacific from award sponsor Sodexo, with Fortescue People group manager Linda O'Farrell.

Fortescue as heavy diesel mechanics, increasing productivity at a retention rate of 99pc.

Health and Wellbeing award: Compass Group (Australia)

Compass Group implemented a grassroots campaign encouraging employees to talk about mental health and feel comfortable in seeking assistance if facing personal challenges.

A video message was compiled involving four employees talking about their personal battles, resulting in the 'Got Your Back' campaign.

At the same time a peer support program was developed within the organisation.

The campaign gained traction and interest across various social media platforms, which led to the #GotYourBack hashtag being emblazoned on PPE, helping a number of employees seek and receive support for mental health.

Diversity and Inclusion award: Fortescue Metals Group

Judges were impressed with the success of Fortescue's Vocational Training and Employment Centre, which has gone from strength-to-strength, assisting Aboriginal people to now make up 13pc of the company's Australian workforce.

The South Hedland-originated program is delivering an ongoing employment pipeline for Aboriginal people, focussing on breaking down barriers to entering the workforce and achieving their career goals.

Young Professional award: Fiona Forsyth from New Hope Group

Fiona excelled in a challenging role since being seconded to Bengalla Mine as integration services advisor, following New Hope Group's majority shareholder acquisition.

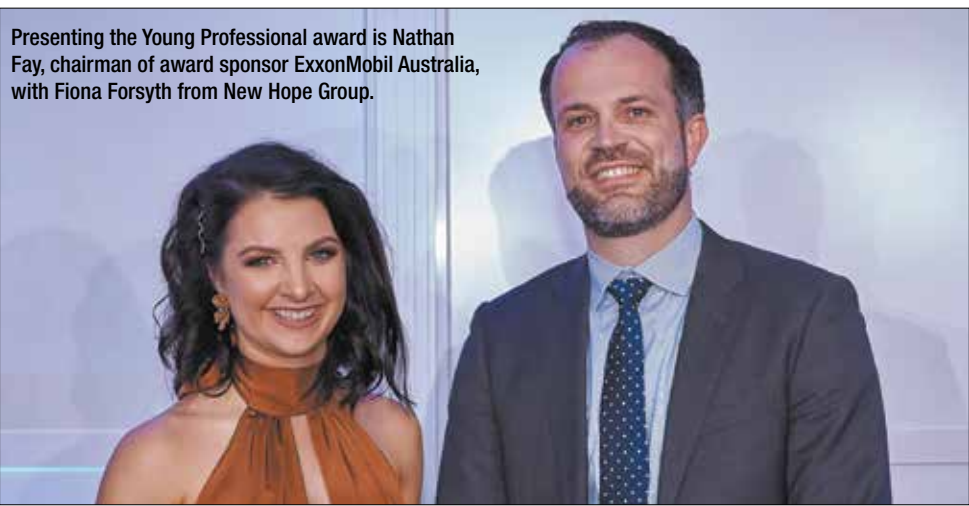
She has been a key part of integration at the site, building positive relationships and working with managers and operational teams to review and plan for a smooth transition.



AMMA chief executive Steve Knott presents the Health and Wellbeing award to with Compass Group Australia executive director (offshore and remote) John Sheridan.



Fortescue People group manager Linda O'Farrell receives the Diversity and Inclusion award from Stephen Halliday, external relations and public affairs head at sponsor Heathgate Resources.



Presenting the Young Professional award is Nathan Fay, chairman of award sponsor ExxonMobil Australia, with Fiona Forsyth from New Hope Group.

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Jointing and purging experts

INTERNATIONAL

FOR 30 years, Ward Operations has been servicing the mining, oil and gas and heavy industrial areas.

The company has built its reputation on the quality of its work, and the quality of the products it uses, ensuring Ward Operations continues to run smoothly through decades of operation.

The company specialises in the service and repair of both paper-insulated cables and XLPE (cross linked polyethylene) up to 132KV.

Ward's is certified to 66KV, with both Raychem and ABB, and 132KV with Raychem and Siemens.

The company has worked on major cable jointing projects across Australia and internationally, and has worked on submarine cable new installations and repairs, as well as cable nitrogen purging.

Water ingress in cables can be an undesirable issue of any mining operation.

The safest way to rectify this problem is by removing the moisture or water through nitrogen purging, a system that can be applied to cables that have had an ingress of moisture or water into conductors and or screens of high voltage cables.

The dry and pure nitrogen forces all the moisture from the conductors and the screens of the cable over a period of time to increase the IR values of the XLPE insulation.



Ward Operations specialises in high-voltage cables.

Ward Operations has two nitrogen generators and fully qualified technicians to complete both small and large projects.

Ward Operations has been in discussion with multiple solar and wind farms around Australia for future projects.

Previously, at Lilyvale Solar Farm, Ward's successfully installed more than

68km of 33KV cable, and over 150 single core HV terminations.

At the Isaac Plains mine, the company installed six Raychem 72KV heat shrink terminations for a haul road crossing.

South Walker Creek saw Ward's install eight Raychem flexible cable terminations on type 411.11 on dragline 28.

And in Darwin, Ward Operations purged over 100km of HV cable, returning them all to the owner moisture free.

For more information, please contact Ward Operations director Jeff Ward at jeff@wardoperations.com.au, or company general manager Tom Ward at tom@wardoperations.com.au.

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Pumped up for mining

NATIONAL

WHEN Australian Pump started 25 years ago, one of its very first products was a Honda engine-powered 3in (outlet) tanker pump designed for basic water delivery applications.

Since then, the world has changed and dust suppression is not just desirable, but an essential addition to mining, earthmoving and construction projects.

Aussie Pumps chief engineer John Hales said that input from the market led the company to develop a wide range of pumps suitable for water carts with petrol, diesel and even hydraulic drive configuration.

“Our first step was to turn a high volume pump into a high pressure and high volume pump just by changing over the impellers and volute”, he said.

“This was the origin of our ‘Brigade Boss’ series of pumps that also found their application in high pressure firefighting.”

These big pumps deliver flows of up to 1800l/m, but also come in configurations that operate at up to 90 psi.

“Those high-flow, high-pressure combinations made them ideal for dust suppression on big tankers,” Mr Hales said.

The company progressed to diesel drive pumps with a focus on both Yanmar and Kubota as the key drive.

“These reliable Japanese design engines provided loads of power and reliability,” Mr Hales said.

“Parts are also readily available in Australia and overseas.”

“There is a continuing sophistication of water carts with water cannons, sophisticated angle sprayers and pumps that are capable of working 10 hours a day without failure.”

Hydraulic drives are coming

Australian Pumps was one of the first companies to develop a hydraulic drive tanker pump.

The company took a cast iron industrial trash pump and turned it into a high-pressure hydraulic drive piece of kit that can deliver flows of 1200 lpm and pressures to 50 psi.

“Not only is that a great success, but we even were able to offer the advantage of a clean-out port being built into the pump’s bowl,” Mr Hales said.

“That means no disconnecting pipework to carry out a pump flush.”

Mr Hale believes that the beauty of the hydraulic drive defeats the massive maintenance problem of dust on small, single cylinder engines normally mounted at the back of the tanker.

“Dusted engines are a thing of the past when you go hydraulic,” he said.

“The system is sealed and what’s more, the pump can be mounted wherever you like, that means the drive lines, being flexible, from the hydraulic pump, to the hydraulic motor driving the water pump.

“The big self-priming cast iron pumps are not subject to issues with pressure spikes; they prime from vertical depths of six metres meaning you can refill the tanker from streams, rivers or dams



Water is one of the most vital resources in mining.

where necessary.

“We’ve heard of tankers being used in emergency firefighting applications where that self-priming capability is a godsend.”

The Aussie Pumps family of self-priming tanker pumps isn’t only available in hydraulic drive.

The range is also available in heavy duty cast iron construction pedestal pumps with bare shaft, which means the pump can be run off PTO shaft, or even by pulley drive.

The pumps start with 2in heavy duty cast iron semi trash pumps, with small, compact hydraulic motors.

Pressures of up to 35 psi and flows up to 600 l/m make them ideal for water carts, mini tankers and even, in their fuel handling configuration, suitable for transferring diesel fuel or even light lubricating oils on mine sites.

The 3in pumps are available in the same family: cast iron, self-priming but with up to flows of up to 1800 l/m and heads as high as 65 psi.

“These higher pressure pumps, in cast iron, with the self-priming capability make them ideal for big water carts doing dust suppression or water transport jobs”, Mr Hales said.

“They’ve done wonderful service during the drought with water carters sometimes delivering 50,000l semi tankers to drought stricken townships.”

All feature unique Aussie GMP semi trash design with silicone carbide seal and stainless steel wear plate.

Also, cast iron foot mounts and separate flanged bell housing is mounted in the hydraulic motor.

The mount for the hydraulic motor and the pump pedestal can be aligned for easy installation on rails or flat tray.

The company chose Casappa gear motors for their reliability, reasonable cost and rugged design.

The motors are simple, capable of



This ‘slip on’ tipper/tanker uses a 4” Aussie Quick Prime electric drive Kubota diesel pump.

dealing with a little contamination, and easy to repair.

Big pumps make sense

In the Aussie GMP hydraulic and bare shaft drive configuration pumps, the biggest is a high pressure, high flow 4in unit with tremendous performance.

It can push up to 2900 l/m out and at the same time offer pressures as high as 50 psi.

The big 4in pump, Aussie’s B4XR-A, is claimed by the company to be simple to mount and to represent excellent value for money.

For more information on Australian Pumps, visit: www.aussiepumps.com.au or distributors throughout Australia.

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Every industrial space is different, and the best air conditioning solution is too.

That's why Enterprise will help you design unique and energy efficient and effective cooling and heating systems for your space.

Your system should meet your needs, your budget and be cost-effective to run and maintain.

Enterprise is the go-to team for all air conditioning sales, installation, service and maintenance and electrical switchboard needs.

The company can supply, install, repair and maintain a system to suit, including chilled water systems, boilers, cooling tower water treatment, and all types of split and ducted units.

In addition, mechanical ventilation, cooling tower service, filtration,



For all your industrial mine cooling and heating, talk to the team from Enterprise Air Conditioning.

consulting engineering, and duct cleaning services are on offer.

For specific mining applications, Enterprise offers complete design and installation of industrial air conditioning systems, annual overhauls to large compressors, controls and alterations, shell and tube condenser cleans,

accredited fire damper inspections.

Enterprise has experience including the design and installation of air conditioning systems across mining sites and large scale construction projects.

Whether a small site or huge project, the company's philosophy remains the same – responding quickly, getting the

job done and customising a solution to meet your needs.

Enterprise has been doing work on mine sites for the past 10 years, including Howden Australia, Voyagers Ayres Rock Resort, Evolution Mining West Wyalong, Worsley Mine in WA, Eloise copper mine, and North Goonyella copper mine, Queensland.

Enterprise can help mine sites design and plan a regular preventative maintenance schedule to keep systems in good working order, minimise any chance of breakdown, and keep systems operating safely and efficiently.

Regular maintenance of your air conditioning, water treatment and filtration systems keeps your systems healthy and energy efficient.

Don't wait until there's a problem to give your air conditioning some attention, let Enterprise stay on top of the maintenance for you.

The Enterprise Air Conditioning team can manage maintenance needs, including water treatment for cooling towers, boilers and chilled water systems, filtration systems cleaning, internal duct cleaning, and maintenance for all brands of air conditioning units.

The company is proud of its experienced team and ability to give mine sites the best advice and the best solutions to meet requirements.

For more information visit: www.enterpriseairconditioning.com.au.



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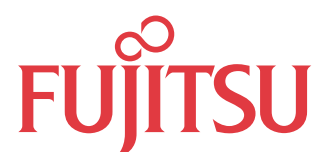
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With peace of mind that comes from a five-year, full parts and labour warranty, and support from the in-house Fujitsu General Assist customer care and technical support team, the Classic range provides a perfect solution to keep the room comfortable all year round.

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[#]This filter is replaceable. Refer to operating manual for details.

Fujitsu keeps mines cool

NATIONAL

THIS century, Australia has experienced more extreme heat records in comparison to extreme cool records by almost three to one for daytime maximum temperatures, and almost five to one for night-time minimum temperatures.

Research by the CSIRO, in conjunction with the Australian Bureau of Meteorology, shows that many of the changes observed recently will continue.

For Australia, in particular, hot days will become more frequent and hotter.

For mining sites, this increase in temperature impacts not only the performance of equipment, but also those working in site offices and buildings that support the operation.

Comfort is crucial and where possible, an air conditioning solution should be considered and built into the design of new facilities, rather than being installed once buildings are completed.

Within the shift work environment of mines, productivity for those working inside can be influenced by indoor temperature, among other things.

Having a system that's easy to manage and control enables the working environment to be comfortable regardless of the time of day or night, maximising performance.

In locations that can experience extremes of temperature and weather, as well as high levels of dust, robust equipment is essential.



The Fujitsu General Classic range ASTG09LVCC.

The Fujitsu General Classic range of wall-mounted air conditioning units includes solutions for room sizes ranging from small to large, while also offering energy management features, controller options and includes an Apple catechin and ion filter that, when maintained, can help remove fine particles and dust from the air.

The Classic range contains R410A refrigerant, which is non-flammable with a safety classification of A1, making it a stable option for volatile environments such as mines.

For efficiency, Fujitsu General air conditioning systems include inverter technology.

The inverter component allows the outdoor unit to vary its speed and output to match the required capacity of the indoor unit.

This contributes to system and cost efficiencies as well as temperature reliability.

Accessible and reliable service is also key for locations in areas of extreme temperature.

Fujitsu General Assist is an extensive

in-house customer care and technical support department which can deliver a high level of support to customers, assisting on-site HVAC engineers.

As Australia's climate potentially becomes more challenging, those living and working out of major cities, and often in makeshift facilities, should still be provided comfortable and reliable conditions to carry out their day-to-day tasks.

For more information visit www.fujitsugeneral.com.au or contact Fujitsu General on 1300 882 201.

Preventative maintenance

NATIONAL

THERE'S an easy way to reduce costly machine air conditioning downtime to mobile plant and save costs on air conditioning components, and that's by preventative maintenance in the winter months or on scheduled shutdowns.

A preventative maintenance program means significantly less down time caused by air conditioning failure and saves sites money in the long run.

Allplant Auto Electrics & Air Conditioning offers complete air conditioning component change-out on a scheduled shutdown.

Not only does this mean Allplant's auto electricians can complete scheduled air con maintenance, they can also complete scheduled auto electrical repairs at the same time.

For sites in hot, remote locations, complete component change-out during the winter months allows machinery to be fine-tuned and ready when summer rolls around.

Allplant managing director Phil Bowen said the company offers further cost savings through different parts supply options.

"We understand that our clients have certain agreements with its OEM's and



Reducing downtime through preventative maintenance.

understand that these agreements will allow them to purchase components at a lower cost than Allplant can," he said.

"We also have access to a range of parts that are equivalent that we can supply at a lower cost.

"We aim to be upfront and honest as to where these saving can be made. This means if we believe our client can purchase the components cheaper from the OEM

or we believe we can supply the same component for less money — we will make sure our clients are aware of their options."

Mr Bowen said that Allplant ensures that the staff conducting maintenance and repairs work efficiently and professionally with minimal downtime for mine sites.

"We do not have issues with tradesmen having to leave the job for breakdowns, leaving the job half finished," he said.

"By supplying labour to complete the work, we have better control over the standard of work — and completing jobs to a high standard is very important to us."

Allplant is ready and available to attend sites and perform air conditioning audits with field service vehicles based in Paraburdoo and Newman.

For more information on Allplant, visit: www.allplant.net.au.

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- Camp Retail Stores
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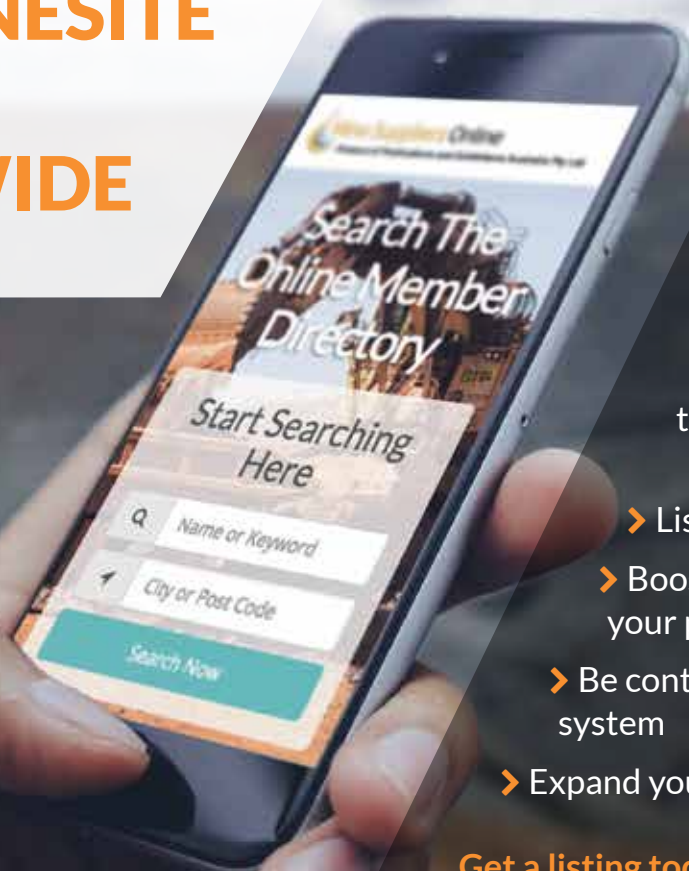


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Benefits of in-house blasting

NATIONAL

ABRASIVE blasting for of surface preparation is a key step in the production process for many companies.

This process is often outsourced for many reasons, but the team at Protoblast know that the cost of outsourcing can be very misleading.

What is not taken into consideration in costing is downtime, logistics, and the loss of control over a project.

Protoblast has had more than 40 years' experience in the industry, and its customers need abrasive blasting for many different products – from roofing screws through to the largest mining machinery – and everything in-between.

Protoblast management listened to its experienced team, all who echoed a common thread in how they would improve the operation: "I need to have more control over the blasting process."

The only way to do that was to bring it in-house.

In regards to the cost of sending a product to a contractor to be blasted, Protoblast has frequently noticed that the other hidden costs are often overlooked.

Case studies have shown that the logistics alone are more often than not equal or greater in cost than the contractors invoice.

That is not taking into account the downtime if the weather is not favourable,



By bringing abrasive blasting in-house, Protoblast has cut many of the hidden costs faced by clients.

or if there is a backlog at the contractors.

The team at Protoblast has perfected the process of working with customers, whether they are needing to blast door

handles or surfboards, mining machinery or structural steel to provide a solution that will not only save them money but speed up the overall process and give the

customer control over the process from start to finish.

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Sustainable waste management

NATIONAL

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As Australia's leading waste management, industrial, environmental and health services company Cleanaway is a one-stop solutions provider.

Cleanaway's commitment to making a sustainable future possible has been proven over many years working closely with some of Australia's largest mining companies.

Cleanaway's Queensland Business Development and Projects Manager Kerrin Carlson explained why the company's hazardous, hydrocarbon and liquid waste collection and processing capability is second to none.

"Our industry knowledge and experience has helped us reach a position of leadership across the mining, energy and natural resource industries," she said.

"With a team of experienced chemists, scientists and operational staff, Cleanaway sets the benchmark for safe collection and disposal of AFFF and PFAS contaminated waste, establishing Cleanaway as the market leader in this waste stream.



A Cleanaway vacuum excavator.

"From managed shutdowns, to routine operations and maintenance, we're side by side with Australian miners creating best business practices for a sustainable future."

Cleanaway's proven solutions include a wide range of services, such as dragline and equipment cleaning, high pressure water blasting, plant maintenance, hydro demolition, tailings dam management, dredging, and sludge removal.

"As a total waste solutions provider, we offer our customers access to Cleanaway's full suite of waste management services, while priding ourselves on using our in-house experts to deliver a consistent quality service."

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FOR THE MINING STORIES THAT MATTER



Australian experts in Dimpleflo

NATIONAL

TERALBA is a third generation Australian company with more than 40 years' experience designing and building heat exchangers.

Back in the late 80s, the company successfully experimented with mining slurry cooling for copper leachate from the Cobar mine site.

Since then, it has built strong links with ammonium nitrate manufacturing companies, with some of the units built back in the early 90s still in service.

In 2019, Teralba is well-equipped to help with heat transfer challenges.

Teralba director Stanley Baker said the company has a qualified and capable team at call.

"We don't think negatively, and we have the solutions," he said.

"We work with special alloys and exotics such as hastelloys, titanium, Duplex Stainless as well as the common grades which is especially useful for thick, (viscous), slurried liquid media, used with phase change applications, including condensing, and is built to withstand very high temperatures and high pressures."

Teralba builds to meet and exceed the



Dimpleflo Heat Exchangers are smarter, tougher, better.

requirements of AS1210-2010 as well as ASME, and the designs incorporate wear elements and design features to prolong service life of exchangers.

"We're happy to help with design and build capacities," Mr Baker said.

"We use HTRI and other design software to optimise our work."

What makes Dimpleflo so unique?

Dimpleflo is highly turbulent, which means

better heat transfer rates and better process efficiency.

Eddies and vortices introduced in the flow behaviour have a self-scouring function which means less fouling, reduced maintenance and lower life cycle cost.

In addition, Dimpleflo's modular designs mean the flexibility and capacity to expand with process changes.

"Dimpleflo is Australian-made, and supports our local economy," Mr Baker said.

"With guaranteed performance, and backed with time-proven (more than 40 years) business experience, you can rest assured you're buying with confidence."

It's also an economical alternative to 'snail' type heat exchanger units with less investment capital tied up, and short lead times mean sites can respond faster to process change and growth.

What else can Teralba do to help?

"We are experienced in SKID mounted, pre-tested, equipment modules," Mr Baker said.

"Combine our Dimpleflo units with pumps, pipework, and controls that are all factory-tested and mine-ready.

"Mine spec bases and adverse work environment protection is the way we think and we build this into our design culture.

"Bring us your basic heat transfer needs; we build plate heat exchangers, shell and tube style units as well as immersion panels."

Teralba offers all in-house, all Australian-made, all performance guaranteed heat exchange solutions for mining.

For more information visit: www.teralba.com.

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Leaders in heat exchange



ADFUSE radiator cores feature robot precision-welded tube-to-header joins that deliver exceptional strength and durability for long service life. These are favoured by heavy vehicle operators who need robust and vibration-resistant cooling.

NATIONAL

ADRAD has been manufacturing radiators and cooling system products in Australia since 1985.

Based in Beverley, South Australia, Adrad is the only automotive cooling manufacturer in Australia to have the international quality accreditation ISO9001:2015.

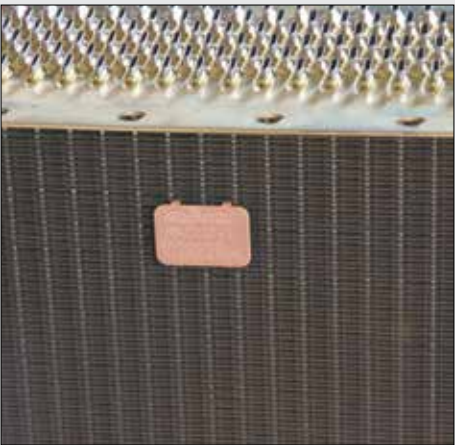
The Adrad Group is a wholly Australian-owned family company with

manufacturing and distribution networks throughout Australia and New Zealand.

The Adrad Group specialises in the manufacture, importation and distribution of radiators, automotive air-conditioning parts and other heat exchange products for aftermarket and original equipment.

It's not just the product range that makes Adrad such a respected name in the industry.

Many of the parts it manufactures in Australia feature technically advanced and innovative designs and construction



ULTRA-T radiator cores are constructed with a more compact arrangement of tubes that provides additional cooling without significantly increasing core thickness. This means that a high performance radiator core can be installed without impacting on the space available. These are very popular for modern hard-working transport vehicles and machinery where space is at a premium.



ADSHIELD heat exchange cores are a desirable upgrade for vehicles and equipment operating in environments where airborne grit is present. Typically this grit will be sucked through the radiator core, impacting on the fin and tube to erode the surface away and eventually cause tubes to leak. The special fin design adds a protective layer (shield) of metal over the tube which takes the impact instead and dramatically extends the service life of the radiator.

processes to deliver performance exceeding that of OE replacement parts.

Specialty cores can be produced up to 1800mm in height and 1200mm in width, although certain cores are available in sizes larger than this.

In addition to three radiator manufacturing facilities in Australia, the Adrad Group also includes another five manufacturing businesses in Australia, New Zealand and Thailand, plus operations in Dubai and Ohio.

The wealth of knowledge and expertise

within the group is extensive so it's no wonder the business is able to pioneer some unique and progressive products.

Specialty Australian manufactured cooling products include the Ultra-T radiator and Adshield heat exchange cores.

As the Adrad Group expands its range, each product is carefully selected to meet the highest quality standards and is backed by the nationally supported Adrad warranty.

For more information or details of your nearest distributor, contact Adrad on 1800 882 043.

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AMR ADFUSE Half Page 0819



Procore AMOC and folded radiators are engineered for superior performance, strength and durability.



