



December 2020 Newsletter

Forge

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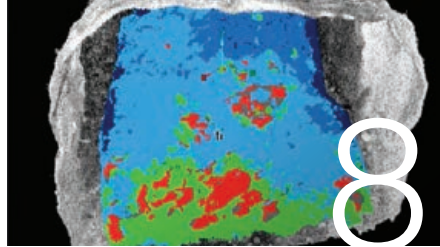
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Welcome to our Forge newsletter December 2020



As we look back on 2020 it's important to celebrate all we have achieved. We made it!

In the next 5 to 10 years mining will see a massive consolidation of automated tasks, supported by data analytics and storage generation in near real time. The uptake of 5G technology will allow the adoption of this type of development and access to its benefits.

At Maptek we're focusing our efforts on smart, dynamic geospatial data systems that close gaps in the mining execution chain. Examples include live material tracking and reconciliation systems that support business improvement by delivering data in-shift where it can be acted on.

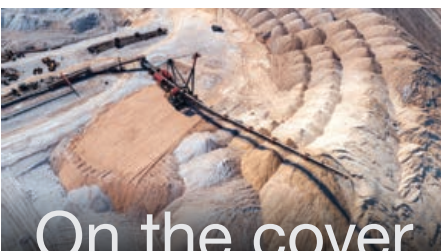
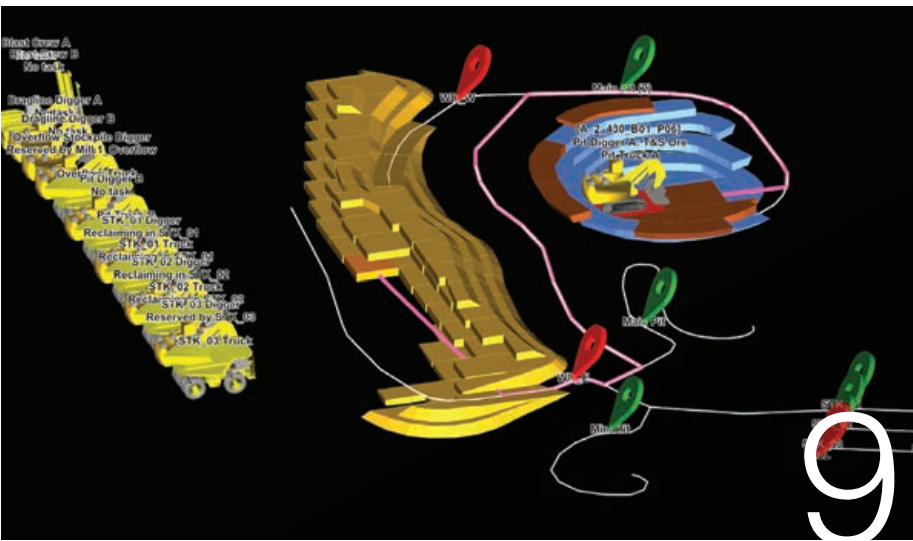
Operations benefit from maximised productivity and utilisation, increasing their material throughput and running more reliable, efficient schedules.

This year we refreshed our long-term strategic plan to guide our technology roadmap to 2025 and beyond. In 2021 we will continue to collaborate with partners to identify spaces in which to invest in innovation.

Wishing our colleagues, customers and industry partners a safe holiday period.

We hope you enjoy this issue and welcome your feedback.

Eduardo Coloma
CEO



On the cover

New Maptek technical data systems enable real time material reconciliation across the mining value chain

Contact us: forge@maptek.com

Smart material tracking

Maptek™ Resource Tracking is a business improvement system that provides a single source of truth for material movement reconciliation.

The established process of mine operations reporting often sees results delivered after the fact. This leaves no room to react and adapt plans as circumstances change. Mining is such a dynamic environment that failure to act quickly can cost millions.

Maptek™ responded to the obvious need for a proactive approach to reporting with a new live material tracking tool. Maptek MaterialMRT allows informed decisions to be made in-shift, where and when they can make a real difference.

Maptek Group Product Strategy Manager, Mark Roberts says the new smart resource tracking and modelling solution closes gaps in the mining value chain.

'MaterialMRT provides quality and quantity control of discontinuous material flows from in situ rock to run-of-mine stockpiles and feed into the plant,' Roberts said.

MaterialMRT connects the resource model, short-term mine schedules, fleet management systems, survey data and feed quality analysers.

Material quantity and quality delivered should match what was planned. Access to current information around available material makes this possible.

MaterialMRT dynamically tracks compliance to plan, reporting on how well the schedule is being met, and whether there are any unplanned movements of material.

Enabling informed decision making at critical stages allows mines to optimise recovery, and accurately reconcile with the strategic mine plan and resource model.

Material movement from pit to plant via the ROM is usually by truck and shovel. Information from the block model is typically lost at this stage, impacting the bottom line.

Roberts highlighted other challenges facing operations, including poor plant utilisation and product quality; lack of optimisation, dump and rehandle compliance checking; poor resource model reconciliation and inefficient stockpile management.

'MaterialMRT uses variable composition to model stockpiles, so material parcels carry the block model values right through the mining chain,' he said.

This fine-grained data modelling sets the Maptek solution apart from incumbent weighted average systems improvised using spreadsheets. MaterialMRT rapidly enables changes to be easily auto-adjusted, manually corrected, verified and approved, with an audit trail back to the raw values relevant to tonnes and grade.

When more up-to-date information becomes available it can be correlated and presented live to deliver meaningful insights and support value in-use decisions to address issues before it is too late.