Micon grommets and seals utilise custom formulated rubber compounds created specifically for applications such as Mesabi and also Caterpillar AMOC, folded, modular and NGMR units.

Innovative, superior design

NATIONAL

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

Being a manufacturer, Adrad has the

experience and knowledge to recognise innovation and superior design, which it uses to carefully select high-quality products from manufacturers worldwide.

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

For example, original units have a single end tank with a baffle and rubber

gasket to separate the coolant.

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.

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Decanter centrifuges for dewatering

NATIONAL

TAILINGS slurries can have a major impact on the community living in the vicinity of mining activity, and also carry significant environmental risk.

Calls for greater transparency are mounting from all stakeholders including the mining industry, investors and governments in mining countries around the world.

Small miners to large mining conglomerates are conducting trials to characterise their tailings and assess which dewatering technologies are the most effective and efficient.

Alfa Laval offers a cost-effective solution to dewatering tailings using mechanical separation by solid bowl decanter centrifuges, which enable mines to dispose of tailings solids as a solid cake and remove the risk of storing slurries in a tailings dam.

Conventional methods like pressure filtration have limitations, particularly when processing fines, high clay content, silt or slimes which can bind up the filter cloth.

Solid bowl decanter centrifuges are not a form of filtration, rather relying on G forces and the difference in density between the solids and liquids, to extract a dry cake that has a shear strength which is transportable and suitable for downstream dry stacking or other forms of disposal.

Alfa Laval mining technology



A centrifuge trial allows you to determine parameters such as the moisture in the cake, concentrate clarity, determine scalable capacity, and to see how this technology can work in practice for your specific facility.

engineer Paul Tuckwell said technology had advanced a lot in the past 20 years.

"Before you would have needed 10 centrifuges to achieve what one could do right now," he said.

"There's also a number of advances within the centrifuge; the G force that

can be achieved, the wear protection within the centrifuge can handle more erosive solids, and also the way the internals are designed achieves a higher capacity and drier cake."

The cost and time saving benefits are notable.

Solid bowl decanter centrifuges require a much lower labour component as automation, which means there's no need for an operator to man it round the clock, and staff can instead focus on other parts of the plant.

"With a filter press the cake is generally discharged intermittently and for continuous feed flow a big slurry buffer tank is required plus the way cake is collected is quite complex due to the catch discharge," Mr Tuckwell said.

"Whereas a centrifuge discharges cake continuously.

"So that makes the operation and the installation complexity a lot simpler – saving both time and money."

Maintenance and downtime is also minimal, as centrifuges are physically smaller and easier (and cheaper) to transport and enable recycling of water and process chemicals.

"Instead of getting all your fresh water from a bore, which can be quite expensive, mines can re-use the water for processing purposes from the solid bowl decanter centrifuge which is recovered from the tailings," Mr Tuckwell said.

"Our aim is for water to be reused in the plant, not dumped into a tailings pond."

For more information about how your site can trial a solid bowl decanter centrifuge for stackable and transportable tailings cake, visit www.alfalaval.com.au.

Accelerate your tailings dewatering with solid bowl centrifuge technology



Optimising your tailings dewatering processes is a straightforward way to cut operating and investment costs.

Alfa Laval's P3 solid bowl decanter centrifuge has been specifically developed for large scale, heavy duty solid-liquid separation tasks in the mining and mineral industry.

Find out why a growing number of mining companies choose dry centrifuged tailings as an alternative to storing a liquid slurry in a tailings dam.

The Alfa Laval P3 helps boost capacity, reduce tailings volumes, and increase the recovery of water, chemicals and minerals from tailings, including ultra fine solids and slimes. It offers a significantly smaller footprint, lower CAPEX and OPEX than other dewatering technologies.

Contact Alfa Laval Australia for more information on how the P3 decanter centrifuge can help boost your profitability.

www.alfalaval.com.au



www.alfalaval.com

Trasan Pilbara locals

WA

TRASAN is a high-calibre, well established multi-disciplinary building service provider with a track record spanning 20 years of service to the Pilbara region.

The company has firmly embedded relationships across the supply chain in the Pilbara and has clients throughout WA.

Trasan managing director Travers Clarke said that the business he had built with his wife Sandi had been founded on quality service and strong client relationships.

“Our vision is to be recognised as the Pilbara’s preferred supplier and contractor for responsible projects in the heavy industrial and commercial sectors, together with a range of associated services,” he said.

“Our business culture is evidenced through our local knowledge and our energy and commitment to delivering high-quality, sustainable project outcomes for our clients.

“Everything we do adheres to an established framework of safety, timescale



Trasan’s specialised scaffolding division has allowed the company to significantly cut costs for its clients through operational synergies.

and value.”

After a period of sustained growth, Trasan made the decision to develop a separate scaffolding division.

By offering the services and expertise of the resource in-house, the company was able to fulfil a broader range of project scope for its clients.

The specialised scaffolding division was able to create synergies which cut costs considerably and saved time in the coordination of multiple suppliers for

certain projects, and would ensure that project deliveries were optimised.

Scaffolding supervisor Kirk Packham has brought many years of experience to the team, including in-house engineering and design for scaffolding.

Trasan employs and trains its own workforce, and its experience working in challenging environments sets it apart from competitors.

“As you would expect, our employees have a strong focus on Systems of Safe

Work, which not only protects their health and wellbeing, but ensures all regulatory demands are met,” Mr Packham said.

“This is beneficial to our clients and also helps meet our own legal obligations – safety is paramount at all times.”

The company prides itself on a responsive approach and its commitment to the highest standard of work.

For more information, contact: admin@trasan.com.au.

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CONTACT

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+61 (0)8 9185 5482

trasan.com.au

No limits to scaffolding

NATIONAL

DIAB Engineering has been leading the way for more than 40 years in Engineering, maintenance and construction in Australia and internationally.

DIAB has secured sole distributorship of the MonZon Heavy Duty Aluminium scaffold system for Australia and New Zealand as part of their innovation drive to supply better service to existing and prospective clients.

Monzon No Limit scaffolding is the result of years of research and development from the MonZon engineering team in Sweden.

They worked with scaffolders and users across the globe and across industries such as mining, oil and gas, and construction to refine the product.

The company said scaffolders and users wanted one system that can be built faster, is flexible as tubes and couplers, but also as easy to erect as modular scaffolds.

DIAB operations manager Steve Tognolini said that there was practically no downside to taking on the MonZon No Limits system.

"It is light and ergonomic as it is 50pc lighter than current conventional scaffolding on the market," he said.

"This means scaffolders lift half the weight per year with this system which can only save sprain, strain and repetitive injuries.



The MonZon No Limits heavy duty aluminium scaffold system is very light and ergonomic while providing significant safety and production advantages.

"It is very safe and fast to erect, with fewer components than traditional scaffolds, it will not rust in the general environment, as no part of this system is over 15kg.

"It has opened up a very male-dominated industry to be much more inclusive as much less power is needed than heavy traditional systems, it also provides the same bay

sizes and same bay loadings as traditional systems."

As a modular system MonZon No Limits replaces around 60pc of all tube and fit jobs because of its deck flexibility and ability to change direction at the same level.

DIAB's testing of the product has given extremely good results, and the system

continues to impress both customers and the scaffolders who work with it.

"Per tonne, you get double the m2 of scaffold equipment than a tonne of traditional steel ring systems – when compared with other wedge lock type older systems the m2 is upwards of 73pc more per tonne," Mr Tognolini said.

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MonZon Heavy Duty Aluminium Scaffolding



As the Australasian supplier of MonZon Scaffolding, DIAB Engineering provides rapid, game-changing scaffolding solutions that save our clients time and money.



Contact

Steve Tognolini

☎ (08) 9956 8000 📱 0407 922 933

✉ Stognolini@diabeng.com.au

🌐 www.diabengineering.com.au

Forming the way in design

NATIONAL

WHEN Perth Engineering Firm ETTOL was engaged by Vale Steel Fabricators to design a concrete mould for three off-bridge piers for the Armadale Road Upgrade Project, its principal engineer Kyaw Thu said it drew inspiration from previous design experience in the mining industry whilst leveraging new technology to deliver the goods.

"We used cutting edge technology combined with solid experience in project implementation to provide an innovative time and cost-effective solution for the project," he said.

"To minimise time and cost, we steered away from traditional formwork and developed formwork using a plated steel structure to be implemented over three piers."

ETTOL also leveraged Finite Element Design using a steel mould approach to accurately predict the deflections and stresses more accurately, which allowed the 3mm deflection limit applied by the PTA.

"This type of analysis is not usually applied in the formwork industry as they still (mostly) use long hand approaches," Mr Thu said.

"However, we identified that the high-end ANSYS software by Finite Element was applicable to this particular structure.

"The bi-directional compatibility



ETTOL successfully leverages the right tools in combination with its vast knowledge to deliver high-end designs that are both time and cost effective.

between Spaceclaim and Mechanical allowed us to do several iterations in very short time frame and the stresses and deflections were able to be predicted more accurately."

The detailed stress analysis was conducted to design exact length of welds

needed to save fabrication cost whilst maintaining adequate strength.

In addition, the form deflection was predicted at a maximum of 3mm and was actually measured to be only 1mm, which was well inside the PTA specifications.

ETTOL successfully leveraged the right tools combined with its vast knowledge to deliver a high-end design that was both time and cost effective.

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- Lift studies and lift designs
- Brownfields lift studies and installation methodologies

Screw feeder specialists

NATIONAL

AS part of a major multinational mining company's new project, bulk material handling specialist Bulknet was selected to design and manufacture a unique screw feeder.

Positioned under a 150-tonne storage hopper, the screw feeder supplies nickel sulphate crystals to a bagging system below.

The system needed to start under a full load from the hopper through a 4m long outlet.

This would allow the client to fill and store material in the hopper for when planned maintenance was undertaken upstream.

The hopper's significant capacity and the weight of the material would place the screw feeder under extreme pressures.

Special consideration was necessary in the design phase to ensure it was robust enough to handle the task.

When the screw rotates, it creates shearing force and under a full load, immense pressure is placed on the spiral gear drive unit.

A Bonfiglioli planetary drive was selected to handle this as it was ideal for low speed, high torque and small footprint tasks such as this.

Bulknet business development manager Geoff Thomson said deflection of the centre tube was a major concern during the design and consultation phase.



When a major miner needed to move a heavy and hazardous material, Bulknet was the only company able to meet its strict requirements.

"If there is too much deflection on a screw feeder's centre tube, unnecessary radial loads are transferred to the drive and tail bearings, resulting in faster wear," he said.

"In addition, extra stresses are exerted on the centre tube's welds, reducing its fatigue life."

Nickel sulphate crystals are a class one carcinogen, which presents a hazard to human health.

As such, the screw feeder had to be completely air-tight, so Bulknet incorporated a number of sealed gaskets and air purged Clamp Ezy Seals to ensure no leakage of the product.

Bulknet then manufactured the feeder using Grade 316 stainless steel and delivered it to the client.

As a specialised designer and manufacturer

Bulknet is an Australian manufacturer. For the past 50 years it has specialised in bulk materials handling. It uses an in-house design and manufacturing facility in Melbourne to provide premium quality screw conveyors, screw feeders, pugmills, paddle mixers, live bottom bins, ribbon mixers, bucket elevators and drag chain conveyors. Its clients range from multinationals to small processing facilities worldwide.

of screw conveyors and feeders, Bulknet was also able to offer the customer engineering expertise and spare parts to keep the system running after installation.

According to the customer's feedback, Bulknet was the only manufacturer that was able to meet all of the unique design requirements needed for its screw feeder.

MORE INFORMATION: Bulknet | 1800 069 675 | sales@bulknet.com.au | www.bulknet.com.au

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Leverlink makes impact

NATIONAL

AN idea by Leverlink founder Richard Sharp early in 1991 led to the production of the first "dynamic" impact bed for troughed conveyor belts in Australia, forming the foundation for Leverlink's current leading-edge technology.

Mr Sharp had the idea to develop a better and more reliable product; one that would dissipate kinetic energy and provide the benefits of long service life, as well as assisting in reducing maintenance costs in terms of consumables and labour.

The design for the dynamic impact bed – using rubber torsion springs as suspension – was radically different from the static impact beds that were dominating the Australian marketplace at the time.

Impact bed or belt support cradle?

Many so-called impact beds are nothing more than belt support cradles with limited design capacity to dissipate impact energy and provide belt damage protection.

Design and engineering

Leverlink's experience, engineering skills, and continuous improvement program through research and development and infield monitoring has made the company leaders in the design and application of dynamic impact beds in Australia.

All Leverlink dynamic impact beds are custom-built to suit the application, and in areas where installation space and access are restricted, the design can be such that the individual parts can be broken down and reassembled on the conveyor frame in manageable parts with minimum effort.

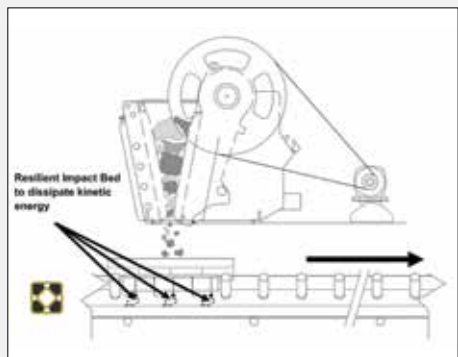
Rubber torsion springs - impact/vibration attenuation

Leverlink has developed rubber torsion springs that provide a unique method of absorbing impact with the added benefit of vibration attenuation.

Rubber torsion springs are used extensively in its designs for various applications.

Leverlink is the largest manufacturer of rubber torsion springs in Australia, and also manufactures some of the biggest rubber torsion springs in the world.

With a proven track record, the company uses in-house engineering and design combined with extensive infield representation and has years of experience in mining, quarrying, and material handling problems.



The dynamic impact bed difference.



Leverlink's dynamic impact beds are fully customised to client specifications and needs.



- No rollers to replace
- Reduced downtime
- Reduced maintenance costs
- Protects conveyor structure from impact damage
- Supports belt profile at load zone
- Long service life
- Cost effective
- Cost saving
- Easy to retrofit



Leverlink dynamic impact beds will stand the test of time.

Load zone design

The design of an effective conveyor load zone can often be a complex issue.

Functional specifications such as belt speed, width, type of belt, product size, free fall

heights, and product moisture content are all major design considerations.

Spillage control

Spillage can be controlled by effective skirting and inner wear plate design and the added use of belt support systems.

Case study one

Leverlink was contacted by a large mining operation who were continually experiencing failure of its impact roller frames.

The conveyor belt was 2000mm wide with a 45-degree trough angle, and the belt was running at 1.5 m/sec, the feed material was -500mm with

a free fall height of 2500mm, and the production rate was 1800 tph.

With the functional specifications supplied, Leverlink then visited the site to determine what additional information could be gained that would assist in the engineering and design of a Dynamic Impact Bed to minimise the damage to the conveyor belt and supporting structure.

The Dynamic Impact Bed was built and installed.

The goal was achieved, and the client completely satisfied, they then purchased a second unit for an identical load zone.

This was 26 years ago.

In this time the slider bars have been replaced three times and the impact mounts twice, but it is expected the Dynamic Impact Beds will last another 10 years.

Case study two

An offshore copper mine commissioned Leverlink to provide a solution for extremely high costs due to belt damage at a conveyor load zone.

The conveyor belt was 2400mm wide, 23 degrees trough angle, and running at 3.35m/sec.

The material was hard rock/copper ore at -250mm with a free fall height of 6000mm. The peak capacity was 10,000 tph.

Engineering calculations determined a multi-trough Dynamic Impact Bed was required for the application.

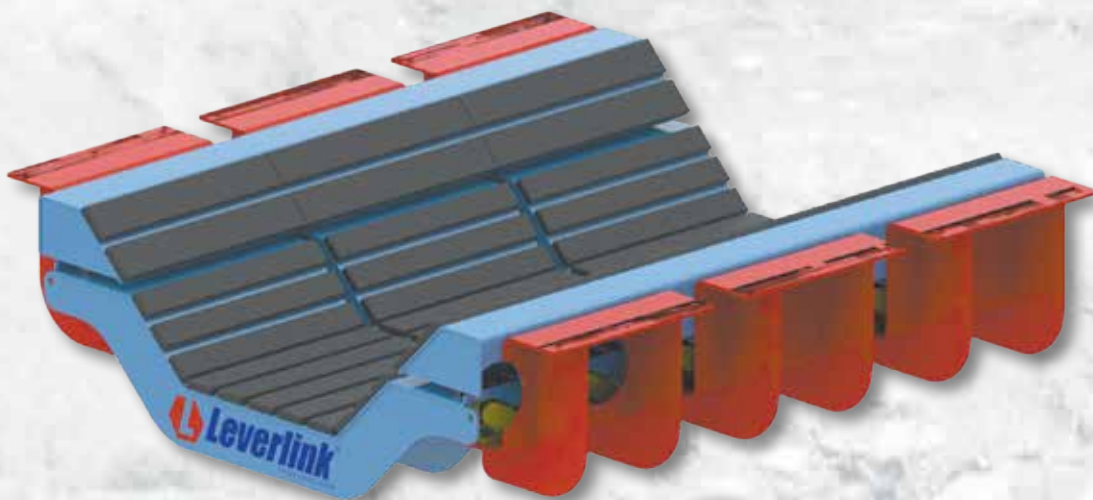
This was designed, manufactured and exported to the client.

When installed and commissioned it resolved the belt damage problem to the customer's satisfaction.

One year later the mine ordered a second unit for a similar conveyor belt.

Leverlink has been at the cutting edge of rubber torsion springs and dynamic impact beds for about 30 years, and can provide fully customised impact beds, and many more products and services.

AUSTRALIA'S CONVEYOR BELT LOAD ZONE PROTECTION SPECIALISTS



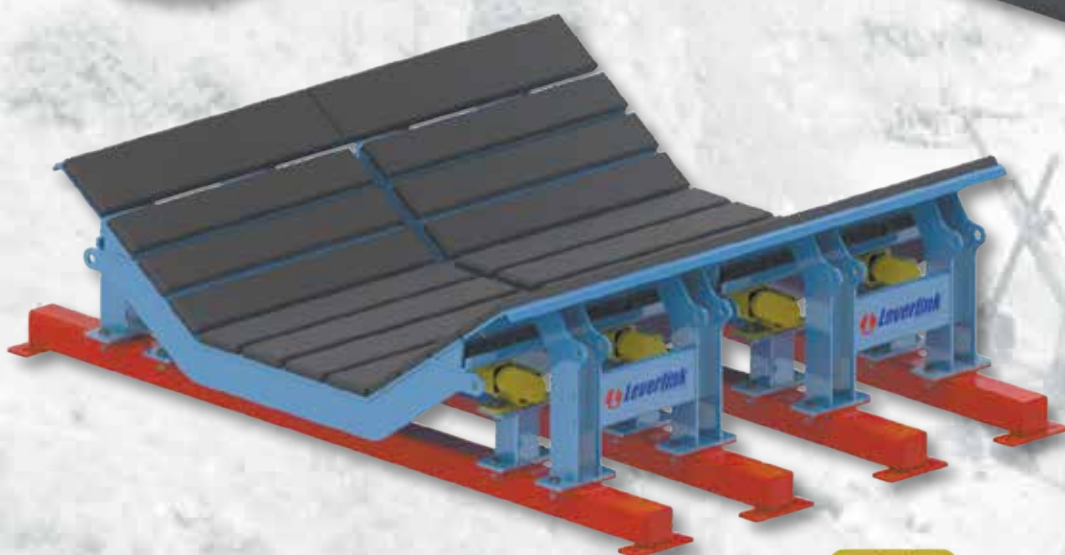
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to protect the conveyor belt
and supporting structure



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Air-powered innovation

NATIONAL

THERE are a number of advantages to using air supported conveyor systems over a conventional roller conveyor, and many of these are derived from the low belt friction and smooth movement of product inherent in air-supported belt design.

Aerobelt Australia is an Australian-owned business, and its engineers have extensive experience on all types of Aerobelt design, installation and maintenance.

They have extensive backgrounds in design, mining and industrial engineering.

Aerobelt mechanical engineer Simon Kutassy says that air-supported conveyors are the only product his company makes, and this gives them the advantage of a fully dedicated team of experts working on customisable designs for clients.

"We're a one product company, it's all we do," he said.

Aerobelt conveyors can transport product at inclines of up to 27 degrees, they are reversible, and they are prefabricated in sections which means they can be rapidly installed and transported.

In an air cushion conveyor system, the belt is carried on a film of air.

Air is blown into the air box or plenum under the conveyor belt by a small fan – with one fan being sufficient for over 200 metres of belt conveyor.

The number of air holes in the trough, the air pressure and volume depend on the material being transported.

Belt widths vary from 300mm to 1800mm.



Low maintenance, low power consumption, smaller drives and drive motors, much smaller gear boxes and lightweight structures separate the Aerobelt from its conventional competitors.

Aerobelt conveyors can deliver tonnage of about 10t/hour to 2000t/hour.

Galvanised steel is used as the standard construction material, although many installations have used stainless steel for part or almost all components to meet food or corrosive/abrasive environment needs.

Because of the low friction, power consumption is reduced significantly, and belt construction is able to be much lighter due to reduced working tension.

Aerobelt conveyors can be retrofitted to reuse existing roller conveyor galleries and steelwork, including concave and convex profile curves.

Operationally, Aerobelt conveyors emit less noise, the fully-covered design enhances product integrity and operator safety, and the stream of air keeps the trough clean.

But perhaps the biggest advantage of an Aerobelt conveyor is the minimal costs in maintenance and repairs compared with conventional conveyor systems.

Quite often, conveyors can be installed in the air without walkways around them because access is not necessary for maintenance, as it can be carried out from underneath.

Mr Kutassy says that while they are not ultra-heavy duty in the context of mining, they are invaluable for many different purposes, especially to one of Aerobelt's main clients, Rio Tinto.

"Rio Tinto has about 40 in the Pilbara," Mr Kutassy said.

"They use them for dust conveyors and also for their specialised sampling system.

"The conveyors are suitable for a number of different types of products, minerals and even food.

"We've done a number of MOP plants, so we can construct the conveyors out of stainless steel to make them food grade, and we've got roughly 50:50 food and minerals products, like mineral sands."

Streamlined design

Low maintenance, low power consumption, smaller drives and drive motors, much smaller gear boxes and lightweight structures separate the Aerobelt from its conventional competitors.

Because friction is so minimal, less power is used, even in starting the idlers.

And, because the conveyors don't vibrate, or go up and down on idler sets, Aerobelt conveyors can go steeper than roller conveyors – up to 27 degrees.

Because there's no need to access the top side of the conveyor, it can generally be left covered and closed, and return rollers are lightweight – they can be made from PVC – and so they are easy, light and



2 x 1000mm wide train loading conveyors – Worsley Alumina (now South32) WA.



350mm wide conveyors at Iluka Mineral Sands, Capel, WA.

simple to change.

The design also means that no walkway is needed for elevated structures; instead a boom lift could be used to replace the rollers once every two to three years when necessary.

This lower cost in maintenance is the key saving that Aerobelt customers have found, and the other major saving has been the reduced power needed to operate the belt.

The results

When Rio Tinto is happy with your product, you know you're doing something right.

Rio has had a repeat order with Aerobelt for a number of years, on a number of different mine sites for many different applications.



Mt Piper (Original conveyors – prior to cover fitting).



AEROBELT
AUSTRALIA PTY. LTD.

☎ (02) 4631 2919
✉ info@aerobelt.com.au
🌐 www.aerobelt.com.au

We do one thing and we do it well, and that is air supported conveyors



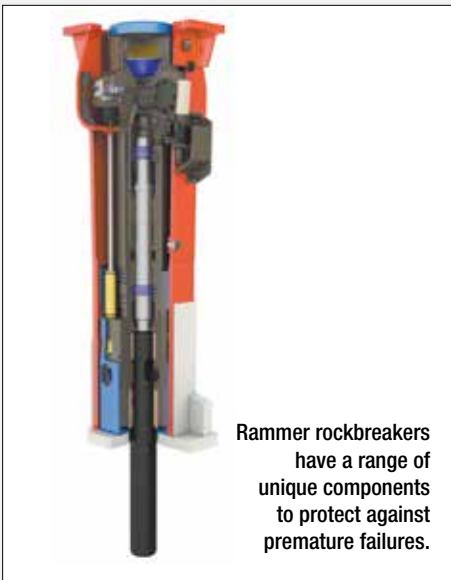
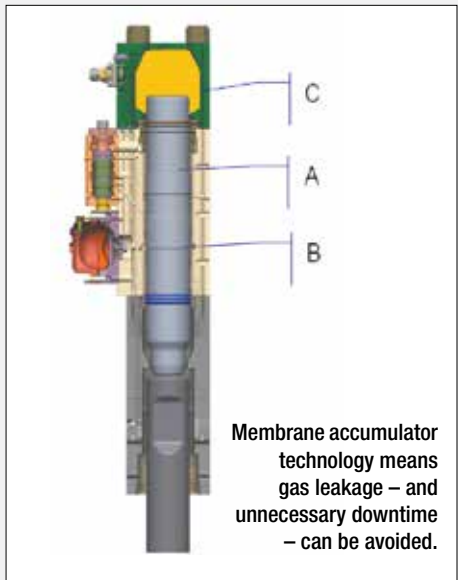
- Less maintenance
- More power efficient
- Incline angle up to 27°
- Reversible
- Prefabricated trough sections
- Lighter construction
- Stainless steel options
- Easy to retrofit

Aerobelt Australia is the authority in air supported conveyors

MORE INFORMATION: Aerobelt | 02 4631 2919
info@aerobelt.com.au | www.aerobelt.com.au



Rammer rockbreakers a hit



NATIONAL

RAMMER'S new Excellence line of rockbreakers are smarter and easier to use than ever before.

With integrated smart technology for easier fleet management and new customer-focused features for more efficient processes, the Excellence line lives up to its name.

Idle Blow Protection

One of the main issues that can cause rockbreakers to prematurely break down is blank firing.

The piston strikes the tool and the tool strikes the rock, but if the piston doesn't strike the tool, all the energy that's normally transferred goes back inside the rockbreaker and causes internal components to fail over time.

Rammer has developed anti-blank firing which stops the unit working unless the piston is striking the tool.

The Idle Blow Protection (IBP) is easily adjustable on-site and ensures the rockbreaker

can't be operated until pressure is placed on the tool.

It also protects the tool from failures and tie rod stress, reduces oil overheating and protects against premature failures – which extends the life of the tool over time.

Constant and high breaking power

Rammer Excellence Line of Rockbreakers come with high pressure membrane accumulators to ensure constant and high breaking power is maintained at all times.

This simply means that they maintain their impact energy as they do not leak gas compared to piston accumulators, in which the gas behind the piston slowly leaks through the seals.

Instead, Rammer tools store nitrogen gas inside the rockbreaker which can last for extended periods of time, similar to the air in car tyres which only needs testing with regular servicing.

Avoiding gas leakage means avoiding a loss of impact energy and excessive downtime – plus

the additional cost due to regular re-gassing.

This makes Rammer Rockbreakers a reliable and productive partner for your carrier, particularly in remote locations.

Reduced breaking times

Rammer's patented Fixed Blow Energy operating principle ensures maximum impact energy regardless of the operating oil flow.

This means that every impact – from first to last – is at maximum power, regardless of oil flow or frequency.

Unlike thinking rockbreakers which try to anticipate how hard a rock is and how hard to strike, the Rammer will strike with the same power each and every time.

This reduces breaking time, maximising productivity on site.

Remote monitoring system

Rammer is the first on the market introducing

an RD3 monitoring device together with a My Fleet platform, making it easy for customers to monitor their rockbreaker fleet remotely.

Historically one of the major causes of premature failure in rockbreakers was long cycles where the operator continues to hit the button and the piston keeps striking for an extended period of time.

The Myfleet platform is a remote monitoring device bolted onto the rockbreaker, which reports back to the customer information about the tools operation in real time.

With the cloud-based system, customers can pinpoint the exact location of their equipment, monitor correct usage and manage service periods for proactive and preventative maintenance.

The cutting-edge technology is available in all new Rammer Excellence models as standard.

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Vidat tie rods

Another unique development is Rammer's Vidat tie rods which can improve bolt life up to three years.

The patented Vibration Dampening Tie rods are at the cutting edge of tie rod technology, outlasting and outperforming standard tie rods.

Vibration during operation is a key cause of bolt breakage and by reducing the vibration through the bolts they last longer before they fail.

Ramvalve

Sometimes rockbreakers can be destroyed by too much oil flow.

Ramvalve actually stops the unit from working if the oil flow is too high.

This is just another example of smart technology that ensures equipment stays in pristine condition and works efficiently, without failure, for its lifespan.

Any application

Rammer has been setting standards in breaking for over four decades and was the first brand to offer large and heavy duty hydraulic rockbreakers for tough conditions.

There is a Rammer Hydraulic Rockbreaker for virtually any breaking application that requires a boom-mounted percussive tool.

From the advanced Compact Range rockbreakers for mini-excavators, whose tools are so strong they are guaranteed for life against breakages, to the extra heavy-duty Large Range for excavators from 27-120 tonnes in weight,

there is a reliable, low-maintenance, easy-to-fit, high-performance Rammer rockbreaker certain to increase productivity, optimise results and give clients a lower cost per tonne of material broken.

Small units

Generally, for small construction companies or plumbers in and around the metro, the small unit excels at breaking concrete for domestic applications like swimming pools, or demolition where smaller rocks need smaller machines.

If access is tight or restricted, down the side of a house or in demolition where no heavy machines can go, the small, lightweight machine and attachments can get the job done.

Rammer's 155, 255, 355 and 455 units are designed to deliver high blow frequency and power where and when you need it regardless of the application.

Medium units

The medium-sized Rammer is best suited for mid-sized contractors or small mines or quarries, as well as medium-sized contractors who are looking to move into heavier rock breaking.

Rammer's 1533, 1655, 2155, 2166, and 2577 units all incorporate the latest technology including a replaceable bottom plate, Vidat system and are made from wear-resistant steel.

The slim and extremely robust body offers greater visibility and better accessibility in trenching and demolition applications.

All medium range Rammer rockbreakers feature Rammer's Fixed Blow Energy operating principle that ensures optimum impact energy with every blow, regardless of hydraulic flow fluctuations.

Large units

Rammer's 3288, 4099, 5011 and giant 9033 units are the preferred choice among large breaker professionals worldwide.

Manufactured with a heavy duty housing and lower boot made from wear-resistant steel, all models are extremely durable and allow for ease of maintenance for mining applications where bigger rocks need to be broken into smaller ones before going into a crusher feed.

Like the other models in Rammer's Large Range of hydraulic rockbreakers, the new 9033 is designed for a long, trouble-free life.

Easily adjustable stroke length allows the Rammer 9033 to be purpose-matched to individual applications and ensure optimum breaking whether it is hard materials, such as granite and reinforced concrete foundations, or softer materials such as limestone.

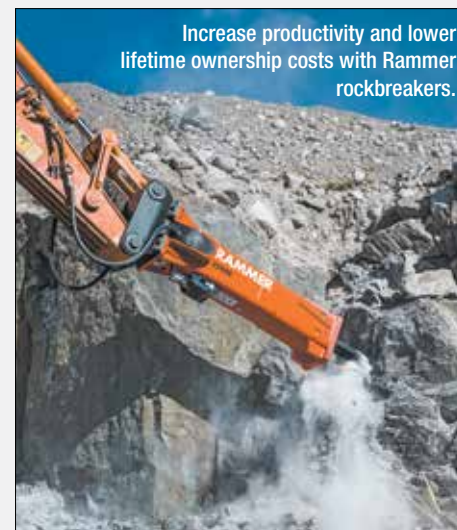
Heat resistance

Generally used in furnace applications to break the lining, these breakers have special seals to withstand heat both outside and inside the rockbreaker. Not for everyday use, the heat resistant rockbreakers are a unique tool for 100 degrees Celsius and above.

Scaler

These are ideal for underground mines where miners need to scale down a wall or any loose rocks before workers go down.

The scalers are designed to work horizontally with a different internal design compared to normal, vertical, breakers.



Rammer's 555, 777 and 999 scalars are ideal for removing loose tunnel material and reducing the risk of rockfall.

Total support

Whether your application is primary breaking, primary or secondary demolition, trenching, asphalt cutting, ground compacting, metallurgical industry or specialised areas such as scaling, tunneling and underwater demolition, Rammer has a solution.

Rammer rockbreakers are manufactured in Finland by Sandvik Mining and Rock Technology and in Australia, customers are supported by the authorized Rammer dealers.

Focusing on customer service and having genuine spare parts and tools available, Rammer dealers can make sure units are fully serviced and tools up quickly brought up and running when needed.

MORE INFORMATION: Total Rockbreaking Solutions | 1300 921 498 | www.totalrockbreaking.com.au






Rammer is the first on the market introducing remote rockbreaker monitoring.

With the cloud-based system you will have real-time data 24/7 on

- operating hours,
- correct usage,
- the exact location of your equipment and
- service periods for proactive and preventative maintenance.

Remote monitoring system is available in all new Rammer Excellence models as standard.

rammer.com

REMOTE MONITORING



Dealer Network

NSW

Groundtec Equipment
(02) 9642 2030
groundtec.com.au

VIC / TAS

Walkers Hammers
(03) 9315 3788
walkershammers.com.au

QLD / PNG

QLD Rock Breakers
(07) 3715 0800
rdw.com.au

SA / NT

Renex Equipment
(08) 8345 0555
renex.com.au

WA

Total Rockbreaking Solutions
1300 921 498
totalrockbreaking.com.au

Plan for the best



Australia's tough conditions call for tough equipment.

NATIONAL

ESTABLISHED in 1995, DM Breaker Equipment is a family-owned and operated business.

For nearly 24 years, the company has grown its reputation to become recognised as one of Australia's foremost rock breaker specialists.

DM Breaker Equipment operates out of its facility in Maddington, WA, and provides sales, hire, spare parts and good old fashioned customer service.

DM Breaker Equipment's technical manager Dave Marriott said the company understands that the key to success for the business is through the success of its customers.

"To do this, we formulate tailored solutions that are dedicated to customer needs," he said.

DM Breaker Equipment is proud to be the sole Australian and New Zealand distributor of DNB products, incorporating the world-renowned DNB Hydraulic Rock Breaker with its range of EPA Smart Silenced Breakers, Mining Range and Civil Contractor Series.

DM Breaker Equipment is the major distributor of the DNB range of hydraulic hammers, which are now established as a leading performer in the industry.

"The DNB Hydraulic Breakers have been one of the stalwart survivors in our tough and competitive market," Mr Marriott said.

"With more than 20 years of proven performance and reliability in the Australian market, DNB Breakers have got to be the first choice for rock breaking."

The company goes by the motto, 'if you imagine the worst, you can plan for the best', and Mr Marriott says that it has served the company well.

"Our experience in breaking blue granite, scientifically proven to be one of the hardest rocks in the world, has created this philosophy," he said.

"In order to break one of the hardest rocks in the world, a hammer had to be produced

which was even stronger.

"That's why DNB Rock Breakers are built with the hardest conditions in mind.

"In all environmental conditions and in high production, DNB Breakers provide continuous breaking power, regardless of material.

"The best raw materials are used to build each part of the hammer because we know that replacing tools and repairing equipment is not only an inconvenience, it also means time away from work and profits."

Powerful impact energy and a variable impact rate increase breaking frequency while



DNB D30 post driver.

decreasing time needed to get the job done.

DNB II's series are designed to meet tight noise regulations, and these units are engineered to meet the conditions for silent demolition, such as for built up and residential areas, and enclosed commercial areas.

Parts supply

DM Breaker Equipment prides itself on after-sales support.

This is backed up by its extensive spare parts department which covers not only the entire range of DNB products, but also all parts

required for servicing the products it sells.

"Our professional store personnel are always eager to help you find the right parts you need for your equipment," Mr Marriott said.

Servicing your rock breaker

Maintaining a regular servicing schedule for equipment is the best way to ensure the attachment performs at its optimal efficiency and to prolong the life of you investment.

DM Breaker Equipment's highly skilled service technicians are extensively trained and capable of performing repairs and service on any brand rock breaker.

From a simple re-gas to total rebuild, the company has a track record of providing first-class services, and DM Breaker Equipment's technicians will repair clients' equipment in a timely and efficient manner, all at a very competitive rate.

And, the team are trained by the manufacturers on all products sold by DM Breaker Equipment.



DM Breaker Equipment is the sole ANZ distributor for DNB products.

- Australasian distributor for the DNB rockbreaker – full range of parts
- Accessibility to genuine and aftermarket parts for other rockbreaker brands
- Rockbreaker tools to suit most brands. Special tools made to required length
- MB Crusher Buckets spare parts
- Movax Piledrivers spare parts
- Remu Screening Buckets spare parts
- Tool shank grease

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(CONTINUED FROM PAGE 59)



Talk to DM breaker about its range of Movax pile drivers.

Full workshop rebuilds and servicing to all brands.

Installation and commissioning of new and used equipment:

Rockbreakers
Crusher Buckets
Screening Buckets
Piledrivers
Boom Systems
Compactors

Grabs

Installation of hydraulic piping:

Hammer piping
Bi-directional piping
Quick hitch piping
Case-Drains fitted
On-site flow testing
Hammer Auto lube systems
Welding repairs to attachments
Technical support

Equipment hire

Need to Hire a Rockbreaker to suit your machine? DM Breaker Equipment has you covered there too.

With a hire fleet of more than 70 rock-breaking units, DM Breaker Equipment has one of the most versatile hire fleets in WA.

Whether you require a rock breaker for a short period, or wish to trial equipment, rental might be the best option.

"Our wide range of hire equipment can help with any most applications you require," Mr Marriott said.

"The hire fleet also caters for compactors, rippers, shears, grabs and tilt buckets.

"We have more than 250 top mounts to accommodate most makes and models of machines.

"All units are serviced regularly in order to keep them in perfect working order."

Not sure what size Rockbreaker is suitable for your machine? Don't know your machine specifications?



The DNB D60 breaker

Then call Deana for your requirements.

She has the knowledge and expertise to help you choose the correct attachment for your machine/job.

MORE INFORMATION: DM Breaker Equipment | 08 9452 1112 | sales@dmbreaker.com | www.dmbreaker.com

DM Breaker Equipment

- DNB Rockbreakers
- DNB Stone Crushers, Grabs,
- Compactors & Shears

- MB Crusher Buckets
- MB Screening Buckets
- REMU Screening Technology
- Movax SideGrip
- Hire, Service & Spares

Address: 25 Valencia Way, Maddington 6109

Web: www.dmbreaker.com

Tel: 61 8 9452 1112

Email: sales@dmbreaker.com



Orbital welding at ENRYB.

WA

WELDING is as much an art as it is a science.

While it takes time and perseverance to master the art, the fundamentals of each type of welding must be taught and understood first.

Skilled welding personnel are at the forefront of the resources industry in Australia and their work is essential for the ongoing operation of process equipment and the fabrication of the largest infrastructure.

Welding for industry goes far beyond simply joining pieces of metal, it also involves equipment and consumables selection, weld procedure qualification and planning, inspection, thorough record keeping (to ensure traceability to industry standards) and testing and certification of personnel.

With so much at stake, a modern welder requires training, testing and certification.

ENRYB Welding Centre is located in Welshpool, WA, and was established to provide the practical education required to become a first-class welder to Australian and international standards.

It is interesting to note that the welding centre is located inside Petroleum and Mining Engineering (PAME) – a specialised welding and fabrication company – that designs and builds everything from mining plant and equipment to huge sub-sea LNG pipelines.

It is little wonder then that ENRYB's instructors are so highly qualified and experienced in the resources industry, and that some of their most talented students also become their latest employees.

The training centre comprises individual welding bays that are fully ventilated and are set up to educate, test and evaluate students in a wide range of welding techniques.

These include: Gas Metal Arc Welding – GMAW (Mig); Flux Cored Arc Welding – FCAW; Manual Metal Arc Welding – MMAW (Stick); Gas Tungsten Arc Welding – GTAW (Tig); Surface Tension Transfer – STT; Submerged Arc Welding – SAW and Orbital Welding (Autogenous and Bugs).

ENRYB has numerous registered welding inspectors on staff, able to certify the work of industry welders prior to starting on new jobs or new sites.

Independent examiners are also welcome for third-party assessment with dedicated office space available, including internet access.

ENRYB instructs and examines to Australian and International codes including AS/NZS 1554 Parts 1 to 6; AS2885; AS3992; ASME IX; ASME B31.3; AWS D1.1 and DNVGL ST F101.

The Australian Mining Review visited the Welding Centre and were instantly impressed by the friendly welcome, how well the school was set out and how well equipped each welding bay was, to give each student the very best tools to work with, while honing their skills.

Perhaps the most striking fact was the amount and degree of oil and gas and mining fabrication work that was being undertaken under the same roof for some of Australia's biggest companies such as Rio Tinto, BHP, Subsea 7, Clough, Downer, Chevron, Woodside, FMG and many more.

This only reinforced the fact that the training provided was based on experience and excellence in these demanding roles and that every ounce of that knowledge was being passed on to the thousands of students who have already participated in ENRYB's many courses.

This is not a school that sits in isolation and focuses on abstract theory; this is an organisation that is active at the highest levels in the industry, capable of assessing and certifying welders to work on the most critical of components, and which actively employs some of the best and brightest for their own industry contracts.

ENRYB caters for welders at all skill levels, from entry level to highly advanced.

Its instructors are happy to pass on the tricks of the trade to its less experienced students to help them advance more quickly and ultimately produce better quality work.

Even old dogs can learn new tricks and many experienced welders pass through the doors to brush up their skills and maintain their certification at various levels.

The last word goes to a recent ENRYB student, Ian James Shearer-Ashfield, who commented: "Top notch facility! The welding bays are laid out really well.

"The trainer spent plenty of time with me to improve my technique and show me some new ones. Best training centre I have been to by far," he said.

Check out ENRYB's facebook page for more reviews and behind the scenes photos: <https://www.facebook.com/pame.com.au/>



A PAME-designed boiler jig for client welder qualification.



Some of ENRYB's standard welding bays.



ENRYB is a client focused, industry based training and qualification facility that understands the rigours of first class welding.



"WELDING IT TOGETHER"

08 9451 6778

admin@pame.com.au | www.pame.com.au/enryb

ENRYB Welding Centre is open from 7.30am to 4.30pm weekdays.
123 Radium Street, Welshpool WA 6106

MORE INFORMATION: ENRYB Welding Centre
08 9451 6778 | www.pame.com.au

They've got the power

NATIONAL

WORLD leading welding manufacturer Lorch has developed new, all-in-one resonance technology that enables the next generation of portable machines to operate from mains supply, small generators and batteries — all delivering a perfect Stick and TIG welding performance.

The MicorStick series

The Lorch MicorStick series always offers you the right tool whether you need to weld with basic, rutile or even special electrodes.

Better still, it provides long duty cycles, high power reserves and the possibility of TIG welding with ContacTIG ignition of even the most difficult electrodes.

The MicorStick is a CEL-capable, fully resonant welding inverter with MicorBoost technology, electrode pre-selection and TIG function.

It's also suitable for connection to cables with a length of up to 200m and for generator operation; in fact, even when powered by a generator and hooked up to primary cables 200m away, the Lorch MicorStick strikes up reliably and remains incredibly stable.

Boasting a remarkably low weight and compact external dimensions, the Lorch MicorStick is one of the most portable welding machines money can buy, making it perfect for working in confined spaces.

For positional welding, the unique Anti-Stick system prevents the electrode from sticking, and the cutting-edge inverter technology with digital controls allows the inverter to combine perfect welding results with superior ease of use.

But where the Lorch MicorStick series truly shines is its high efficiency and low energy consumption, thanks to its integrated state-of-the-art industrial electronics and fan-on demand technology.

It also has specially designed crash protection and is robust and protected against falls from a height of up to 80cm, completely unscathed.

Should you accidentally drop your welding machine or allow it to fall off the workbench, you can simply power through and keep working – plus with the adaptive automotive Hotstart feature, you can always count on perfect ignition.

The IP23 and S-symbol together with VRD makes the series ideal for applications in the field.

Western Welding Services has been supplying the Australian market with reliable products and expertise for more than 25 years.

The company has a high-profile presence with the majority of construction, fabrication,



The Lorch Micro Stick 160 plus battery.

oil and gas, mining and maintenance companies across Australia

The Weld Spot, located in the centre of the brown coal and paper-producing regions of Victoria, services the majority of construction, fabrication and maintenance companies operating throughout the Latrobe Valley.

All of the SPW Group Companies – which include Norstate Gas, Cairns, Townsville Welding Supplies, Townsville & Independent Welding Supplies Brisbane and Mackay – are driven to deliver exceptional service and provide a comprehensive range of quality welding products, such as the first-class Micor Series from Lorch, but also major brands like Lincoln, ESAB, Cigweld, Hyundai, and Miller.

Lorch quality welding equipment is available from South Pacific Welding Group branches, Western Welding Services in WA and The Weldspot, Victoria.



The TIG welding torch.



The MicorStick-160-125-VRD.



The MicorTIG-200-DC-BP.

THE NEW STANDARD IN PORTABLE WELDING-MAINS, GENERATOR OR BATTERY

MicorStick 125/160/180 Accu-ready and battery pack MobilePower The dream team for welding applications on the go.

Lorch, world-leading, new, all in one resonance technology that enables the next generation of portable machines to operate from mains supply, small generators and batteries all delivering a perfect Stick and TIG welding performance.

THE MICORSTICK SERIES AT A GLANCE

• **Electrode welding inverter.**
CEL-capable, fully resonant welding inverter with MicorBoost technology, electrode pre-selection and TIG function. Suitable for connection to cables with a length of up to 200m and for generator operation.

STD FEATURES

- **Anti-Stick System.** especially useful for positional welding.
- **Hotstart.** adaptive automatic Hotstart feature you can always count on perfect ignition.
- **Arc-Force control.** increased arc stability and optimised metal transfer.
- **Dependable.** Even when powered by a generator and hooked up to primary cables with a maximum length of 200m, strikes up reliably and remains incredibly stable.
- **Robust and protected against falls from a height of up to 80cm**
- **Safety.** IP23 and VRD makes the series ideal for applications in the field



Technical data						
	MicorStick 160 Accu-ready		MicorStick 180 Accu-ready		MicorStick 160/125 VRD	
Welding process	Electrode	TIG with ContactTIG	Electrode	TIG with ContactTIG	Electrode	TIG with ContactTIG
Electrode Ø	mm 1.5 - 4.0	1.0 - 2.4	1.5 - 4.0	1.0 - 2.4	1.5 - 4.0	1.0 - 2.4
Weldable material	Steel Stainless steel	Steel Stainless steel Copper	Steel Stainless steel	Steel Stainless steel Copper	Steel Stainless steel	Steel Stainless steel Copper
Welding range	A 10 - 150	10 - 160	10 - 180	3 - 200	10-125/150	10-125/160
Duty cycle I max. (40°C)	% 30			25		30
Current at 60% duty cycle (40°C)	A 120			150		120
Mains voltage	V 230			230		230
Dimensions (L x W x H)	mm 360 x 130 x 215		360 x 130 x 215		360 x 130 x 215	
Weight	kg 4.9		5.8		4.9	

MAINS-INDEPENDENT, EXCEPTIONALLY VERSATILE, AND POWERFUL.

MicorStick plus MobilePower. This is the formula for short distances. The need to look around for a mains connection – eliminated. The need to carry along extension cables – eliminated. Simply connect the MobilePower battery pack to the MicorStick Accu-ready. No more cumbersome preparations just start welding right away. Exactly where you need to and where you want to. An excellent choice for installation work on construction sites and in the area of forestry. Ideal for quick repairs on conveyor systems, construction equipment and agricultural machinery. First-class welding performance exactly where you need it.

FULL FLEXIBILITY THANKS TO CHARGEABLE BATTERIES

Battery 1
= Up to 28 electrodes

Battery 2
= Up to 56 electrodes

Battery 3
= Up to 74 electrodes

Battery 4
= Up to 102 electrodes



Western Welding Services WA: T. 08 94184511 | E. Sales@westernwelding.com.au
Weldspot Victoria: T. 03 5135 3000 | E. vic.weldspot@spwgroup.com.au
spwgroup.com.au

LORCH
smart welding



Innovative induction heating

Induction heating systems like the Proheat 35 can save mining companies time, money and provide a safer option than traditional resistance heating methods.



NATIONAL

INDUCTION heating is a simple, cost-effective heating process that delivers fast and consistent heat in welding fabrication and construction, weld preheating and stress relieving, post-weld heat treatment (PWHT), coating removal and shrink fit applications.

Compared to flame or resistance heating, induction heating can save hundreds or thousands of dollars per week because it can bring a part to temperature in a fraction of the time and hold that part at a specified temperature.

How does induction heating work?

Induction heating induces heat electromagnetically rather than by using conventional heating elements.

It acts more like a microwave oven; the appliance remains cool while the food cooks from within.

In an industrial part, heat is induced in the part by subjecting it to a high-frequency magnetic field.

The magnetic field creates eddy currents, exciting the part's molecules and generating heat, and because heat generation occurs slightly below the metal surface, no heat is wasted.

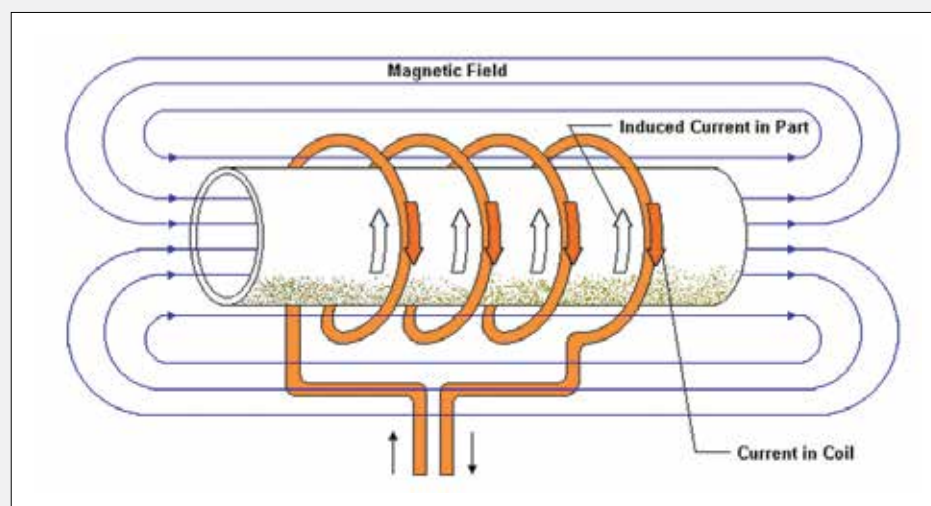
Unlike resistance heating, which heats the surface of the part, induction heating heats within the part.

The depth of heating needed depends on the frequency used, a high frequency (50 kHz) heats closer to the surface, while a lower frequency (60 Hz) penetrates deeper into the part. This allows more efficient heating of thicker parts.

The induction coil itself does not heat up (as the work-piece heats up) since the conductor is large for the current being carried.

Benefits of induction heating

Compared to using open flame or resistance



87pc of the heat is created by eddy currents within the part.



Induction heating offers a significantly faster time-to-temperature than resistant methods.

for preheating and stress relieving, induction offers numerous advantages:

- Temperature uniformity

Induction heating distributes heat energy evenly over the area where the coil is wound or the blanket is placed, providing even, consistent

heat to the base material.

The high degree of temperature control across the heat affected zone (HAZ) means you can maintain the desired temperature during the welding process and maintain uniformity.

Often flame heating is difficult to control and causes uneven heat and stresses on the weld.

Induction heating systems like the ProHeat 3 use sensors to accurately report and record the joint temperature.

- Reduced cycle time

Induction heating components also make cycle interruptions unlikely, which is critical to productivity in stress relieving.

Many users of the ProHeat 3 have reported a two-hour time reduction to control temperature and a one-hour time reduction to soak temperature.

Resistance heating often means a preheating contractor is needed (resulting in delays and welder downtime) but in comparison induction heating systems mean that welders can heat their own parts – maximising efficiency and achieving time-to-temperature in minutes instead of hours.

A simple setup using preheat blankets or flexible heating cables, along with on-board diagnostics and operator tutoring system, mean a four-hour operation can be reduced to just 15 minutes.

- Efficiency benefits

Induction heating has been shown to be 92pc more efficient at transferring more energy into the part — and decreased heating times mean improved power efficiency.

In comparison, resistance heating generally wastes electrical energy because of the large transformer in the power supply.

- Reduced consumables costs

There are also no fuel costs and minimal insulation costs because reusable insulation reduces disposal and replacement costs (it can be used 50 or more times).

The induction coils are also robust and don't require fragile wire or ceramic materials and are extremely durable.

- Versatility

Induction heating systems are also extremely versatile and easy to use on a range of shapes, sizes and types of parts - from pipe and flat plate to elbows and valves.

One aspect of induction that makes it attractive for complex shapes is the ability to adjust the coils during the heating process to accommodate unique parts and heat sinks – plus the induction cables can be moved without waiting for cooling after the cycle.

- Improved safety

Flame heating carries the risk of fires and even explosion, but with induction, only the workpiece gets hot so there's less chance of injuries or accidents.

Additionally air particles from lagging and insulating blankets are significantly reduced.

The ProHeat 35 system

Miller's Induction Heating system can reduce pre-heating time by up to 75pc compared to traditional flame and resistance heating processes.

The ProHeat 35 Induction Heating System is available with numerous air- and liquid-cooled options, depending on the job requirements.

- Air-cooled

Air-cooled blankets or air-cooled cables are easily laid onto or wrapped around the part and can be used for preheating applications up to 400 degrees Fahrenheit.

Air-cooled blankets are extremely flexible and are available for pipe diameters from 8 to 56 inches or, in the case of plate, the lengths are from 40 to 185 inches.

- Liquid-cooled

Liquid-cooled systems are used for high-temperature pre-heating, stress relieving,



and hydrogen bake-out for applications up to 1450 deg F (788 deg C).

The principal differences compared to air-cooled systems are the addition of a water cooler and the use of a flexible liquid-cooled hose that houses the induction coil.

Liquid-cooled systems generally use a built-in temperature controller and outside temperature recorder, which are particularly important components in stress relieving applications.

- Rolling induction

The majority of pipe welds completed in fabrication shops are rolled.

Rotating pipe while welding provides many benefits, including ease of achieving quality welds by eliminating out-of-position welding, reduced welder fatigue, and improved productivity from higher wire feed speeds and increased deposition rates.

The ProHeat 35 Induction Heating System with rolling inductor allows fab shops to preheat work pieces – including moving parts – and delivers fast, consistent heat up to 600 deg F.

Renteca's role

Renteca is a recognised market leader in the

supply of welding related products in Australia. Renteca offers the largest range of welding related machinery for hire in Australia and adds value by providing innovative technical solutions and customised equipment packages – like the ProHeat 35 – to mine sites around the country.

The company is a proud supplier of induction heating equipment that offers an efficient, high-quality method for preheating, bakeout and stress relieving a wide range of part shapes and types in welding applications that saves customers both time and money.

MORE INFORMATION: Renteca | 07 3375 4146 | ryan@renteca.com.au | www.renteca.com.au

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Renteca is a leading equipment provider of superior quality, compliant welding and power generation equipment to the mining industry.

Our exclusive partnership with worldwide hire company Red-D-Arc Weld rentals allows us to provide the latest equipment to meet every need.

But we don't just provide equipment - we package and deliver a multi-faceted solution for your project, including support, advice, maintenance and repairs.

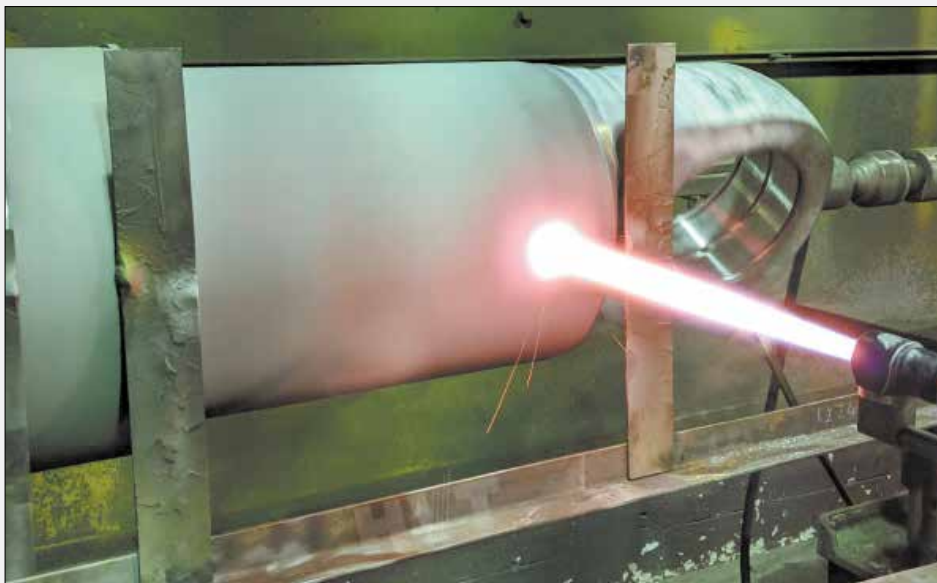
Our experienced team can provide highly specialised technical advice and support, while the breadth of our equipment range allows us to accommodate projects of all sizes with speed and consistency.



MACH 3



HVOF of a CAT 793 rear suspension rod wear band to improve wear resistance and increase longevity to service life. Suitable for an endless range of components and environments, there is a HVOF solution to almost every maintenance problem.



When maintenance downtime is a killer, HVOF-treated hydraulic areas (such as the CAT 793 rear suspension rod above) increases wear and corrosion resistance, providing improved service life and minimising repair requirements.

NATIONAL

PARTICLES of Inconel or tungsten carbide heated up to 3000°C in a jet-fuelled flame, boosted by liquid oxygen and colliding with a steel shaft at Mach 3 – welcome to the world of HVOF.

The Australian Mining Review visited High Velocity Technologies (HVT) in Maddington, WA, for an insight into this high-tech, high-temp process.

High Velocity Oxygen Fuel (HVOF) is a unique process that allows a metal substrate to be built up or coated with a range of anti-corrosive or extremely wear resistant metal particles.

These particles are heated to the point of

plasticity as they are introduced into a flame path created by burning Al jet fuel with liquid oxygen added as an oxidiser to create up to a 3000°C super-sonic torch.

As the highly malleable particles of tungsten carbide, inconel, chromium carbide, cobalt chrome or chromium-nickel-boron move towards the metal substrate, they are shrouded with a nitrogen carrier gas, which is coaxially injected at the hand-piece.

The relatively 'low' temperature at which HVOF is applied is advantageous as it is comparatively 'cold' compared to other metal coating techniques, resulting in less change to metallurgy of the metal substrate.

The end result of this molten metal bombardment is a super-hard surface that is

less than 1pc porous and can be finish ground to an incredibly smooth finish of only 0.05µm RA if required.

The surface finishes available provide optimal conditions required for seals, and the HVOF process is widely used to reclaim hydraulic shafts and other areas that experience wear, abrasion or friction – especially under the rigours of mining operations.

HVOF is the next step up from hard chrome, which certainly has its applications, but when it comes to high temperature applications, extreme loads or highly acidic or alkaline environments, the correct metal coating applied with HVOF will provide greater protection of the work surface and many times the working life of hard chrome.

In the mining world, the longer a machine is in operation, the more money it can generate.

Downtime is the enemy of any operation striving to maximise productivity and profitability for its shareholders and that is exactly why HVOF coating technology is used so widely in the industry.

Applications aplenty

The list of uses for the various metal coatings that can be applied using this technique are almost limitless but one prime example is increasing the corrosion resistance of downhole and digging tools – particularly those used in acid sulphate soils.

Ground Engagement Tools (GET) and wear plate can be coated with up to 5mm of tungsten carbide to provide surface hardness of 9Mohs (file steel is 7Mohs and diamond is 10Mohs) and dramatically extend the life of these hard-working tools.

HVOF coatings are creating significant cost savings and increased production when applied to the front and rear suspensions and hydraulic braking systems of automated dump trucks.

By the nature of their automated control systems, these trucks do not deviate to avoid rocks or pot holes in the haul road and they typically carry heavier loads and travel faster than their manned counterparts.

While the extra wear and tear does increase operating costs, the extra payload delivered each shift offsets these costs significantly.

Some mining contractors report that converting to fully automated trucks has increased haul truck operating costs by about 1pc but has also increased delivery of ore by between 10-15pc – so the extra expense is far outweighed by the extra revenue derived.

HVOF coatings contribute to each truck having longer service intervals, less component wear and failure and ultimately less downtime. So, each truck becomes more profitable to the operation in real terms.

Those in the drilling game will be familiar with a Hydra-jar – a double-acting hydraulic drilling jar, which amplifies force at the surface to free stuck or jammed drillstring components.

A Hydra-jar is capable of delivering up to 1,000,000-pounds (≈4.5MN) of force to the drill head – enough to tear the hardened surface of the drill head itself.

HVT regularly coats the Hydra-jar assembly components with an HVOF covering to protect them from such brutal forces and the extremely degrading effects of such a corrosive environment.

A specific powder matrix is applied to such components to provide incredible corrosion resistance, reclaim parent material lost to wear and effectively hard-face the components to withstand not only regular abrasive wear, but also the shock loads imparted by the Hydra-jar when it is applied.

Other applications for HVOF include ash fans, train exhaust fans and heat exchangers.

Power stations also benefit from the technology.

They use large valves with bearing plates to regulate the airflow to the furnaces and these plates are subjected to concentrated heat and super-sonic air vortices containing particulates that burn through the plate after a relatively short time.

HVT has coated many of these plates using specific HVOF alloys and the valves are rated for 10-years without failure – a true indication of quality and resilience.

Cast iron welding and repair

Formerly known as United Welders, HVT is the continuation of more than 70 years of a multigenerational welding legacy renowned in WA.

Offering exceptional specialised TIG, MIG and manual arc welding services, HVT also has a long history of proven success with cast iron welding and other exotic materials.

Recently, HVT was tasked with the development and execution of the complex repair of splines on a 793 extended-life rear brake housing, as a result of a worldwide component shortage.

As a critical component of the vehicle, there is no established repair procedure from the OEM.

After a series of qualitative and quantitative material tests, HVT established a repair process and 'forged' ahead.

About 30pc of the splines were cracked 10-15mm down their length.

Firstly, these damaged sections were removed from the housing.

The casting was then encapsulated in a forge and pre-heated to several hundred degrees in preparation for welding.

While holding the casting at temperature for the duration of the welding process, the damaged splines were rebuilt around the diameter of the housing.

After slow-cooling, the splines were worked back to OEM specifications and non-destructive testing was undertaken to confirm the housing was devoid of cracks.

Successful identification of cast iron structure/type is critical to these repairs, as pre- and post-heat treatment processes and temperatures, interpass temperatures, choice of welding process and electrode/wire selection is paramount in achieving the desired yield and tensile strength.

It also avoids problems with porosity and heat-affected zones, and the subsequent formation of undesirable structures.

Heat-affected zones can cause formations of brittle structures such as martensite and cementite, which put the component at high risk of post-weld cracking due to lowering of tensile strength.

Different methodologies applied throughout the process can affect the outcome.

For example, post-weld annealing can lower the hardness of martensite that may form in heat-affected zones, but post-weld heat treatment will not restore full ductility and toughness to something like nodular cast iron due to the formation of secondary graphite.



Weld repair of cracked splines on a cast iron CAT 793 extended life rear brake housing, proving a challenging solution to maintenance gaps in today's industry.

Warped, dropped and holy

In-line with its affinity for complex repairs, HVT was the recipient of an R1300's cast iron converter case, which had already been subjected to a failed weld attempt at another service provider.

Unfortunately, an already significant hole in the housing was made worse by heat-affected zones in the surrounding area forming brittle

structures and resulting in further cracking of the housing.

To make matters worse, the housing was exceptionally warped – 6mm out of round and dropped by 3mm.

Simply welding a piece of plate into the gap would not be enough to make the case serviceable again.

To counteract the warped housing, bracing



When there is no new, used will most-certainly do. A remarkable recovery of a badly damaged cast iron converter case using high-temperature forge welding techniques.

was designed and manufactured to re-align it with the flange faces/PCD and to support the housing throughout the welding process.

A piece of plate was fused into the housing under forge conditions and at exceptionally high temperatures – so hot the welding helmets were melting and multiple helmets were used on rotation to allow them to cool.

After days of slow cooling, the housing was successfully machined back to specifications.

MORE INFORMATION: High Velocity Technologies | 08 9493 1355 | www.hvt.net.au



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High Voltage

The thermal arc spraying process in action on a sprocket assembly.



This forklift diff housing was brought in to Arc Spray Engineering for repair, showing signs of extreme wear on the bearing surfaces.



A close-up view of the forklift housing after spraying shows the brand new surface – no trace of the severe scoring it was brought in with.



The sprocket assembly before spraying shows clear signs of wear and pitting on the bearing surface.



After thermal arc spraying and machining, the bearing surface is fully restored and the part is fit for service once more.



The complete diff housing with newly machined surfaces and a coat of paint – back to work.

NATIONAL

THERMAL arc spraying is a process whereby molten metal is blasted under pressure onto a metal substrate in order to reclaim a worn or corroded surface.

The technology is cost effective for repairs and is used widely in the mining industry for the repair of components ranging from wheel hubs to spindles, shafts and bearing surfaces.

This unique process is also known as twin wire arc spray because it uses two spools of wire passing through the same handpiece, like a double MIG welder.

However, unlike MIG, one wire is positive and the other is negative so that when the two touch, they create an arc which melts both wires simultaneously.

The addition of compressed air into the handpiece literally atomises and blasts this molten metal onto the substrate, building up a new layer of metal in the process.

As part of the welding feature this issue, *The Australian Mining Review* visited Aden Kelly from

Arc Spray Engineering in Forrestdale, WA.

Mr Kelly has been in the business of thermal spraying and specialised welding for many years and has a great deal of experience when it comes to fine tuning the amperage, voltage and the air pressure within the handpiece, to achieve specific finishes to meet the demands of both oil and gas operations and mining companies.

Versatile and durable

With an experienced eye, Mr Kelly is able to alter the finish and density of the metal finish on the substrate and achieve surfaces that range from rough and textured for anti-slip areas, to smooth and dense for bearing and seal surfaces.

The only areas that are unsuitable for thermal spraying are splines, threads and where there is direct point contact with bearing rollers ie: needle roller bearings.

Adding to the versatility of this repair process is the number of materials that can be used in the process.

"If they make a welding wire in a material, we can spray it," Mr Kelly said.

This includes nickel, aluminium, bronze, copper, stainless steel, tungsten carbide and pure zinc.

The marine and offshore oil industries often opt for arc sprayed zinc coating of their components in preference to galvanising, as it offers a thicker and more durable finish.

In most cases, the zinc coating is also covered in a corrosion resistant paint for an extra degree of protection in harsh saline environments.

Low substrate temperatures, no distortion, tough bond

Despite the fact that molten metal is being blasted onto the surface of the job, the actual parent material remains below 100°C, which, unlike conventional welding, means no distortion and therefore no re-machining.

This relatively low substrate temperature also prevents the material from hardening, which can make subsequent machining more difficult.

Prior to commencing the thermal arc spraying process, the component is pre-heated to a very moderate 40°C and, once applied, the new material yields a 10,000psi bond strength.

420-grade stainless steel is the most common medium used for thermal arc spraying in the resource industry because it is incredibly durable and also a far more economical option to tungsten carbide.

Stainless steel typically registers at 40-45 HRC on the hardness scale, providing excellent wear resistance.

Depending upon the application and environment, Arc Spray Engineering can recommend the best option in terms of material to extend the life of the component, therefore reducing downtime.

A particular material used has a 50-55HRC hardness rating which makes it very popular for use on seal areas that require an extremely durable and uniform coating, that is a fraction of the price of using tungsten carbide.



This breakaway housing has been zinc metal sprayed. The surface coating offers greater and longer lasting protection than conventional galvanising.

This particular material also shows extreme resistance to acid and caustic solutions, which make it perfect for the protection of the inside of fluid transfer pipes.

When the inside of a pipe is metal sprayed with this material, the life of the pipe is doubled and even tripled in some instances.

When the cost savings of not only replacing the pipe but also the downtime incurred during replacement are considered, the arc spray coating is a very cost-effective solution.

Surface and underground applications

This unique technology has its place in both underground and surface mining operations.

It is used to repair spindles, hubs, brake part assemblies, shafts, final drives, transmission components and diff components on various above and below ground earthmoving and drilling equipment.

Arc Spray Engineering also offers hard



A close-up view of this CAT D10 shaft shows the quality of the finish after thermal arc spraying.

chroming and High Velocity Oxy Fuel (HVOF) coatings (which are even more durable than hard chrome as well as incredibly resistant to salt, wear and corrosion).

Arc Spray Engineering has been servicing the resource industries for three years but Aden has more than 11 years' experience in thermal spray coatings and machining.

Aden is a firm believer and advocate of the customer coming first and he has built his reputation by ensuring that a job will not leave the workshop unless it is correct.

He also recognises that downtime is one of the greatest operating costs for any company – especially when production equipment is idle – so, he makes it his responsibility to supply every client with regular progress updates and anticipated return dates to help them manage standby equipment and labour requirements.

Thermal arc spraying technology may rely on high voltage but it delivers low component temperatures, a long service life, fast turnaround times and excellent cost-effectiveness compared to OEM part replacement.

MORE INFORMATION: Arc Spray Engineering | 08 9398 3500 | www.arcsprayengineering.com.au

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Back from the brink



This Lincoln Air Vantage 600SD is having major work performed. It was totally stripped to fit new parts before being re-assembled ready to work another day.



This Lincoln Vantage 580 Perkins engine has had the thick layer of red dirt and oil removed prior to servicing. They are reliable and solid engines.

NATIONAL

MODERN welding machines are highly sophisticated pieces of equipment that use computer processing to regulate the flow of current, wire, gas and other variables to create the perfect bond between two pieces of metal.

Every machine has a service life but welding equipment seems to do it tougher than most – they are lifted on and off trucks, operated in hot, dusty environments and sometimes just plain abused.

As is the natural order, even the most well-made welders eventually need repair and that is when an experienced technician is required to either bring it back from the brink of oblivion or give it a gentle nudge over the edge.

GSE Weld Pty Ltd, in Kewdale, WA, was born from G&S Welding – a company with more than 20 years' experience servicing the welding industry – especially companies working in the resources sector.

Many of the original G&S staff members are now with GSE, including Jim, who's been 27 years in sales, and has more than 20 years' experience as a boilermaker.

He is also an IWS internationally certified welder with a Certificate 10 in structural pressure vessels.

Ben Cook has a background in electrical engineering and is the service manager at GSE.

He too has over 20 years experience repairing almost every conceivable machine type in all corners of the globe from Russia to Wales, onshore and offshore.

Repair

GSE Weld specialises in the repair and service of all types and brands of welding equipment.

Given the depth of knowledge, it has the practical experience to fault find, assess and repair a welder where others may concede and declare it past its use-by date.

In many cases it is far cheaper and quicker to fix a machine and have it back on site than it is to order a new one, wait for it to be delivered and then commissioned.

However, as GSE Weld also has a fleet of hire welders in stock, being able to supply a replacement unit on short term hire where timing is critical.

The scope of repairs on offer include electronic boards and control modules, low voltage wiring, high voltage wire replacement, generator rebuilds and the full gamut of diesel engine repairs for generator welders and engine drives – truly a one-stop shop.

Such a comprehensive service is made possible by having ticketed electricians and

qualified diesel fitters on staff.

Poor maintenance is often the cause of most problems that machines come with when they arrive at GSE Weld.

So the company offers a welder service program for customers that manages their units on a rotation basis and ensures that every welder is well maintained and operational to minimise downtime from unscheduled repairs.

Safety is a critical consideration across the resources sector and Voltage Reduction Devices (VRDs) are a vital component of any mine spec welder.

These devices reduce the voltage at the handset to near zero when the machine registers zero load at the electrode, thus reducing the risk of electric shock to the operator.

GSE Weld tests, calibrates and certifies the operation of VRDs in all the machines they service, repair or refurbish for resale.

GSE Weld is the authorised service agent for Lincoln Electric, Kemppi, Miller and WIA and carry out their warranty work in-house.

Sales

GSE Weld stocks a comprehensive range of welders from industry leading brands such as Lincoln Electric, Miller, WIA, Kemppi and CIGweld.



Miller's Big Blue 800 Duo Air Pak, with ArcReach, is the cleanest, greenest diesel power available in a stand-alone welding machine. It features one dependable engine, two independent arcs with up to 400A each (or 800A for a single operator) and capacity to plug in additional inverter welders for a true multi-operator (3+ arc) work platform. Exclusive ArcReach technology uses existing weld cables to communicate process adjustment commands back to the welder generator. With an ArcReach system, amperage and voltage are conveniently located at the operator's fingertips - not back at the power source.



Three Lincoln Vantage 580s in for repair, with various faults including a solid layer of the red Australian dirt and a combination of iron ore powder and humidity creating the right environment for earth fault situations, thus the importance of regular servicing. These units are fully specced for the mine site and will have all their safety devices tested and qualified during servicing.



Lincoln Electric's DC600 Multi Process offers powerful stick, TIG, MIG, flux-cored, submerged arc and gouging with 115V, 15A, duplex auxiliary power receptacle and VRD (Voltage Reduction Drive).



Lincoln Electric's LN-25 Pro series wire feeders are designed to be simple, reliable and easy to service. Suitable for an ironworker, pipeline welder, or welding at a construction site, shipbuilding facility or metal fabrication shop, the machine also features a semi-automatic wire feeder.



GSE Weld has a fleet of 80t rotators for hire for heavy duty pipe welding, which makes even the biggest jobs easy. These come with turning rollers to rotate while you weld.

These range in size from small portable inverters to large truck-mounted units with fully independent power supplies.

GSE also converts units to full-mine specifications by adding a cage, additional air cleaners, a fire extinguisher, a log book and an external E-stop button.

GSE Weld has a machine to cater for every requirement from precision TIG welding, general MIG welding, arc air gouging to metal arc spraying and subarc work – and the consumables to suit.

Hire

The range of hire equipment is just as comprehensive as the sales range.

All GSE Weld's machines are regularly serviced and maintained to ensure reliability and can be delivered to site.

Every hire machine is set up to suit the client's nominated process requirements, from wire size to plug top.

Each welder can also be calibrated and electrically safety tagged if required.

Additional services

With so much experience on hand, it is little wonder that GSE Weld receives calls for advice from welders of all levels and it is happy to help.

This advice often includes reviewing a client's mill certificates to determine the exact composition of the materials being worked with and then matching the correct consumables to suit those materials.

GSE Weld has also been called on to assess the productivity and efficiency of welding workshops.



GSE Weld stocks a wide range of consumables and parts to suit a multitude of different welding brands and machines.

This often entails downloading and assessing the on-board data stored in each welder to look at the amount of time it was actively in use compared to total labour hours consumed in a shift, and then implementing processes and procedures to increase output and reduce costs.

GSE Weld has the knowledge, experience, equipment and parts to assist with any welding operation, no matter how simple or complex.

The team is enthusiastic and always puts customer needs first – whether they need a new welder or an old one brought back from the brink.

MORE INFORMATION: GSE Weld Pty Ltd | 08 6555 7782 | www.gseweld.com.au



gseweld.com.au

☎ (08) 6555 7782
✉ sales@gseweld.com.au
📍 9 Aitken Way, Kewdale WA 6157

GSE Weld are a Perth family owned company specialising in the hire repair, service and sale of all brands of welding machines and equipment.

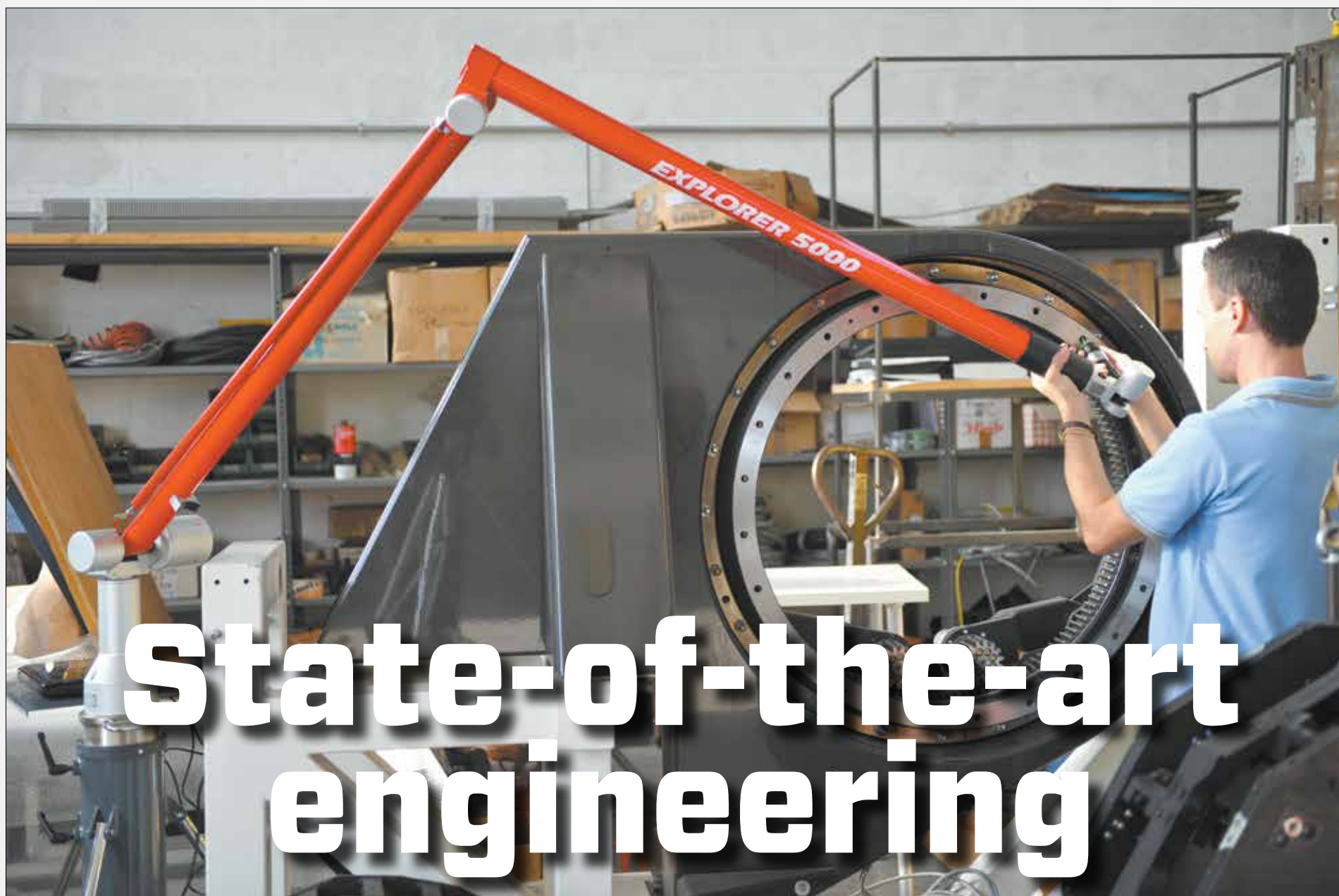
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Units are ergonomically designed with comfort of the operator in mind.

NATIONAL

ESTABLISHED in 1973, Leussink Engineering is a state-of-the-art engineering company located in Wollongong, NSW.

Family-owned and operated, the business is now managed by the second generation of Leussinks who have continued to grow the company in both size and operational capacity.

Leussink Engineering provide a range of engineering solutions.

From machining of bespoke components – providing parts and components for turn-key manufactured projects, world class quality welding and jigging table solutions – to reverse engineering obsolete OEM components, Leussink will leverage its world class thinking, skills, and reputation to solve your engineering problem.

Leussink is the leading supplier in Australia of state-of-the-art, large volume, portable metrology systems that deliver: unprecedented efficiencies in deviation analysis, precision in reverse engineering, and qualification of tolerances of any part required, without having to rely on an external metrology lab.

Leussink managing director Jason Leussink said the company's hardware is supported by a range of versatile software programs to suit the individual needs of a business and the type of work undertaken.

"We don't just sell you a product.

We provide solutions designed to help your business grow through improved accuracy, efficiency and quality," he said.

"We speak your language – our understanding and expertise in engineering and manufacturing means zero confusion and zero chances of anything being lost in translation."



Extended reach capability for maximum efficiency on the job.

Measurement arms

Leussink provides a full support solution to ensure longevity of metrology equipment – whether that be technical support, servicing, training, accessories, or calibration checks.

The range of metrology arms are portable – meaning you can perform 3D inspections, CAD-to-part analysis, alignment or reverse engineering in house, without having to go to an external metrology lab.

Given their size, the Leussink measurement arms can measure large volumes, making it ideal for use on mining sites.

"With a Leussink measurement arm, you can repair, restore or reverse engineer obsolete OEM parts that are no longer available to exact specifications," Mr Leussink said.

"We specialise in heavy duty machinery engineering and the team are experienced in ensuring continual operation of everything from large mining trucks and loaders to

crushers, feeders and earth movers."

Case study

The company recently reverse engineered a project for a blue chip steel manufacturing client to help problem solve some issues they were having with their impellers breaking.

"The client uses ocean water in the operation of its plant to cool equipment and materials," Mr Leussink said.

"The salt water moves through the plant via a network of pipes, with the water pumped using a custom-built, cast-iron impeller.

"Due to the long delivery lead time of the designed cast impellers and a need for better strength and durability of the working vanes, the client started looking into other options."

The company engaged Leussink Engineering to collaborate on and deliver a bespoke mixed flow impeller, which would be a more functional long-term solution as they had multiple pumps with the original designed cast impellers.

Leussink was tasked with providing solutions to several key challenges, the most pressing of which was the absence of any existing designs or molds for the impeller.

The complexity of the job coupled with the tight timeframe for delivery were additional challenges Leussink needed to overcome in meeting the client's expectations.



The arm used in conjunction with Demmeler fixturing table.

MORE INFORMATION: Leussink | 02 4260 7777 | info@leussink.com.au | www.leussink.com.au

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WQMS helps to fix the fatigue cracks

NATIONAL

FATIGUE cracking of steel occurs due to accumulated damage from repeated cyclic tensile stresses.

Eventually, this damage results in a micro-crack developing, which then grows progressively.

There are a number of factors that contribute to fatigue cracking, but from a practical perspective, the key consideration is the presence of stress concentrators.

Notches, sharp corners, flaws, sudden changes of section are all stress concentrators that act to magnify the stresses in that very small area, which is why fatigue cracking almost invariably occurs at locations like weld toes.

Steel has what is called an 'endurance limit', which is the stress below which cracking will not develop even after more than a million cycles.

Higher strength steels have a higher endurance limit.

As seen in the example diagram for steels, the endurance limit is typically about 50pc of the tensile strength.

Although the bulk stresses may be below the endurance limit, stress concentrators may magnify stresses by up to three times or more depending on their severity.

For example, if the bulk stresses in a component are 40pc of the tensile strength, then even a modest 1.5x stress concentrator will cause localised stresses well above the endurance limit, resulting in fatigue cracking after only a few thousand cycles.

The effect of residual stresses from crack repairs also magnifies the localised stresses.

Hence they can be seen.

A significant aspect of maintenance in the mining industry is the repair of fatigue cracking in heavy earth moving equipment.

There are many challenges in relation to the management and repair of fatigue cracking, including identifying and reporting the nature and location of cracking, how to assess the severity of cracking, monitoring and tracking of cracking, understanding the causes of cracking and planning for the weld repair requirements.

Other challenges include knowing how to carry out an effective weld repair, ensuring the assigned welder is capable of doing the repair, management of contractors, how to ensure that the repair is of the required quality, and tracking the cracks that have been repaired and those that haven't.

These issues are further exacerbated by a general lack of understanding and consideration of the causes of fatigue cracking and how fatigue life of repairs can be improved.

Weld repairs of cracking are unfortunately often treated as a means of simply 'removing a crack'



Welder competency assessment in progress.

rather than optimising the repair for fatigue life.

By applying a suitable repair method it may be possible to significantly extend the time before re-cracking, or even prevent re-cracking altogether (provided there is not an inherent design flaw or operational issue).

Furthermore, these issues are compounded by a combination of needing to be able to manage and apply a database of suitable weld procedures, a general low level of welder training and skill for crack repair welding, and a general lack of welding expertise of mine site personnel.

The impracticalities and hurdles that must be overcome in attempting to create and manage a database of weld procedures, apply them to repairs, maintain welder qualifications to the various procedures, have welding supervisors on hand at all times to manage the repairs, and general difficulties in achieving compliance, means that making improvements to weld repair management has remained in the 'too hard' basket.

Overall, this means that welding is typically not well managed, and repair outcomes are correspondingly poor as a result.

Poor quality repairs of cracking tend to rapidly re-crack, which results in a snowballing amount of cracks and often result in larger cracks rapidly developing than were originally repaired.

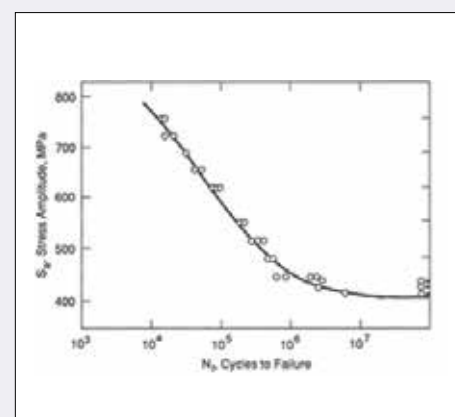
This results in an increased risk of failures and replacement components, and increased equipment downtime and maintenance costs.

Eventually, the equipment will require a major shutdown to repair structural cracking, and the viable asset life be reduced.

There are significant benefits (up to a few percent of the total maintenance budget — see wqms.com.au/benefits) to be gained by upgrading the management and outcomes of crack repair welding, in the form of reduced maintenance costs, reduced downtime and extended viable asset life.

AICARM approach

WQMS believes that the objective of a weld repair should be to restore, or even



Example S-N diagram for steels, showing the relationship between stress magnitude and the number of stress cycles for when fatigue cracking will develop.

improve, the original fatigue life of the cracked component.

WQMS has developed the AICARM (Asset Inspection, Condition Assessment and Repair Management) system in order achieve this by addressing all of the issues identified in this article by providing a robust, practical and easy to use welding management framework.

AICARM has been built on the basis of fundamental metallurgical principles relating to fatigue cracking and optimised repair welding, combined with practical welding expertise and in-depth experience of equipment cracking.

AICARM demystifies the weld repair management process, so that there is no need for reliance on welding experts for most weld repairs of cracking.

At its core, it is a comprehensive suite of training, site procedures, technical support, QA documentation and welder competency for weld repair management of heavy equipment.

The system has been specifically designed to address the needs and challenges of the mining industry, and fully integrates into existing workflows and supports all existing roles.

Contact the company to learn more and find out how to start the journey towards repair excellence.



02 5516 1008
info@wqms.com.au
wqms.com.au

AICARM™

The complete system for crack repair welding management in the mining industry

Asset
Inspection
Condition
Assessment
Repair
Management

AICARM™ delivers the following benefits and more:

- Comprehensive site welding management framework
- Improved repair strategy, planning and execution
- Less re-cracking and risk of failures and downtime
- Reduced maintenance costs
- Extended asset structural life

To find out what the benefits of AICARM™ may be for your site, please try our online estimator: wqms.com.au/benefits

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From service to supply

NATIONAL

WHEN it comes to welding, workshops need to ensure their equipment and environment is safe for staff and compliant with Australian standards.

WeldConnect director David Crosby said all companies need to test their oxy equipment and environment – and carry out a hazard and risk assessment – every six months.

“We go into workshops that don’t test, and the equipment is in very poor condition which leads to equipment failure, but more importantly the risk of injury goes through the roof,” Mr Crosby said.

“The companies that stick to the system, after about the third time we come in, around 18 months down the line, they’re in a really good spot.

“The equipment is in excellent condition and they get better performance out of the equipment – less failures, less downtime and it improves the standard of their workshop.”

Mr Crosby compared the cycle to that of maintaining your car:

If you don’t, eventually something breaks.

“It’s exactly the same principle,” he said.

“It costs companies exorbitant amounts with the endless cycle of replacing equipment when it breaks, so testing regularly means companies are compliant with regulations and they save a lot of money in the long run.”

In terms of downtime, equipment failure often leads to staff idling around while it’s fixed.

“If the equipment is well maintained and replaced as needed, there’s less downtime,” Mr Crosby said.

“But more than cost saving, it’s about the safety of staff in the workshop.

“Around 80pc of the reason behind equipment failure is human error, whether that’s from turning the equipment off incorrectly or treating the equipment with little regard.

“People do get hurt with welding equipment, so if your standards are low your risk of an accident is high.

“But if standards are maintained, the risk is very low, which is great for safety of staff, with the added advantage of large cost savings for the company over a five-year period.”

Mr Crosby said this comes down to Weldconnect’s systematic approach to testing and compliance.

“We don’t just come in and tell a client what



Weldconnect is the one-stop-shop for all welding equipment plus testing and compliance requirements for mining workshops.

equipment they need to replace,” he said.

“We take a systematic approach.

“We test the equipment but also the surrounding environment.

“We document any hazards, measure the risk and give you the appropriate control to eliminate that hazard.”

Mr Crosby said this approach lifts the company’s standards in the long run.

“Down the track there’s less equipment failure, the equipment is performing better and the culture in the workshop has changed,” he said.

“Instead of being rough as guts with the gear, the staff lift their game and look after the company’s equipment.

“Again, it’s like a car.

“Some might not last for 10 years because the person driving it isn’t taking care of it properly and has treated it poorly.

“Whereas if you look after it, wash it, clean it, service it – you’ll get that 10-year lifespan.”

WeldConnect also sets a high standard in its reporting and has an ISO quality management system with SAI Global, the risk and compliance experts, often auditing the company’s systems.

“We set a high standard for everything we do, and SAI review all our reports to see how we report to the customer every step of the way,” Mr Crosby said.

“It’s great because it encourages us to keep improving.

“As a result we have even created an app for

customers so all our comprehensive reporting data for their site is stored with easy access to their reporting history, including images and the risk matrix for any hazards we’ve identified in their workshop.”

Quick order options

Mr Crosby said that WeldConnect’s experience in getting workshops and their equipment and surrounds up to date has now led to product compliance.

“Because our standards are high, it’s led to workshop management and offering clients an efficient supply chain,” he said.

“So from that reporting log-in, clients now have a quick order portal with all the data of the products they have purchased so they can see what’s coming up that they need to replace, and make monthly orders so they don’t run out of products.”

With everything from service to supply all under one roof, customers are loving the easy and convenient process.

“When you’re the supervisor, the last thing you want to worry about is a little knick knack for the workshop, so they like us coming in to test all the gear, make sure they’re compliant and that they don’t run out of equipment,” Mr Crosby said.



MORE INFORMATION: WeldConnect | 1300 828 764
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WORKSHOP SAFETY COMPLIANCE SPECIALISTS

We Deliver On-Site Welding, Oxy Hazard and Risk Assessments with our unique our iCloud Register, Technology Integration and cutting edge App which allows us to manage your workshop compliance, as well as supply the highest quality welding and oxy/fuel products and accessories, anywhere in the country, wherever your location.

Make sure that your workshop meets all Safety Compliance standards – contact WeldConnect today.

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WeldConnect
Keeping Welding Safe

Design-based solution

NATIONAL

THE mining industry places structures in some of the harshest conditions in Australia.

Underground mining and surface process plant infrastructures are subjected to a broad range of conditions including low and high temperatures, vibration, humidity, corrosion from acids and slurries including exposure to many aggressive chemicals and direct heavy impact from normal operating activities.

While construction of steelwork to the appropriate standard gives assurance that it is fit for purpose when it is newly constructed and installed, the aggressive nature of the operating environments and the variability of the conditions on mine sites will most certainly guarantee that degradation and deviation from design strength will take place over the operating life.

The humble guardrail is a safety-critical part of this infrastructure.

It provides peace of mind when we venture up or down a stairwell or onto a platform.

It is usually not given a moment's thought when we lean against it for support and it is taken for granted that it will not fail.

In 2009, Perilya Broken Hill Ltd identified a need for the development of an effective quantitative condition assessment technique for this safety critical infrastructure component, engaging Rosetta Stone Operations to design and manufacture a suitable testing apparatus.

Appendix B of AS1657 was adopted as the



The Test-a-Rail in use.

technical basis for the design of an apparatus suitable for testing new and existing guardrails.

The Test-A-Rail

The Test-A-Rail apparatus is the result of a series

of problem-solving sessions with a range of stakeholders.

The tester is lightweight and can be easily carried up stairways and onto typical platform locations.

The tester is attachable to Johnsway meshes, chequer plates, cement floors and walkways. Anchoring to various floor materials and profiles is by hook bolts, magnetic base or vacuum foot.

The aluminium testing frame is combined with a standard hydraulic actuator and load measurement gauge.

The tester establishes a baseline result and a quantitative test procedure that is non-destructive and reproducible.

Routine tracking of test records can readily identify gradual strength reduction in a quantitative manner that can be tracked over time.

The Test-A-Rail can identify guardrails that require repairs and confirms those that are still fit for purpose at the time of testing.

The tester allows for the application of non-simultaneous horizontal and vertical test loads to rails and posts, and any resulting deflections can be measured.

A load-deflection chart supplied with the tester provides a guide for the allowable deformation of the guardrail system.

The tester is easy to use, accurate and the test data is recordable

The test records establish a 'condition criteria' that determines and prioritises maintenance response and provides the necessary insight to identify unacceptable guardrail designs or installations and predict unacceptable guardrail degradation at a specific location.

The testing process has six simple steps:

1. Anchor the testing frame to the floor
2. Adjust the loading cylinder in position over the rail to be tested
3. Operate hydraulic hand pump until the correct

The device solves the significant problem associated with implementing a reliable in-service condition assessment approach for guardrails.



cylinder pressure and rail loading is achieved

4. Hold this loading for 60 seconds and then release the hydraulic pressure
5. Measure any permanent rail deflection using a straight edge
6. Establish if any permanent deflection falls within the limits of the load-deflection chart provided. If the deflection is out of range, the rail is deemed to have failed and must be repaired or replaced.

The failure of a guardrail and the fall of an employee from height will result in significant injury.

The avoidance of only one such incident will justify the effort and expense of developing and implementing a guardrail condition testing system.

Can you afford not to test?



The Test-a-Rail™ improves your workplace safety by identifying guardrails that require repair & confirming those that are still 'fit for purpose'.

- Control the risk of falls by eliminating unpredictable guardrail failure
- Apply non simultaneous horizontal & vertical test loads to rails & posts
- Determine compliant & noncompliant guardrails according to AS1657
- Light weight for single person test & carry



There were 35 Serious injury claims involving handrails, steps and stairways in the Mining Industry for 2016-17* *Safe Work Australia National Data Team

CAN YOU AFFORD NOT TO TEST?



A product by Rosetta Stone Operations Pty. Ltd.
www.rso.net.au / jrc@rso.net.au / njc@rso.net.au / +61 417807371



MORE INFORMATION: Rosetta Stone Operations
+61 417807371 | jrc@rso.net.au | www.handrailtester.com



SERVICE | SUPPLY | HIRE

We have over 30 years of experience in the Queensland mining industry and understand the unique needs of this sector. We provide bespoke Service Agreements that are tailored specifically for the needs of the mining and quarrying industry.

Our technical support team is available 24 hours, 7 days a week to help reduce risk of breakdowns, saving you downtime and money.

We give you peace of mind in the knowledge that your equipment is compliant and delivers accurate measurements that you can always trust!

Our technical team combine extensive experience with metrological training and NMI certification to deliver expert advice and service to you.

We provide service and calibration of all weighing equipment for the mining industry and the supply or hire of:

- Weighbridges
- Belt weighers
- On-board weighing systems
- Loader scales
- Weighing Management software

CALL US 1800 SCALES

Helping new starters succeed

NATIONAL
ANDREW KNIGHT
MINING COACH
UNDERGROUND TRAINING

Why do so many new starters in mining fail?

It's not like this is a new problem, with three in five new starters failing in the first six months being a long-term industry average.

It was going on when I first started underground in 1994 and continues today.

Every time we hit an upswing and have to hire new starters, and there are always issues retaining them.

To be fair to the employers, they have over the years (and continue to) spent large amounts of time and money to address this problem – but with limited success.

Underground Training was founded by a group of Western Australian shift bosses in 2009 who were frustrated by the high turnover of the inexperienced staff on their crews because inexperienced miners learning on the job often have safety issues as they learn.

Being a WA shift boss is a statutory position, so if anything goes wrong on your crew, you are the first one standing in front of the magistrate.

Having a crew with lots of people with less than six months to one year's experience, still learning the fundamentals and trying to understand the culture, can be problematic at best — and extremely stressful at worst.

It was getting to the point that every time they



Underground Training's packages of Workready and DIY have been designed to create a win-win for both employer and new starter.

returned to site from break, there was a new face that needed to be brought up to speed on processes, procedures, culture and the inner workings of the mine.

Watching people failing in the same ways over and over again inspired the shift bosses to write a three-day training course.

The training is everything they wanted a new starter to know as shift bosses before they went down the hole with their crews.

The training isn't designed to replace anything that happens to a new starter when they get to site, rather it's to bring them up to speed on what is going to be expected of them on site.

Culture shock is a big issue and having someone able to understand what's going on from day one, is a huge boost to safety for both the new worker and the crew they are working with.

Between 2010-2011, more than 300 people completed the training and found work with companies all over Australia.

In 2016 the training was moved online and now takes the form of four online courses and a short seminar that addresses the culture of the industry.

What does an employer get out of hiring someone that has completed the training?

They get a new starter that can find their feet in weeks instead of months.

The first drive underground with the shift boss goes from what can be an overwhelming experience to a big game of 'eye spy' for the educated new starter.

Employers are welcome to take part in our Workready partnership program with KCA Site Services, giving an employer a labour hire risk-free option to bring new starters into their workforce.

Employers are welcome to hire direct from the training as we also offer a DIY option for students to apply directly to the employers.

If the candidate can get the mining questions right in the interview and meet the employers other requirements, it quickly becomes a win-win for both parties.

If they get the mining questions wrong, we recommend that you don't hire and move onto the next candidate.

When interviewing, the people that really want the career end up selling themselves to the employers with the extent of their mining knowledge.

What does the new starter get?

For a new starter, going in green (the industry term for no mining knowledge) is like sending them to the moon.

A plane ride to site (for most) and straight into inductions, tickets and everything else in their first couple of weeks on site.

It's a lot of information that has to be learned in a short amount of time.

While people are encouraged to ask questions, most people will ask a few and then stop because they don't want to appear stupid or slow or it just becomes information overload for them.

Not understanding important information leads to safety issues, problems and turnover.

Then there's the culture and etiquette to navigate which is often learned as the new starter goes, leading to even more turnover.

Underground Training's packages — Workready and DIY — have been designed to create a win-win for both employer and new starter.

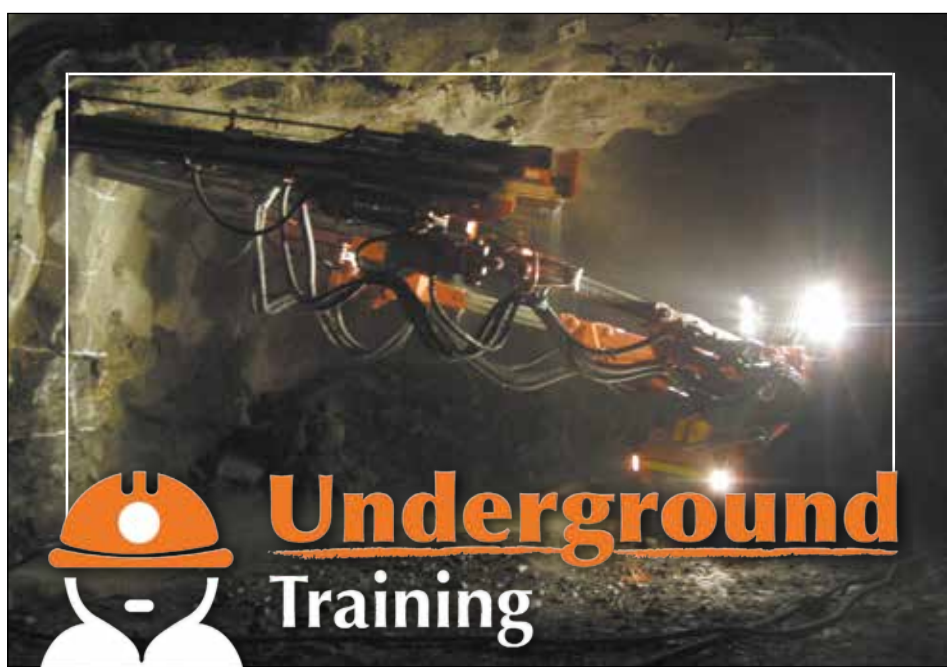
The new starter gets their start in the industry by being able to answer the mining questions in the interview.

The employers get a new starter that can understand what's going on in the morning meeting on day one.

As far as safety goes that's priceless.

For more information and to find out how you can take advantage of our partnership program for new starters on your underground mine sites around Australia, visit our web address or email info@undergroundtraining.com.au.

For a labour hire solution with educated new starters, call KCA Site Services on 1300 143 947 for more information.



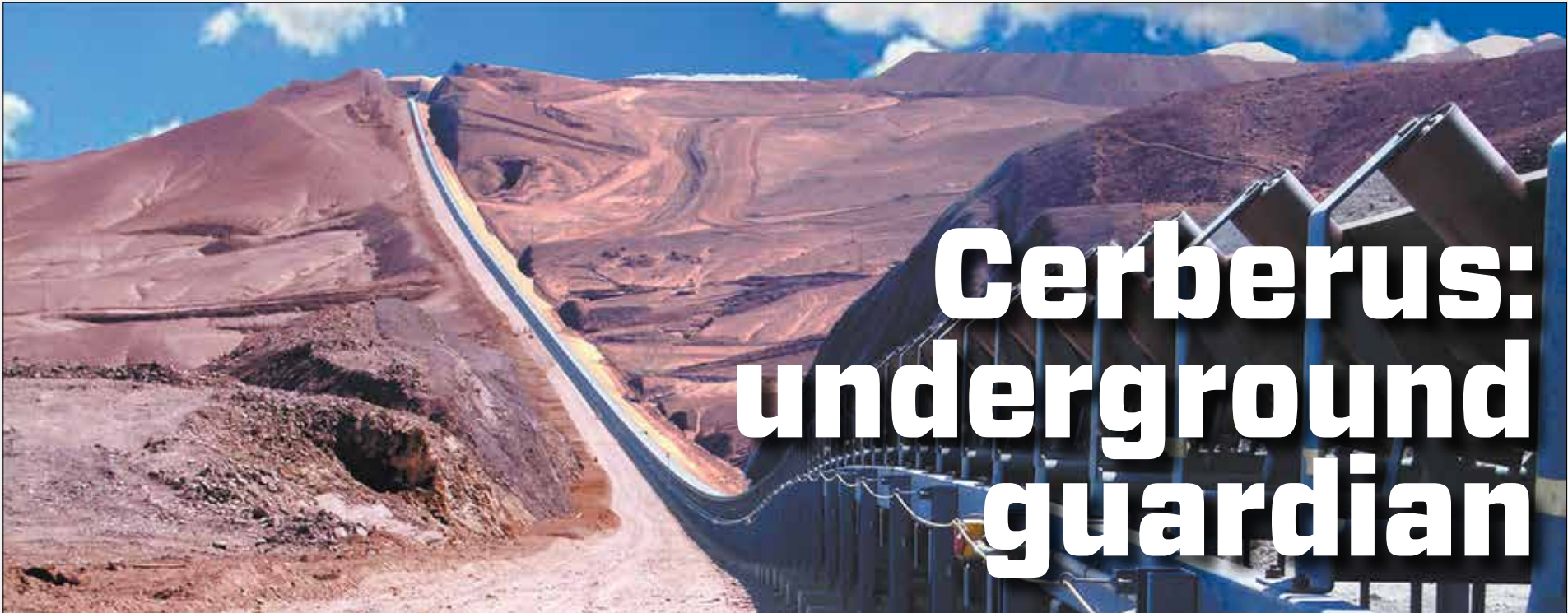
SITE SPECIFIC DIGITAL TRAINING PLATFORMS

Partnership program "Workready" with KCA Site Services to supply new starters that know exactly what's expected of them on site

Online training courses for the
Hardrock Underground Mining industry

info@undergroundtraining.com.au
www.undergroundtraining.com.au

MORE INFORMATION: Underground Mine Training
1300 143 947 | www.undergroundminetraining.com.au



Cerberus can be used to link a system of pole-mounted video and comms stations along the length of a conveyor. E-Stop buttons are positioned at regular intervals so that when a repair crew needs to work on a section of the belt (which may be 40km away from the conveyor control), they are able to radio in their position, press the E-Stop at the closest point to the repair and work without fear of the conveyor being accidentally started, causing injury or death.

NATIONAL

JUST as Cerberus guarded the gates of the underworld in Greek mythology, Tecom Australia's Cerberus conveyance communications management system guards underground personnel from many of the hazards they face on a daily basis.

Tecom Australia specialises in hazard reduction technologies and was the first Australian company to develop Safety Integrity Level (SIL) rated communications for drift and shaft winders — not only permitting the instant management of incidents, but also adding multiple safeguard layers and incorporating video to monitor down shaft, inside cages, man-riding conveyances and winders.

Cerberus is a closed loop system that adds additional layers of redundancies, which are themselves SIL-rated.

An example of this is a simple switched door lock on a typical personnel cage.

If the single switch fails, the door may not close fully, creating potential injury to workers.

By adding an additional switch in series to that circuit, the odds of both switches failing at the same time are increased exponentially.

In order to override such a system, other systems within that closed loop must first be activated — such as turning a key, pushing a button or pulling a lever.

It is these added levels of redundancy that prevent remote override and significantly reduce the risk of injury.

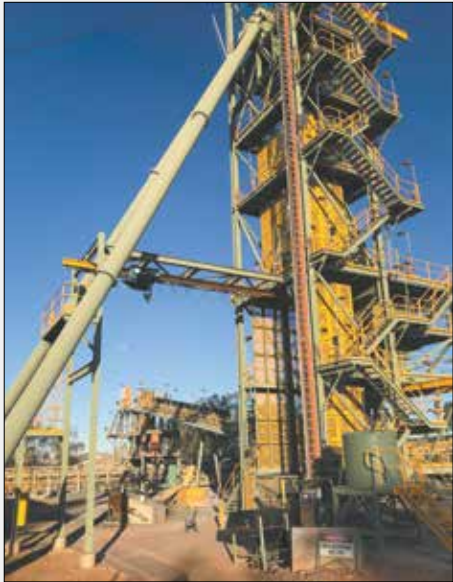
Cerberus also delivers communications over VOIP with its own dedicated intelligent 5.8GHz data radio network connecting underground operations to the surface.

Apart from monitoring and interfacing the closed loop SIL redundancies across the site to the mine's PLC system, Cerberus incorporates data, telemetry and video communications that meet NSW mine safety guidelines — one of the strictest in the country.

In the case of a conveyance cage, the system monitors the cage emergency stop, the push buttons, the safety switches (monitoring door open and closed positions) the cage door lock, a motion prestart alarm and a slack rope switch.

Gone are the days of three-bell systems with inherent time delays that can turn a slack rope event in a cage into a deadly situation.

With Cerberus's VOIP and video communications, the winder control system and the



Tecom Australia specialises in hazard reduction technologies and was the first Australian company to develop Safety Integrity Level (SIL)-rated communications for drift and shaft winders, cages and man-riding conveyances.

operator are instantly alerted to any abnormal event and can not only manually and automatically stop the cable from feeding, but also look inside the cage and communicate directly with personnel to quickly and safely rectify the situation.

The live video link also allows the winder control operator to look above, below and inside the cage or bucket as it is travelling, in real time.

This enables fast hazard identification, assessment and avoidance.

This is only one example of Cerberus's seemingly endless list of applications — it can be applied to almost any materials handling role.

The system is also commonly used in conjunction with long conveyors, particularly those spanning tens of kilometres.

In this case, Cerberus can be used to link a system of pole-mounted video and comms stations spaced at regular intervals (approximately 1 km apart) along the length of the conveyor.

This independent, wireless network can also include solar power for backup.

E-Stop buttons are positioned at regular intervals along the conveyor so that when a repair crew needs to work on a section of the belt (which may be 40km away from the conveyor control), they are able to radio in their position, press the E-Stop at the closest point to the repair and work without fear



Cerberus monitors a conveyance cage's emergency stop, push buttons, safety switches (monitoring door open and closed positions), cage door lock, motion prestart alarm and a slack rope switch.



A view behind the scenes of the Cerberus control system, which incorporates VOIP data, video and telemetry in a closed-loop system using its own 5.8GHz data radio network.

of the conveyor being accidentally started, causing injury or death.

Again, by employing SIL redundancies, only the ground crew can re-start the conveyor after completing a sequence of steps to reset the system.

The belt cannot be in put into action by staff in the control tower.

To view a video detailing the functions and operation of the Cerberus system operating on

an underground cage and winder system, visit the following link: <https://youtu.be/ux6ZNz3BJlk>

Tecom Australia is an expert in designing bespoke systems to suit any client's requirements.

It is able to assess potential site hazards and develop integrated solutions that mesh with a company's existing PLC.

Tecom adds the safety stop protocols to any materials handling solution.



Keeping connected underground

The N-Connex standard node includes a Distribution, Power and Battery Module. The Distribution module is what the fibre and Ethernet cables connect too. Mounted directly, there is no need for extra enclosures and it is quick to install and maintain.

NATIONAL

SINCE the release of Northern Light Technology's (NLT) award-winning (Australia and the USA) N-Connex networking solution a little over two years ago, the market growth has been exponential.

NLT is now about to roll out its 25th installation after successfully concluding two new sales to Imerys mines located in Greece.

N-Connex has been hugely successful for NLT in both the global hard rock mining and tunneling markets.

N-Connex system

N-Connex was specifically developed for harsh environments and the simplicity, robustness and reliability of the system is a major reason for the success.

The product suite is a modular, IP67 rated, data network and communications solution.

N-Connex provides a gigabyte (up to 10 Gb available) fiber backbone, ethernet and WiFi connectivity and a range of modules that connect easily to enable voice communications, emergency evacuation, ventilation optimisation, fixed and mobile equipment monitoring and control as well as IOT sensor monitoring.

If it works with ethernet or WiFi, it will work with N-Connex.

While NLT were the first in the world to develop and deploy intrinsically safe WiFi into a coal mine, the company took its time to develop N-Connex to meet the needs of hard rock mines.

The first system was installed into a silver mine in Mexico and was soon followed by MMG's Dugald River zinc mine in Queensland.

Further success in Mexico was achieved when Canada's Pan American Silver (PAS) procured the system over a traditional leaky feeder offering.

PAS was one of the first to deploy N-Connex for full voice and network capabilities, and was so impressed it subsequently installed N-Connex in a second mine in Mexico and an operation in Bolivia.

Today, in addition to Australia, N-Connex systems are installed in Canada, USA, Mexico, Bolivia, Ecuador, Switzerland, Austria and South Africa.



The vehicle radio allows IP radios to be properly installed in a vehicle with vehicle power, external antenna, and external speakers.

N-Connex is simple to deploy due to the nature of the "plug and play" pre-terminated fiber optic cables and Cat6 cables.

The connections are clear and keyed to reduce complexity and the risk for error.

The modular hardware does not require any additional enclosure or cabinets as it is IP67-rated and designed for supporting directly on the mine wall.

The proprietary brackets and rail assembly are also quick to deploy and install with a typical node installation taking less than an hour.

All devices are connected via Power over Ethernet (PoE), and with NLT's proven Cat6 Extenders; mine sites can easily achieve 400-500m of connectivity over the Cat6 cables, hence enabling very cost-effective coverage in a typical hard rock mine.

Partnering with Icom, NLT now offers a handheld and vehicle mounted IP (WiFi) radio that looks and functions similarly to traditional two-way radios.

The result is that mine personnel are very comfortable with the technology and are happy to adopt it.

Additionally, performance of the IP radio terminals is superior to their two-way counterparts, and so the critical component of

voice communications over IP networks is now finally a reality.

Emergency alarm options

N-Connex modules also include two emergency or alarm options.

These modules will both inform underground personnel of an emergency and also enable triggering of a controlled alarm as well.

With high intensity strobes and 110dB sirens as standard, the modules easily boost safety in the underground environment.

Control and monitoring of electrical equipment and sensors is also easily achieved via the digital and analog IO modules.

Applications include paste-fill, dust suppression, blasting operations and many others.

Perfect for mine operations

NLT general manager Tony Napier said that N-Connex takes the complexity out of networking and that convenience and durability made it perfect for mining operations.

"The rugged nature and IP67 rating of the N-Connex enclosures means that failures are very rare," he said.

The enclosure and internal hardware are very reliable and hence the uptime of an N-Connex system is very high and suitable for covering critical applications such as voice communications, tele-remote vehicle operations, control and monitoring of paste-fill applications, and enabling of ventilation on demand.

"More common data communications, video and tracking benefit from the inherent reliability of N-Connex as well," Mr Napier said.

Uptime is maximised by using the pre-terminated cables, and a special fiber joiner is used, which removes the need for difficult splicing underground.

"If a cable is damaged, it is quicker to replace that shorter section than try to conduct repairs," he said.

"The system enables a mine to expand at their own pace through the addition of true plug and play modules."

Client Feedback

"Right off the bat, there was a 100pc difference ... coverage went over and beyond expectations"

Burning Springs mine (Martin Marietta, WV, USA) mine foreman
Allen Hoover

"Very neat job with the results showing attention to detail and professionalism"

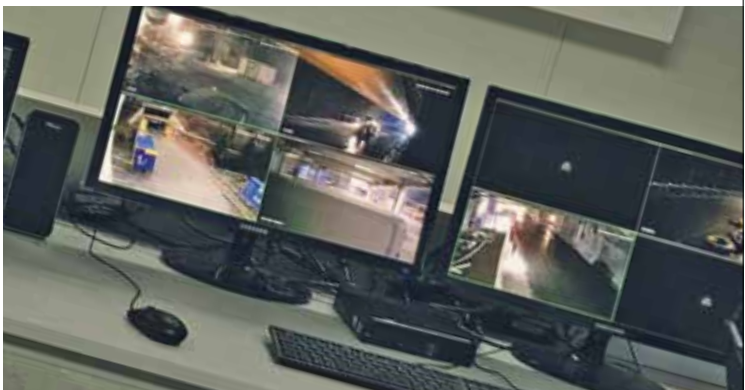
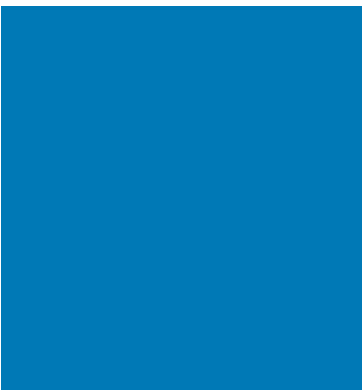
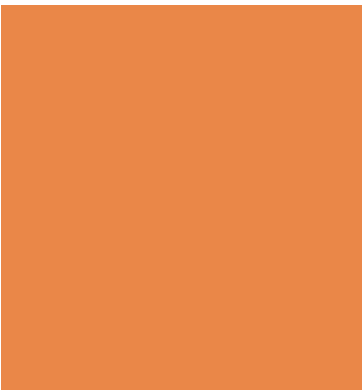
Oz Minerals Carrapateena mine, (SA, Australia) superintendent,
mine projects, Chad Parken

"First time I've seen a system and software (solution) delivered so well prepped, planned and virtually finished which made the install a dream"

PORR Bau GmbH, Brenner Base Tunnel (Austria) senior electrical engineer, Peter Bartokos

N-Connex

Transition to a more connected mine
Digital networks for harsh environments



- Plug n' play, high speed modular network
- Pre-terminated fiber eliminates splicing underground
- Rapid deployment and easily maintained
- Turnkey data and voice communications solution
- Data Networking via a gigabit backbone
- Monitoring and control systems
- Video Surveillance and Monitoring
- Personnel and vehicle tracking
- Install the modules you need as required
- Connect and future proof your mine

Pumping workhorse 90 years in the making

NATIONAL

MALCOLM Thompson Pumps has a proven history delivering quality pumping solutions to a wide range of Australian applications.

This 50-year-old company is now the proud owner of Stalker Pumps, providing even more solutions for its customers and is still being manufactured on Australian soil.

The recent redevelopment of Stalker Pumps – a reliable pillar in the Australian Pumping industry for more than 90 years – is delivering customers a quality solution for removing water from underground mine sites.

This combination of Stalker Pumps and Malcolm Thompson Pumps (MTP) has created an unbeatable workhorse delivering exceptional pumping solutions for Australian mining.

Stalker Pumps have been engineered to provide exceptional durability, higher flow and reduced maintenance to meet the end goal of saving customers' time and improving productivity.

Stalker Pumps are legendary for their ability to operate at peak capacity even in the most challenging Australian mining conditions.

Malcom Thompson CEO Ben Farr said the pump was proven in the market.

"We are not introducing a new product, rather an existing product that has been engineered to better meet our customer's requirements," he said.

Stalker Pumps is one of the last remaining all-Australian pumps with an onsite foundry allowing total control over the manufacturing process.

The ability to manufacture high quality castings in 19 types of ferrous and non-ferrous metals in-house is unique to MTP.

Mr Farr also provided a case study from one customer in Kambalda, WA, who had been using traditional PC (progressive cavity) pumps underground which required a complete service every six months.

After replacing these units with a Stalker SHD103 underground pod, the customer has enjoyed almost two years of faultless operation, without any repairs required.

The operating cost savings to that customer have also been significant.

In contrast to a PC pump, the Stalker pump is a fraction of the operating costs and has not been touched with a spanner since installation.

This exceptional performance has become standard for customers, who are turning away from the more traditional PC pumps in favour of the super heavy-duty centrifugal pump, following the results of two years of extensive pump monitoring of all the associated service and maintenance procedures.

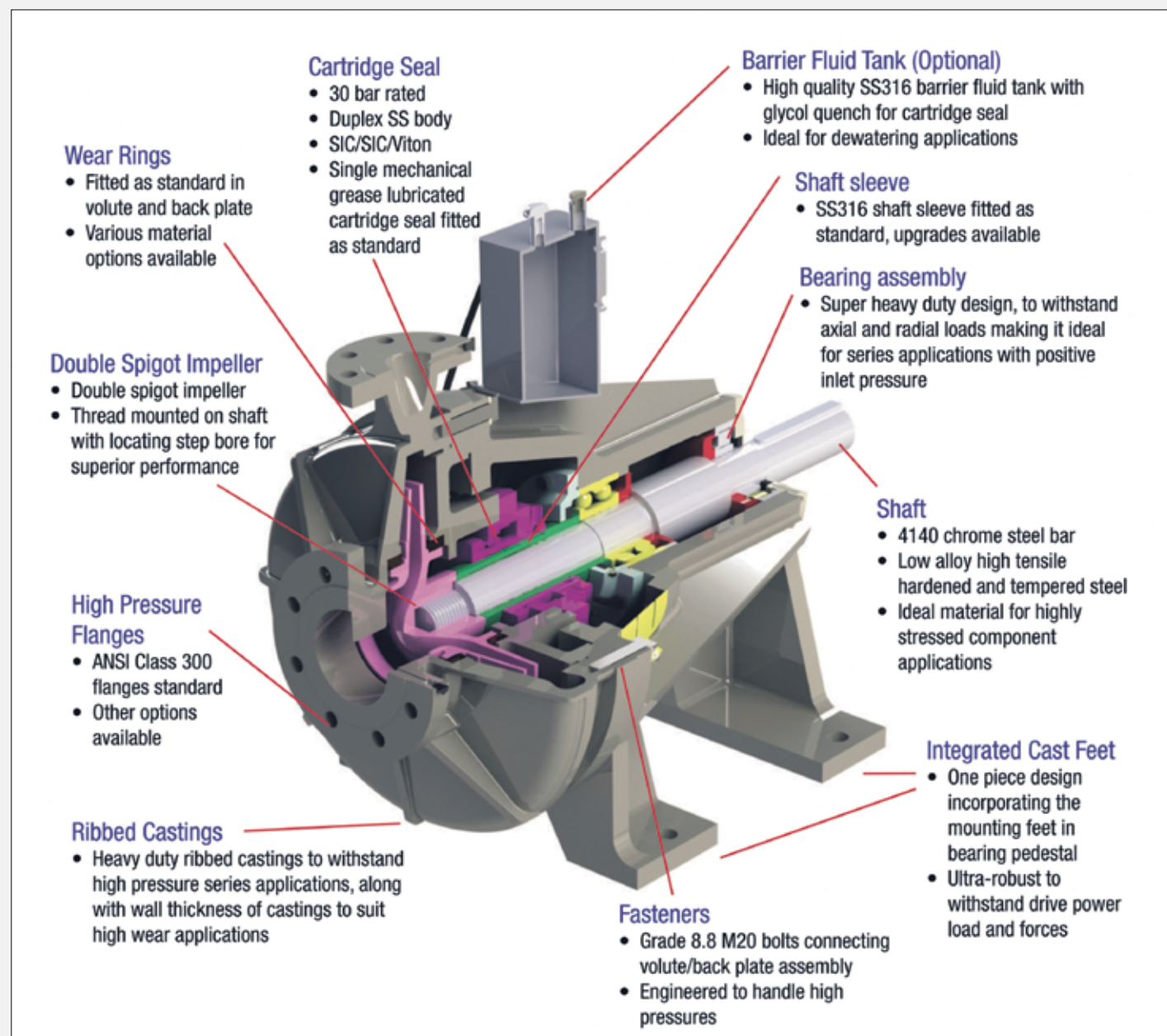
The Stalker pump has a higher flow range, starting from 20 to 50 litres per second (L/s) in the most standard models, in comparison to a 27L/s flow rate (at same head) with a PC pump.

Other models are capable of taking this to 80 L/s and above with a single pump.

Because of this increased flow rate, the run time of the Stalker can be almost halved, further extending the life of the pump and reducing the overall setup cost.

However, as Mr Farr states, the advantage is not really the flow itself but the extended wear life.

"The sand, solids and grit migrates through the underground dewatering process and



The Stalker pump from Malcolm Thompson Pumps is designed and made in Australia to cope with the demands of underground dewatering and slurry pumping. It features a hardened chrome iron housing to resist abrasion, a heavy duty main shaft for greater load handling and a burst pressure of 75 bar. The Stalker units are capable of pumping up to 360m vertically in series operation.



MTP's underground dewatering skid, featuring the new Stalker pump.

typically creates greater wear conditions for the pumps," he said.

"This is what really destroys other pumps, particularly PCP's.

"Whereas, the Stalker powers easily through slurry, grit and sharp solid particles of up to 8mm in diameter".

Key features of the Stalker are the materials of construction and high pressure rating,

making this pump ideal for medium flow high head applications.

The two most popular choices for underground mining are 27pc chrome iron for highly abrasive fluids and H3C stainless steel for highly corrosive fluids.

The standard cartridge seal fitted is rated to 30 bar (435psi) pressure and is upgradable to 40 and 60 bar.

The casing has been redesigned with a burst

pressure of 75bar (1087psi).

Combined with the ultra-robust ribbed casting design and high precision bearing assembly, the pump spins to a maximum of 2900rpm, with a normal duty rate of around 2500rpm.

This shorter run time often allows for one pump to be utilised as a standby in case additional pumping is required – eliminating the need for mine site closure due to uncontrolled water ingress and the related safety risk to personnel.

Compared to conventional centrifugal pumps that typically top out at 180m of head with low flow rates, the Stalker pump – by design — is able to withstand much higher loads and pump vertically up to 360m in series operation.

This impressive feat is unmatched in regular centrifugal pumps.

The Stalker's main shaft has also been designed and built to be much more robust than traditional shafts to withstand the high radial and axial loads while spinning at a high RPM.

Another feature that adds to both increased pump life and longer service intervals is the barrier fluid tank.

Due to the abrasive nature of the slurry passing through the pump, the mechanical seal is lubricated by coolant from a tank mounted directly on the Stalker unit.

It also protects the pump if it is accidentally run dry for a short period of time.

In addition, a duplex cartridge seal is used to increase seal pressure and allow more than one Stalker pump to be used in parallel.

MTP produces a unit it calls a pod, which is essentially a tank that is located underground and is fed either by a dam or a series of smaller pumps.

Mounted next to the pod is a Stalker pump that is capable of pumping the underground water all the way to the surface, either on its own or in stages with multiple pumps, depending on the depth of the mine.

Conventional PC pumps are not easy to repair or replace in-situ and this is often a very time-consuming and costly process that increases the risk of flooding while the pump is out of commission.

Such uncontrolled water flow can lead to complete mine shutdown.

The Stalker pump, however, can be completely removed and a new unit fitted in only four hours.

Mining contractors are always very conscious of costs and productivity, so the use of a Stalker pump and a pod translate into lower operating costs, lower maintenance costs, less downtime and lower labour costs.

Australian standards remain some of the highest in the world for pumping solutions, standards which the Stalker pumps meet and exceed.

Australian mining conditions demand the highest quality equipment to survive the brutal elements they are exposed to on a daily basis.

Malcolm Thompson Pumps is committed to listening to customers' needs and delivering equipment that surpasses expectations.

Being locally-based also decreases wait times for spare parts, repairs or replacements.

As anyone in mining knows, reduced downtime is paramount for cost saving.

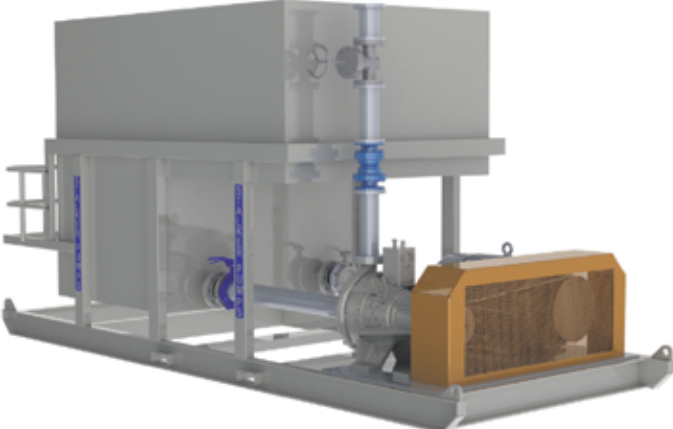
Driven by customers' demands, Malcolm Thompson Pumps is currently developing other ranges suitable for use underground.

"We have the ability to custom design and engineer to meet specific requirements for specific customers," Mr Farr said.

"We listen to our customers' feedback and our design and engineering is driven from their needs."



MTP's underground dewatering pod is purpose built for the evacuation of underground water. It can be fed by multiple small pumps or a dam and offers high pressure, high flow rates and much lower operating costs than conventional PC pumps.



- Pump construction in 27% chrome iron volute and back plate, H3C Impeller, fitted with 30 bar seal and barrier tank
- Customisable pod size and pump combination to suit individual application
- Belt drive to reduce footprint and customise RPM, direct coupled optional
- 2 pump parallel or series setup available
- Various options available for surface treatment of pod to suit the application and environment
- Customised valving, monitoring and control equipment options available



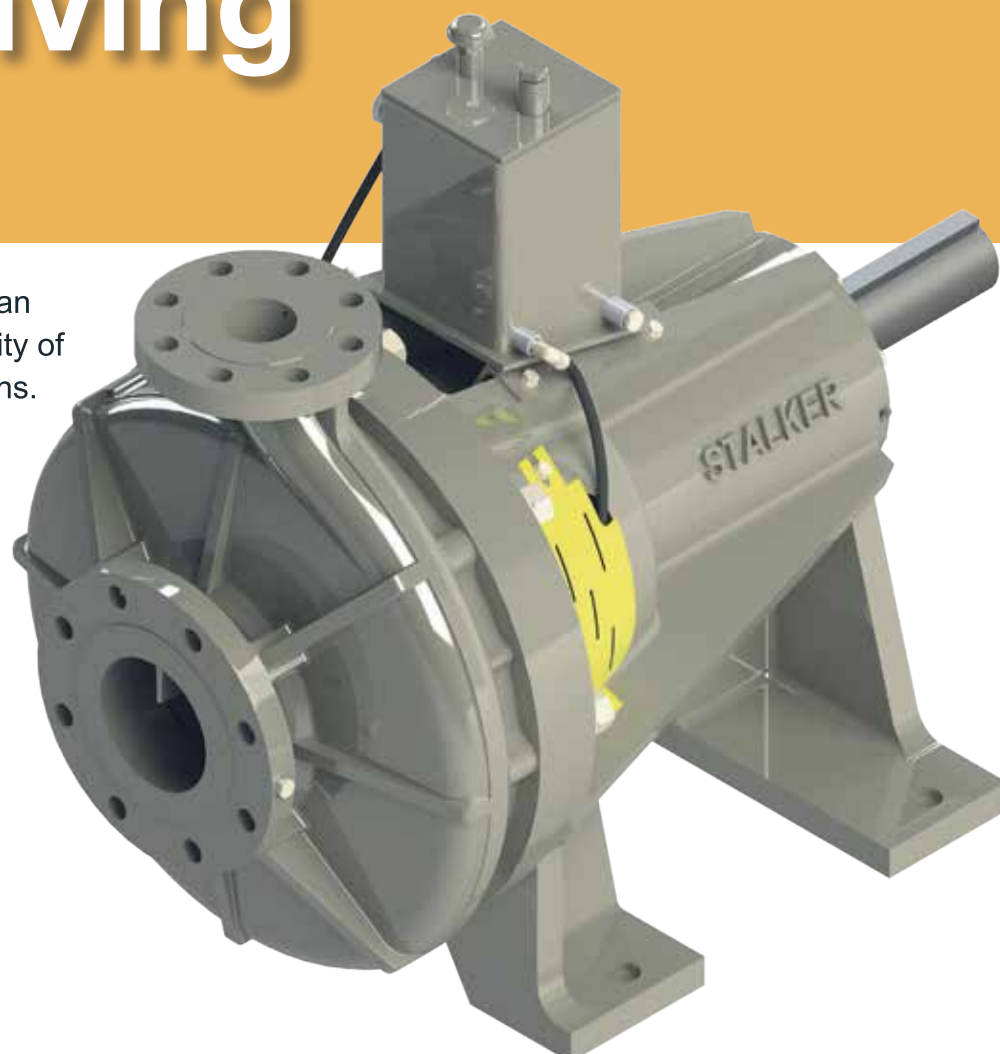
A view inside the pod's tank. The Stalker pump's housing is harder than silica and it can pump solids of up to 8mm in diameter, so removing slurry is all in a day's work.



Creativity driving productivity

With over 50 years' experience working within the Australian Mining industry, MTP fully appreciates the drive for reliability of pumping equipment in underground dewatering applications. MTP have taken this experience and manufactured a new range of dewatering pumps, specifically designed for the harsh environments found in underground mining.

- ✓ Reduced total cost of ownership
- ✓ 27% chrome iron ensures longevity
- ✓ Reduced downtime due to in-situ underground maintenance
- ✓ Run dry slurry seal
- ✓ Flows greater than 40L/s, with heads exceeding 160m
- ✓ Manufactured in Perth, Australia



To learn more about our SHD Range visit www.mtp.com.au/shd or call us on **1800 733 687**.

KALGOORLIE | PERTH | SYDNEY

Timely underground craft

ADINA has mastered the art of making automatic (mechanised) watches for the Australian underground mining industry.

Created as a result of demand for a watch that would be used in some of the harshest environments known to man, without fear of accidental ignition from cell or battery-powered digital units, the Adina NK151 Underground Countrymaster collection also boasts rugged sophistication and stylish looks.

Old school watchmaking and modern ideas ensure this watch is up to the onerous task it has been set.

Sapphire crystals are employed in the time pieces, with automatic needles and a clear back so that safety officers can verify that they are mechanical.

Made of steel, they are made flat so as to avoid being accidentally caught in minesite fixtures, with the glass on top recessed a little bit lower than normal.

A threefold catch is built into the bracelet to ensure the watch does not come loose during operations.

Components are also screwed down tight to ensure the timepieces can withstand extreme vibrations.

Adina was founded in 1971 by Australian watchmaker and current



The Adina NK151 Underground Countrymaster collection boasts rugged sophistication and stylish looks.

managing director Robert 'Bob' Menzies, who had a dream of creating a watch capable of withstanding the rigours of the Australian lifestyle.

After months travelling the world sourcing premium components and advanced technology, he returned home to begin assembling his first watch collection.

In a small storeroom in his family home, he designed and crafted each watch by hand, painstakingly ensuring the quality through an ever-fixed eyeglass.



This attention to detail and culture of hard work remains at the core of Adina's business today.

Adina now remains the only company to design and assemble its complete watch collection in Australia.

Today, the business has grown from one dedicated man to a staff of 20, including Bob's son Grant, building the craft of quality Australian watchmaking through the generations.

Each year Adina produces more

than 40,000 artisan watches from its Brisbane factory, available in over 300 retail outlets across the country.

Through quality craftsmanship and evolving design, Adina has made a history of specialising in limited release watch collections.

The brand remains a stronghold in regional Australia, where Adina watches are trusted to endure the outback's harsh conditions.

The beginning of every Adina watch starts with the humble pen and paper.

Hand-drawn sketches, inspired by elements of the urban and natural environment, form the foundation of every unique Adina watch design.

The artistry is combined with CAD drawings, engineering expertise and the latest machine technology to ensure each component is created to the highest standard.

A range of techniques are used to create our iconic models, from sandblasting or mirror-finishing the case and bracelet, to stamping or etching the face background.

The Australian Mining Review is offering readers a chance to win an Adina underground watch — visit the website for entry details: <http://australianminingreview.com.au>.



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Safe Reliable Robust

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- Supports voice channels
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- E-Stop safety feature for conveyors
- Solar backup available

Cerberus can be used in almost any materials handling role, keeping workers safe and productivity up on site.

TECOM

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Specialised, adaptive drilling



Raisebore Australia is a privately owned company supplying raiseboring services to mining, coal and construction industries.

NATIONAL

FOR productive and safe raise excavation, raiseboring is the most successful method, and Raisebore Australia is one of the country's leading specialists.

Raisebore Australia is a one-stop shop – providing specialised, adaptive drilling solutions to meet clients' needs.

The new addition to the fleet is a diverse slot machine — the Rhino 100.

Raisebore Australia Operations manager Alex Hughes said the Rhino 100 is an easy to use one-man machine, taking slot raise drilling to new heights, maximising the output and reducing the risks without compromising productivity.

"The set-up time for the machine is around 15 minutes, which is much quicker

than conventional/box hole raiseborers," Mr Hughes said.

"You also don't need concrete foundations for the derrick to be secured to and it's much easier to transport, making it convenient for clients drilling multiple pilot holes and slot raises."

The Rhino rig is an efficient option in underground operations, allowing mines to save money, manpower and time.

Mr Hughes said the company specialises in conventional, down-hole, box-hole and any vertical development drilling.

"Our fleet features 14 machines, one of the largest in Australia, with the flexibility to ream raises as small as 0.66m diameter up to 6m diameter and 1000m in depth, vent shafts, escape ways, slot raises, ore passes," he said.

"We cover everything – we're the one-stop shop when it comes to raiseboring."

MORE INFORMATION: Raisebore | 0408 892 098 | alex.hughes@raisebore.com.au | www.raisebore.com.au

RAISEBORE AUSTRALIA THE RAISEBORE SPECIALISTS

A privately owned company supplying
raiseboring services to mining, coal
and construction industries

CONVENTIONAL | DOWN REAMING | BOX HOLE



New Rhino 100 joining our Fleet soon

We provide Directional Drilling of Pilot Holes for Raiseboring using:

- Welnav Directional Drilling Systems
- Micon RVDS Directional Drilling Systems

Our services:

- A specialist raiseboring company with a core business in conventional, down reaming and up-hole raiseboring
- Our fleet features 14 machines (one of the largest in Australia) with the flexibility to ream raises as small as 0.66 metre diameter up to 6.0 metre diameter and 1,000 metres in depth
- RBA has raisebored 146,000 metres since inception

Raisebore
Australia
raisebore.com.au

Contact: **Rod Bertram** Managing Director // m. 0419 856 118 // Office (08) 8358 4444 // email rod.bertram@raisebore.com.au
Contact: **Ben McCarthy** Chief Operating Officer // m. 0400 196 823 // Office (08) 8358 4444 // email ben.mccarthy@raisebore.com.au

Gas evacuation

This gas evacuation plant, built by Tecom Australia, extracts methane from underground and pumps it to a series of gas flares. This converts methane, a very harmful greenhouse gas, into carbon dioxide, which is less harmful to the environment.

NATIONAL

TECOM Australia has many strings to its bow.

In addition to innovative underground communications and SIL hazard reduction technologies, it also designs and builds custom gas monitoring, evacuation and storage systems for the coal mining industry.

A significant burden to most coal mining operations is the accumulation of explosive and noxious gases like methane, which congregate in the ceiling of underground tunnels and voids.

The real problem arises when these gas levels build to the point where they present an asphyxiation or explosion risk to workers.

These gases must be removed in order to make the coal seam safe for mining.

The first step in mitigating this risk is monitoring gas levels with a dedicated tube bundle system, which constantly samples and tests gas concentration from as many as 60 points in a given area to provide early warning of dangerous conditions.

Working hand-in-hand with the monitoring system is a gas evacuation, or drainage, system that

actively extracts these hazardous gases and returns the underground atmosphere to safe working levels.

As the volume of gas flowing into these voids varies from mine to mine, Tecom Australia must first measure this inflow, then analyse the results and finally design and construct a plant capable of safely draining the methane and other gases.

Typical methane inflow can be around 3000l/s – 10,800m³ per hour – an enormous volume to continuously evacuate in order to keep the mine safe for coal excavation.

According to the volume of gas that must be removed, Tecom can build either a mobile plant that travels with the progress of the long wall, or a large fixed plant where only the extraction manifold and piping are extended as mining moves ahead.

Evacuation of the gas is typically via two or three large pipes that protrude through the ceiling of the tunnel and feed upwards into the manifold that leads to the gas plant.

Special pumps, which use water to seal and create a vacuum, are used to transfer the flammable gas.

By eliminating any metal-to-metal contact

within the pump, the chance of accidental ignition is eliminated.

Regardless of whether a fixed or mobile plant is employed, the evacuated gases can be disposed of in one of four ways:

Flared.

The gas is burned in a flare which converts the very dangerous greenhouse gas, methane, into less dangerous carbon dioxide.

Heat from the flaring process can be used for ducted heating in colder climate or even used to heat water for a variety of uses.

Fuel source.

The methane gas can be collected and used to fuel natural gas turbines to generate electricity.

This electricity can then be used to power the mine site, reducing operating expenses by harnessing a by-product of the mining process.

Excess power can also be returned to the grid to generate another cashflow stream for the operation, thus translating the burden of noxious gas into a potential profit centre.

Compress and store.

The extracted methane gas can be compressed

on site into CNG or LNG, stored in tanks and either sold as a separate product or used on site for vehicle fuel or power generation.

Vent.

This is the least environmentally responsible option.

The extracted gas can be vented to atmosphere but as Methane is such a harmful greenhouse gas, this option should be avoided wherever possible.

Especially when the wasted gas is a valuable commodity in its own right.

Tecom's gas monitoring, evacuation, processing and storage solutions use the latest technology to provide proactive control of dangerous coal seam gases.

Its technology not only ensures a safe working environment but also the opportunity to use these by-products to reduce internal costs or create additional revenue streams.

Tecom is the only Australian contractor to build and deliver complete control over the supply chain to clients.

To view a video that further explains Tecom Australia's gas monitoring and evacuation plants, visit the following link: <https://youtu.be/EOvSPkqsj7o>.



This skid-mounted gas evacuation plant can be moved as mining of the long wall progresses. Fixed gas plants are used for larger applications with a moving pipework manifold.



Tecom Australia designs, builds and maintains gas monitoring (tube bundles) and gas evacuation plants.



The evacuated gas passes through a water separator before passing through the gas vac blower unit and then on to gas flares or an additional pumping station to compress it for storage and future use as LNG or CNG.

A real eye light

Creating light and developing the future.

NATIONAL

Innovative lighting solutions for demanding environments

FOR more than 40 years, Eye Lighting has provided quality lighting solutions for industrial, mining, commercial businesses, sporting venues, and hazardous sites.

Eye Lighting's operations have expanded to include sales networks throughout Australia and New Zealand, delivering comprehensive service and advice.

The company offers technologically advanced and efficient high intensity discharge (HID) lamps, developed by global producer Iwasaki Electric, to add to its growing portfolio of LED products suitable for industrial environments.

Driven by the motto 'creating light - developing the future', Eye Lighting's team of technical staff is occupied with ongoing research and development.

With the latest technology at their fingertips and in-house design facilities, qualified lighting engineers and design staff are able to generate technical lighting solutions for a range of Eye Lighting customers.

Eye Lighting's most recent addition is the SST Bulkhead Series.

Its advent has demonstrated that there are many yet-to-be-defined applications where the SST can deliver a successful solution.

One such challenging application arose recently with the upgrade of all lighting at a significant mining resource export loading terminal.

In this installation, the client's brief was that for one particular section of the plant, the preferred lighting upgrade was to be a one-for-one replacement: HID out and LED in.

Not that simple

The existing fixtures (70W HPS) were mounted at an approximate height of 1.2m from the deck on a vertical surface.

This gave rise to the operator's biggest concern and aspiration, the taming of the glare from each fixture along the length of the equipment — a critical design aspect not taken into account during the original installation.

It was recognised by all parties that Eye Lighting's SST Bulkhead Series could and would offer the best solution in terms of the lighting fixtures' upgrade (both mains operated and emergency).

Glare control

Having the hardware was one thing but would the SST Bulkhead really be fit for purpose?

With the aid of in-house product design specialists, Eye Lighting was able to introduce a specific degree of glare control through the application of a glare control diffuser film, affixed directly inside the glass lens which provided the desired glare control required by the site operators.

Technically, the diffusers suppress high-angle light above 65 degrees to reduce visual glare and improve the Unified Glare Rating (UGR) of luminaires.

This helps luminaires comply with IESNA RPI-04 and EN12464 glare specifications.

These patented and patent-pending diffusers, unlike conventional prismatic sheets, have a soft cut-off, with no colour separation, thereby increasing visual appeal and LED hiding ability.

Focused on delivering solutions

This is but one of the many solution success stories emerging from the field as this new product delivers exactly what it was created for — widespread, glare-free light.

The ConV series consists of a range of luminaire options addressing standard, emergency and marine eco with optimal output for multiple applications.

The ConV1 is a purpose-built, pole-mounted LED luminaire, featuring a wide light distribution.

It is designed for a range of applications such as pathways and conveyors situated in demanding environments.

The ConV2 80W and ConV2 emergency lights are also pole-mounted but built for specific but the emergency variant is an integral, self-contained emergency luminaire, with a 50,000-hour service life.

Eye Lighting is confident that it has the right solution for you designed with quality, durability and reliability, by creating light and developing the future.

AT A GLANCE



SST-60 BULKHEAD SERIES

High-powered multi-use LED bulkhead
Designed for heavy-duty industrial applications.

Applications

Demanding environments including:
Conveyors
Walkways
Stairwells
Tunnels
Warehousing
Gantry
Load-out station
Beneficiation plant
CHPP

Compliance

Safety: AS/NZS 60598 series
EMC: AS CISPR15
Vibration test: IEC 60068-2-6

Technical Specifications

Luminous flux (lm) Up to 5,700lm
Efficacy Up to 95lm/W
Electrical 220 - 240 Vac 50Hz
Power Factor >0.95 @ 230 Vac
LED Service Life 50,000 hrs (L80 B10)
CCT 4000K
CRI >70
Distribution Symmetrical
Body LM6 Die cast aluminium alloy (low copper content)
Lens Flat tempered glass (frosted)
Operation Temperature -20°C - +55°C
Weight 6.1kg
Dimmable Optional
Cable entry M20 gland (max ø12mm cable)
SPD 20 kV Uoc, 25 kA I_{max}
Mounting Wall, ceiling or pole (with mounting plate by others)

AT A GLANCE



CONV2 EMERGENCY SERIES

Purpose-built pole mounted LED luminaire
Wide light distribution
Integral self-contained emergency luminaire

Applications

Demanding environments including:
Conveyors
Pathways
CHPP
Beneficiation plant
Transfer stations
Safe passage ways

Compliance

Safety: AS/NZS 60598 series
Classification according to AS/NZS 60598.2.22
EMC: AS CISPR15
Emergency lighting: AS/NZS 2293.3

Vibration test: IEC 60068-2-6
Safety of Lithium battery: IEC 62133

Technical Specifications

Luminous flux (lm) Up to 3,800lm
Efficacy 95lm/W
EM Efficacy 117lm/W
Electrical 220 - 240 Vac 50Hz
Power factor >0.96 @ 230 Vac
LED Service Life 50,000 hrs (L80 B10)
CCT 4000K
CRI >70
Green Safety Light Optional
Distribution Asymmetrical
Body LM6 Die cast aluminium alloy (low copper content)
Lens Polycarbonate
Operation Temperature -5°C - +55°C
Weight 5.2kg
Dimmable No
Input Cable Supplied with 5m flex cable (4-core, 1.5mm²)
SPD 2 kV common and diff. mode
Battery LiFePO4 Battery - duration >90minutes
Emergency Maintained and non-maintained operation
Mounting Wall and spigot mount options available (at an additional cost)

ELPHINSTONE

SEE OUR TECHNICAL ARTICLE PUBLISHED IN THIS ISSUE.

UNDERGROUND RELIABILITY

PURPOSE
BUILT

Elphinstone WR820 / WR810 Series Underground Mining Support Vehicles.



WR820 Agitator

Standard features

Cat powertrain, Cat C11 Tier 3 engine, All wheel drive, Front suspension, High performance heavy duty axles, Oil-cooled 4 wheel disc brakes, Seperate brake cooling circuit, Swing out radiator grill, Hoses and electrical harnesses bulk headed in hitch, Wheel chocks, Larger 10m³ agitator bowl including 2 x access covers and 2 x empty bowl lift points, Agitator infinite bowl controls in cab and on a manual pendant at the rear of the machine, Digital slump meter reading in cab and on manual gauge at the rear of the machine, Digital inclinometer reading in cab, Agitator bowl motor hitch hose quick couple connections, Thermal lagging material on turbo, exhaust pipe and muffler, Automatic retarder.

Optional features

Climate controlled enclosed operator station, 200L water tank with water hose reel, 300L chemical tank, Fire suppression system, Folding hand rails, Secondary steering and recovery brake release system, Rear agitator bowl access ladder and platform.



WR820 Water Cannon

Standard features

Cat powertrain, Cat C11 Tier 3 engine, All wheel drive, Front oscillating axle, Swing out radiator grill, Wheel chocks, Water cannon on extendable boom arrangement with reach of approx. 8m Boom movement - 32 degrees up, 10 degrees down, 90 degrees left and 90 degrees right from centre, Automatic boom retract function, Water cannon can slew left / right and up / down, Trimming lockout for testing the boom on remotes, Water level and pressure on remote control screen, Automatic water pump shutdown when tank empty, Water tank pump compartment and hydraulic valves easily accessible for maintenance, Manual 3" dump valve in water tank, Remote control, Secondary steering and recovery brake release system, Thermal lagging material on turbo, exhaust pipe and muffler, Automatic retarder.

Optional features

Climate controlled enclosed operator station, Fire suppression system, Hydraulically controlled collapsible height FOPS cab to obtain low profile machine, Folding hand rails.



WR820 Water Tank

Standard features

Cat powertrain, Cat C11 Tier 3 engine, All wheel drive, Front oscillating axle, Swing out radiator grill, Wheel chocks, Automatic retarder, Variable water delivery control system – varies the water output rate with ground speed to maintain a constant volume of water on the road regardless of ground speed, 3 rear water spray heads, Water level and pressure on in cab control screen, Automatic water pump shutdown when tank is empty, Water tank pump and hydraulic valves easily accessible for maintenance, Ground level fill or top of tank fill, Manual 2.5" dump valve in water tank, Thermal lagging material on turbo, exhaust pipe and muffler, Secondary steering and recovery brake release system.

Optional features

Climate controlled enclosed operator station, Fire suppression system, DPF exhaust muffler, Water cannon (joystick controlled from cab), Folding hand rails.



WR810 Agitator

Standard features

Cat powertrain, Cat C7.1 TIER 3 engine, All wheel drive with lock-up torque convertor, Three seat operation station, Tilting cab for servicing, 12" digital touch screen operator display, Swing out radiator grill, Hoses and electrical harnesses bulk headed in hitch, Wheel chocks, Oscillating hitch, 6m³ agitator bowl including 2 x access covers and 2 x empty bowl lift points, Agitator infinite bowl controls in cab and at the rear of the machine, Digital slump meter reading in cab, Agitator bowl motor hitch hose quick couple connections, Secondary steering and recovery brake release system, Reverse camera system, Electric Retarder.

Optional features

Enclosed climate controlled operator station with 24V DC aircon system, DPF exhaust muffler, Front suspension, Quick fill fluid points, Cat 7.1 Tier 4F engine arrangement, Fire suppression system, Rear agitator bowl access ladder and platform, Manual slump gauge at the rear of the machine, High pressure washdown.



WR810 Scissor Lift

Standard features

Cat powertrain, Cat C7.1 TIER 3 engine, All wheel drive with lock-up torque convertor, Three seat operator station, 12" digital touch screen operator display, Digital inclinometer reading in cab, Swing out radiator grill, Hoses and electrical harnesses bulk headed in hitch, Wheel chocks, Hinged bonnet and exhaust module, Oscillating hitch with stabilising lock cylinders, Tilting cab for servicing, Dual access ladders to either side of scissor basket, 17% levelling ability for machine via levelling cylinders, Secondary steering and recovery brake release system, Reverse camera system.

Optional features

Enclosed climate controlled operator station with 24V DC aircon system, Fire suppression system, DPF exhaust muffler, Front suspension, Quick fill fluid points, Cat 7.1 Tier 4 engine arrangement, Side-shift platform.



WR810 Fuel & Lube

Standard features

Cat powertrain, Cat C7.1 TIER 3 engine, All wheel drive with lock-up torque convertor, Three seat operation station, Tilting cab for servicing, 12" digital touch screen operator display, Swing out radiator grill, Hoses and electrical harnesses bulk headed in hitch, Wheel chocks, Oscillating hitch, 1 x 5000 L diesel fuel tank, 4 x 300 L oil tanks, Provision for 1 x grease container, Provision for 2 x 44 gal drums, Hose reel cabinet at rear of machine, Fire extinguisher in rear hose reel cabinet, Secondary steering and recovery brake release system, Reverse camera system.

Optional features

Enclosed climate controlled operator station with 24V DC aircon system, DPF exhaust muffler, Front suspension, Quick fill fluid points, Cat 7.1 Tier 4F engine arrangement, Electric Retarder, Fire suppression system.

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*Elphinstone reserves the right to change specifications without notice.
Please consult your Caterpillar Dealer to confirm details

ELPHINSTONE

Elphinstone underground support solutions

TASMANIA

ELPHINSTONE, located in Tasmania's north west, are leaders in the innovation and design of underground mining support vehicles.

The company has recently developed and released six new vehicles for this unique and demanding environment and the first production units are already on their way to North America, South America, Russia, Africa, Asia and Australia.

There are two fundamental platforms, with specialised underground attachments for different applications.

The first is the WR820 series – a 20t base platform – and the other is the WR810 series – a 10t platform.

The WR820 Series currently comprises a water cannon, an agitator (in 8m³ or 10m³) and a water tank.

The WR810 Series currently comprises a scissor lift, a 6m³ agitator and a fuel and lube truck.

The Elphinstone engineering, research and development division has an extensive program to develop new configurations for other applications and to complement the existing range.

Engines and power trains

At the heart of both platforms are CAT engines – world-renowned for their smooth torque delivery, reliability, fuel efficiency, readily available parts and product support.

The WR810 Series vehicles are equipped with CAT's C7.1 ACERT engine, which meets Tier 3 EPA regulations.

The engine delivers 158kW (214hp) net and 922Nm of torque from its 7.1-litres of displacement, at 1400rpm.

Due to their extra payload capacities, the WR820 Series machines are fitted with CAT's C11 ACERT engine, which delivers 239kW (321hp) net and 1430Nm of torque from its 11.15-litres of displacement, at 1300rpm.

By the end of 2019 there will be a new CAT Tier 4 Final engine for the WR810 platform.

Countries with strict engine emission levels will benefit from this option.

All of the engines feature CAT's proprietary ACERT technology and their ADEM A4 control module to control the common rail fuel injection solenoids and achieve emission requirements through controlled combustion, rather than via exhaust gas recirculation.

This higher level of fuel control throughout the combustion cycle not only improves emissions but translates directly into lower fuel consumption as the engines are simply working more efficiently and using less fuel.

Literally boosting each engine's performance is a turbocharger, fitted with a computer controlled wastegate that allows higher boost pressures to be brought in earlier in the rev range to increase useable bottom-end torque.

Backing up that power in the WR810s is a five-speed (three-speed reverse) transmission fitted with a lock-up torque converter.

The WR820s are fitted with a six-speed (single speed reverse) power shift transmission, also with a lock-up converter which stops converter slip under certain load and rpm conditions (such as empty return), when torque multiplication is not required, to increase road speed and reduce fuel consumption.

Serviceability

Downtime during service and maintenance is dramatically reduced on all Elphinstone vehicles through some clever engineering and design features incorporated with service personnel in mind.

Large, hinged engine enclosure doors make servicing easy and fast, as do removable floor and side plates.

Quick-change air filters and 500-hour oil service intervals also reduce downtime and keep machines in operation longer for greater productivity.

A centralised onboard service centre includes fast fill and evacuation points and points to take uncontaminated fluid samples for analysis.

The 24V electrical system features colour-coded wiring circuits with individual circuit breakers.



WR810 Scissor Lift Specification snapshot:

GVM* 23,400kg
Rated capacity 5,000 kg AS1418.10 Group A, Type 1
Rated capacity 4,000 kg AS1418.10 Group A, Type 2
Platform size 2,400mm wide x 4,000mm long
Engine model: Cat C7.1 ACERT
Gross power: 168kW (228hp)
Articulation: 42.5-degrees
Tyres: 14.00 R20
**Approximate only. GVM dependent on product configuration*



WR810 Agitator 6m³ Specification snapshot:

GVM* 29,400kg
Payload 12,550kg
Engine model Cat C7.1 ACERT TIER 3
Gross power SAE J1995 168kW/228hp (Cat C7.1 ACERT TIER 3)
Articulation 42.5-degrees
Plant mix mode agitator bowl speed 0-19rpm
Transit mode agitator bowl speed 0-6rpm
Tyres 14.00R20
**Approximate only. GVM dependent on product configuration*



WR810 Fuel & Lube Specification snapshot:

GVM (TBC)
Engine model Cat C7.1 ACERT TIER 3
Gross power SAE J1995 168kW/228hp (Cat C7.1 ACERT TIER 3)
Articulation 42.5-degrees
Tyres 14.00R20



UG20K Motor Grader Specification snapshot:

GVM* 15,000kg
Engine model Cat C7 ACERT™
Gross power SAE J1995 108kW/145hp
Frame articulation left/right 20 degrees

Steering range left/right 47.5-degrees
Turning circle inner/outer 60"/227"
1524mm/5766mm
Width over front tyres 96.4"/2449mm
Tyres 14.00 x 24 Triangle 12 ply E2 Tubeless
**Approximate only. GVM dependent on product configuration*

All wiring is double-insulated, sealed to keep out dirt and moisture and covered with fire-resistant material.

An on-board diagnostic system continuously checks all critical machine functions for early warning and fast fault finding, with all data recorded for analysis.

Maintenance, technical assistance and access to spare parts is simplified through the worldwide Caterpillar dealer network and the Elphinstone product support team.

Safety

Safety is one of the most important aspects of any piece of machinery employed in the mining world.

All WR810 and WR820 vehicles feature anti-skid deck surfaces; three-point access to cab and machine; retractable seat belt; steering frame lock; hinged belly guards; ceramic coated exhaust manifold and turbine housing; triple insulated battery cables; fuel water separators made of non-flammable material; firewalls and heatshields; machine interlocks; a centralised isolation point (engine disconnect switch, starter isolation switch, jump start receptacle and fire system activation if fitted); and an optional integrated fire suppression system.

Integrated into the operator station is a ROPS/ FOPS (Roll-Over Protective Structure), ISO 3471:2008, (Falling Object Protective Structure) ISO 3449:2005 that offers protection to the operator.

Operator station

In addition to the safety features mentioned, the operator stations can be optioned as fully enclosed and climate controlled if required.

Various seat options are available from a mechanical suspension seat to an active suspension seat for premium operator comfort.

The WR810 operator cabin has been designed to seat three people in comfort and with exceptional visibility.

Operator training is simpler and safer with the trainer positioned next to the operator.

In the working environment, a three-seater cabin allows for the complete crew to go collectively rather than deploying an additional light vehicle for personnel transport.

The transmission control for forward, reverse

and gear range is conveniently located for the operator's right hand.

The machine controls are ergonomically designed and positioned allowing the operator to control machine functions with minimal effort, resulting in greater concentration on vehicle operation, with reduced operator fatigue.

An engine protection system is fitted that will shut down the engine if low engine oil pressure, low coolant level or coolant over-temperature conditions are experienced.

Conveniently located and easy-to see gauges and displays make monitoring machine systems as simple as possible.

The system continuously provides critical machine data and a three-level warning system alerts the operator of any abnormal conditions.

Grade control

Elphinstone identified an opportunity to expand its growing range of underground support vehicles by including a haul road maintenance vehicle, based on the Caterpillar 120K and 120M surface grader platforms.

The key role of the underground grader is to create a safe, consistent access throughout the underground tunnel network, ensuring all production, support and light vehicles can move freely in a safe and controlled manner with optimal efficiency.

The added benefit is the improvement to the production equipment tyre life due to well-maintained haul roads.

Elphinstone initially acquired the IP for the UG20M and UG20K underground graders from Ground Force, before further refining and customising these existing platforms to ensure compliance and performance in the harsh and demanding underground environment.

In addition to Elphinstone's leading operator safety and ergonomics features, a robust rear guard is installed to provide rear protection to the machine itself and the front of the machine features a counterweight for machine balance.

Operation and manoeuvrability are enhanced via an optional shortened gooseneck frame and mouldboard resulting in improved turning radius with the standard articulation features of the grader.

Mouldboard lift cylinders and exhaust have been redesigned to a low-profile configuration.



WR820 Water Tank
Specification snapshot:
GVM* 42,631kg
Water capacity 16,000L
Engine model Cat C11 ACERT
Gross power SAE J1995 242kW/325hp
Articulation 42.5-degrees
Tyres 18.00 R25
**Approximate only. GVM dependent on product configuration*



WR820 Water Cannon
Specification snapshot:
GVM* 38,775kg
Water capacity 8,200l
Engine model Cat C11 ACERT™
Gross power SAE J1995 242kW/325hp
Articulation 42.5-degrees
Water pressure approx. 150psi
Water flow approx. 2,700l/min
Water cannon nozzle size 38mm (1½")
**Approximate only. GVM dependent on product configuration*

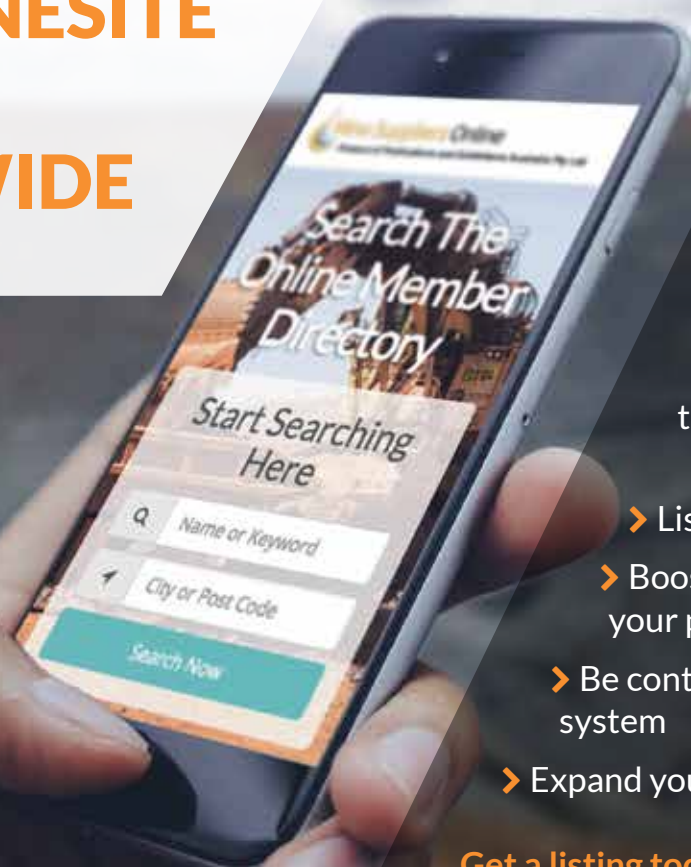


UG20M Motor Grader
Specification snapshot:
GVM* 18,000kg
Engine model Cat C7.1 ACERT™
Gross power SAE J1995 108-141kW/145-189hp
Frame articulation left/right 20-degrees
Steering range left/right 47.5-degrees
Turning circle inner/outer (shortened wheelbase) 63"/235" 1600mm/5969mm
Overall length (shortened wheelbase) 320"/8128mm
Width over front tyres 98.9"/2511mm
Tyres 14.00R24 Bridgestone VUT * L2 Tubeless
**Approximate only. GVM dependent on product configuration*



WR820 Agitator
Specification snapshot:
GVM* 50,095kg
Payload 24,000kg
Engine model Cat C11 ACERT™
Gross power SAE J1995 242kW/325hp
Articulation 42.5-degrees
Plant mix mode agitator bowl speed 0-19 rpm
Transit mode agitator bowl speed 0-8 rpm
Tyres 18.00 R25
**Approximate only. GVM dependent on product configuration*

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Geomembrane with seam control

NATIONAL

THE new innovative Teranap TP Control was the first bitumen geomembrane with integrated seam control system.

The same BMI Siplast Teranap quality now has seam control technology, with the control channel embedded in the geomembrane and located in the middle of the weld melting zone.

When the overlaps and welds are completed, the channel becomes fully encapsulated between the two layers of the membrane.

Leak detection is carried out after the welding of Teranap TP rolls. The tracer gas is injected at low pressure into the channel, and will spread along the geomembrane's welded channel, finding all possible escape routes.

The detector is able to quickly locate the leak with high precision alerting the operator to possible issues.

Not only is leak detection easy, it's fast and reliable and precise – with non-destructive control.

Teranap Control BGM provides peace of mind for the specifier, designer and client, knowing that the project is water-tight before commissioning.

About BMI Siplast

Siplast was founded in France in 1955, and quickly became a technical leader in the waterproofing business by creating the first SBS modified bitumen blend in 1965.



For more information visit: www.geotas.com, www.teranap.com.au, or www.siplast-international.com.

After years of experience in the building industry, Siplast created the bituminous geomembrane for the mining industry, with the first production and installation of Teranap TP in 1976.

In 2010, Siplast began supplying Teranap TP bituminous geomembrane to Australia with canal lining solutions, followed by dam liners for containment.

In 2017 Siplast joined the BMI Group, with 35 bituminous manufacturing plants across Europe, and around 160 plants in the world.

The Siplast plant in Mondoubleau, France, is the home of the Teranap TP Geomembrane.

Civil engineering wholesale supplies and design

Geotas is Teranap's distributor in Australia, having stock in WA and Qld for easy transport to site.

Geotas has been supplying advice and materials since 1985 for contractors ranging from small landscaping projects to major Federal, State and Local government funded civil projects, including all of the major dam and waste cell lining projects in Tasmania.

Come and see GEOTAS at the AIMEX Exhibition, August 27-29, at stand R140 where the first BGM with welded seam control technology will be presented.

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Precise leak location - Non-destructive control

Come and see us at the AIMEX Exhibition 27th – 29th of August at stand R140 where we will be presenting the first BGM with Welded Seam Control Technology.

BMI

Siplast



Contact: 03 6273 0511
www.geotas.com
www.teranap.com.au
www.siplast-international.com



Nitro Sibir has built its reputation on strong customer relationships.

No sawdust in the sausage

NATIONAL

SINCE its inception in 2012, Nitro Sibir has worked in partnership with its clients to deliver a comprehensive range of market-leading products backed by a highly responsive client — focused and 'safety first' culture.

The company continues to diversify its service offering and expand its geographical presence, and its capability continues to broaden.

This currently includes projects for key clients across the gold, lithium and bulk commodities sectors, where Nitro Sibir provides value-adding services both in the underground and open cut market.

Nitro Sibir business development manager Christine Everett said that the company was focused on being proactive in managing major projects while maintaining the required flexibility to respond quickly to client needs.

"Our approach is all about flexibility," she said.

"Our approach encompasses the modern relationship and the traditional model.

"The way we work is integral to deliver our services to standards above industry expectations and to constantly challenge ourselves to drive continuous improvement in safety and innovation."

Nitro Sibir Australia supplies only low water content bulk emulsion as a standard, Polar SX.

"This product delivers maximum energy at a standardised price, and it is the most cost-effective, energy-efficient solution to mining operations for the breakage of rock," Ms Everett said.

Its unique formulation has the added benefit of reducing fume events, and it is offered in a range of blends that make explosive selection for specific geologies highly effective, and for underground mines it is oxygen-balanced.

"Our difference lies in the product formulations — we will not 'add sawdust to the sausage'," Ms Everett said.

"Everything in our product formulation is designed to improve its effectiveness rather than reduce cost."

Nitro Sibir Australia is focused on maximising explosive energy in all products, which enables customers to focus on the blast productivity of the selected blast parameters, rather than trying to work out whether they need to spend more money to get a premium bulk explosives with lower water content.

With the low water content Polar SX bulk explosives blended explosives, clients have realised that by using lower density bulk explosives, they can achieve the same results in fragmentation and blast movement at a 1.05 gcm-3 cup density, compared to other explosives suppliers' bulk explosives blends at 1.15 gcm-3 cup density, leading to a 9pc savings in bulk explosives volume.

To achieve these benefits the client must move away from a powder factor determined set of pattern parameters and use a MJ / BCM energy calculation.

"This optimisation can only be performed where the explosive supplier is open and honest with the client and, if required,

allowing the client to independently verify water, oxidiser and fuel contents to enable accurate energy calculation of the formulation," Ms Everett said.

Ammonium nitrate emulsion (ANE) formulations can significantly vary due to water content, which is dependent on suppliers, from 16pc to 24.5pc if carting on a public road.



The GL and SQ series diesel generators keep sites operational even in the event of unexpected power outages.



Nitro Sibir Australia supplies only low water content bulk emulsion as a standard.

Water adds no energy to bulk explosives, but is required for melting of the ammonium nitrate and blending with the fuel to create a water proof explosives.

The difference between an energetic (16pc water) and a really economic (24.5pc water) bulk ANE is an addition 8.5pc water, which adds no energy to the bulk explosives, it reduces the fuel and oxidiser (explosives) component of the bulk explosives.

The difference in the field

Nitro Sibir specialises in blast design review, and has been working to improve wall control blasting results, as well as targeting improved crest retention and selecting optimal product parameters.

This allows for the detailed analysis of current blast design results, and the provision of detailed recommendation by a blasting consultant to improve the results.

It has also demonstrated improved crest retention through quality control, suitable blast parameters and explosives products.

Nitro Sibir Australia has an ongoing research and development program and the team is constantly researching new products that can deliver improvement on site.

Looking to the future, Ms Everett said that the company was working on increased energy Python Presplit specialised wall control packaged explosives.

“It is a specialised high-energy presplit that enables the user to reduce the explosive



Nitro Sibir is a specialist in blast design review, and constantly works to improve wall control blasting results.

weight required to be lowered into the presplit blast hole, compared to a standard presplit packaged explosives,” she said.

“For example, a 29mm product due to higher energy formulation will have the same or greater energy than a 32mm diameter product.

“This achieves similar result for a lower charge weight and less physical strain on users.”

Nitro Sibir works in partnership with its clients to deliver innovative, industry-leading solutions.

The company has built its reputation on valuing strong client relationships over short-term profit, and as a result the company has thrived.

“We believe that the right products are developed and improved through

collaboration and a thorough and in depth knowledge and understanding of the blasting challenges that are unique to each site,” Ms Everett said.

“After listening to our clients and understanding their requirements, we then apply our skills and experience to tailor a product and service that addresses their identified needs.”

MORE INFORMATION: Nitro Sibir | 08 9022 3821 | christinee@nitrosibir.com.au | www.nitrosibir.com.au



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ACCENTURE EMERGING TECH MANAGING DIRECTOR (ANZ) HARSHU DESHPANDE

As the mining industry moves toward circular economies and the 'Triple Zero' paradigm, a whole suite of emerging technology is set to change the way miners do business in the future. Gerard McCartney spoke with Accenture Liquid Studio lead for emerging tech and open source lead (ANZ), Harshu Deshpande, about the emerging tech at the vanguard of the post-digital age – from the Industrial Internet of Things (IIoT), to AI, machine learning, AR, VR, quantum computing and the need for sophisticated encryption that can protect data from a quantum threat.



Harshu Deshpande helps clients launch new products, services and ventures to market utilising emerging tech across a number of industries.



The transition to a circular economy will be founded on the triple Zero principles of zero harm, zero loss and zero waste.

Q. What is a circular economy and how is it disrupting the industry?

In the mining sector there is a drive towards achieving what we call 'Triple Zero'.

These are: zero harm which refers to worker health and safety, cyber security and social trust at an organisational level; zero loss which is end-to-end value chain optimisation and ROI for capital projects; and zero waste which is recycling, recovery and value from waste such as waste water, carbon neutrality, creating value for waste products. The transformation to a circular economy has to be linked to these outcomes by leveraging advanced technologies to achieve a steep change in productivity, safety and climate or waste.

This represents a very different future where mining can sustain the creation of new cities and improve the standard of living for communities.

What we are starting to see, as consumers are becoming more savvy, is that they are demanding it all the way through the supply chain.

Circular economy really goes to the heart of two things: one is that consumers now have the expectation that you will reduce any kind of waste in the entire life cycle from the point of, for instance, taking the minerals out of the ground through to the end consumer product, and the consumer expects that all the parts and components can be used and reused and bought back into the ecosystem.

The second part of it is making sure that you're getting to the heart of the waste, so you're not trying to produce products and services that aren't going to be used at the end by the consumer.

In mining that could be on-demand mining for a specific product so that you're not stockpiling resources ahead of demand.

If we can forecast demand to the point where you know exactly when it's required, you can produce it from mine through to the end product on demand.

Q. How far along is the mining industry to realising a fully circular transformation?

It is a multi-year journey, and we're at the very beginning of that.

We like to think of it as a digital transformation story, but we've come to realise that digital isn't the end game.

We are starting to optimise and transform parts of business, but what's missing now is the end-to-end ability to string together the entire supply chain from mine to end product for a customer.

What we're finding is that we have pockets of automation happening, pockets of digitisation happening across different industries, but we don't have it working across an entire organisation, or across organisational boundaries.

I think that is the next big step we will see business start to adopt.

Q. Who are the leaders in this circular economy space within the mining industry and what are they doing?

More than 70pc of Rio Tinto's electricity consumption is already from renewable energy sources.

Glencore has more than 50 years of recycling history, and is one of the world's largest recyclers of electronics and a major recycler of secondary copper, gold, silver, platinum and palladium.

Vale is repurposing iron ore tailings into engineered stone, turning waste into new value.

And Anglo is working towards recycling or re-using water to meet 75pc of its global water requirements.

Its intent is to operate waterless mines in water-scarce areas.

It wants to eliminate fresh water from usage from mining processes – and to eventually achieve a near-waterless mines.

Q. What is the post-digital age and what will it look like for the mining industry?

What we are starting to see is that digital is no longer a differentiator.

If you are in business, you are effectively a digital business.

In the past, we were focused heavily around SMAC (social media, mobile, analytics and cloud).

But we are starting to look at the next set of technologies.

We are starting to see the next wave of technology come about, which will bring the next level of innovation or digital transformation and those are DARQ and DoT – a set of super technologies, with blockchain AI and machine learning, augmented reality and extended reality, and quantum computing.

Right now we are seeing people do things at the very peripheries – they may have created a better employee platform, or an end product, but the entire supply chain isn't yet automated.

Q. Where are we in this transformation?

Algorithm is king. Whoever has the best algorithms creates the best efficiencies and therefore gets the highest profit margin.

In the past we were doing lots of data mining and analytics on top of static data, but we had nowhere to take the algorithms and test them out, except the field, and that's not always possible or feasible.

If you look at AI machine learning at the moment, the current way to develop new algorithms is that you need a simulated environment.

You need to simulate all the "what if" scenarios to test these algorithms over and over again in a confined environment where you can control all the variables.

The only way to do that right now is to create really physically rich or immersive environments.

The way you do that is to use AR or VR to create simulated environments where you can create and train your algorithms over and over again.

You can use those technologies in combination to create the next set.

Q. What does a post-digital mining industry look like?

If you look at something like DoT, AI and quantum computing, the big factor going forward is data security.

The big challenge with sharing data is making sure that it is quantum proof.

Quantum computing will allow people to break current encryption methods.

Even sharing data now, with current encryption methods, quantum computing may be able to go back in time to decrypt data that was encrypted using today's mechanisms.

No one wants to share data but if you combine DoT, which allows you to trace data for its entire life cycle, use the new set of AI machine learning tools available in the cloud to create these new types of algorithms, and finally quantum computing, you can take data sharing to a whole new level.

In Australia we are using a world-leading method called 'homomorphic encryption' and that takes those three technologies and puts them together.

Essentially, organisation A and organisation B both have valuable sets of data, and they don't want to share it with everybody, so homomorphic encryption can create new mathematical techniques to share that data, keep it secure, and also combine the data set between the two and really create something new.

And then there is the IT to Industrial Internet of Things (IIoT) conversion.

The mining industry is doing a lot of IIoT work going forward and there is an emerging aspect of it.

So, as more and more devices become connected to the internet, there is a whole security aspect that is starting to become challenging.

We're now starting to see digital transformation go beyond IT landscape in the mining industry and out into the field with the operational landscape as well.



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Looking Forward **VEGA**



With a background of over 30 years in the industry, Jetcrete Oz Pty Ltd has extensive experience in all aspects of concrete spraying and specialist ground support services. An ISO accredited company, Jetcrete operates in over 19 sites across Australia. The company is capable of providing a wide array of services from remote site concrete supply, underground/surface shotcreting, underground/surface civil construction, shaft lining, cable bolting, and strata consolidation via resin injection.



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