'MaterialMRT therefore becomes a tactical planning tool for geologists and engineers. They control their per-shift reclaim and blending profiles to optimise feed into the plant, and can confidently deliver on final product, on time, every time,' Roberts said.

'All stakeholders and management, from mine site or corporate office, can now identify and quantify the variability of material as it progresses through each stage of mining.'

Measuring and validating actual material movements at every stage during a shift is essential to better plan and manage material movement.

MaterialMRT consists of a cloud ready centralised server, web-based user interface and a database optimised for storing arbitrary time series geospatial data. Live dashboards and reports deliver high visibility to easily identify trends within mining processes.

The Maptek MRT services extend into the beneficiation process and stockpile management through additional capabilities in PlantMRT and StockpileMRT.



Underground scanning at Fosterville

Maptek™ mine measurement solutions are helping geology and geotechnical engineering teams save time and monitor safety at an underground gold mine.

Kirkland Lake Gold is a growing gold producer operating in Canada and Australia that produced 974,615 ounces in 2019.

Kirkland Lake Gold's production profile is anchored by the Macassa Mine and Detour Lake Mine in Northern Ontario, Canada and the Fosterville Mine in Victoria, Australia.

Located about 20km from Bendigo, Fosterville began operating in 2005. The underground mine has benefited from Maptek™ technology, including SR3 laser scanners and PointStudio™ software.

The geology team uses two laser scanners, mainly for structural mapping and identifying structures.

'They primarily focus on scanning the ore drive development headings and then analyse the data and do the mapping in PointStudio,' said Fosterville Project Rock Mechanics Engineer, Corey McKenzie.

The Maptek SR3 is a dedicated underground laser scanner, with a scan window of 130° vertically and 360° horizontally for capturing roofs and walls in tunnels and underground drives.

With fast accurate sensing and tailored mount accessories, the SR3 can be operated remotely from any web-enabled device and combines well with PointStudio modelling software for improving overall productivity and safety underground.

'PointStudio has a lot of neat tools. Smart Query is useful for extracting joint set data, and the Distance for Objects feature can be used for fibrecrete thickness analysis,' McKenzie said.

The geotechnical team uses ZEB scanners for convergence checks and is excited about the potential of Maptek workflows to streamline and save time in convergence monitoring.

The Workflow Editor incorporates software menu items, command line executables and scripting capabilities with Maptek Workbench tools and custom components to automate processes.

McKenzie commented that cloud to cloud comparison using laser scan data in PointStudio is all about safety.

'We want to know if the walls or backs are moving. If we notice a spot that's starting to deform we scan it more regularly so we've got that constant update of data and can track how it's moving and the rate of deformation. We can then make decisions about rehabilitation. And we also need to know when our ground support capacity is going to be consumed,' he explained.

When PointStudio was introduced at the site this year, McKenzie found it relatively easy to learn, appreciating the visual layout of the options along the top ribbon.

The geotechnical team is looking to expand its usage of PointStudio, and expects that the new scanline mapping tool in the latest version will be helpful for rockmass classification purposes.

'We're just starting to explore the geotech/rock mechanics aspects,' McKenzie said. 'Maptek is always willing to answer questions.'



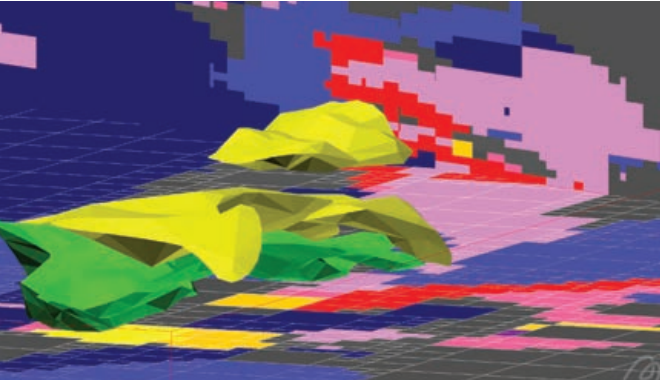
The site recently completed a trial of Maptek monitoring solution Sentry.

'Now that we've tested Sentry and know its capabilities, we'll be confident down the track if there's an area that we want to monitor more closely,' concluded McKenzie.

*Thanks to
Corey McKenzie
Project Rock Mechanics Engineer
Fosterville Gold Mine*

Data driven geology

Technological advances have matured machine learning to a point where it can be readily and practically applied by solutions such as Maptek™ DomainMCF.



Maptek™ DomainMCF uses machine learning to translate geological data into resource models in dramatically less time than traditional methods. This approach is transforming the way we think about our data.

Digital transformation requires data analytics. To drive your operation from these analytics, you need to adopt a data-driven culture. Not just you, your team or your site, but the entire company needs to embrace change to benefit from transition to digital systems.

This requires making systems which are robust, repeatable and independent of who operates them. It requires moving away from a traditional hierarchical way of working to a more distributed model. From a data point of view this can be termed the democratisation of data.

Democratisation of data

Maptek Senior Technical Sales Specialist and Technical Lead – DomainMCF, Steve Sullivan considers the changing nature of the workforce means this shift in mindset is critical to success.

‘When I started my career in the 1980s at a smallish mine there were about five levels of geologist,’ Sullivan said.

‘That hierarchical structure has changed. With people moving around more we’ve lost continuity and consistency of thought.’

A data driven approach links and automates geological processes to provide an up-to-date single source of truth for an operation, liberating all geologists to analyse the results.

Computers are now doing a lot of the back end and tedious work, which frees people up to do more analysis and higher level thinking.

This paradigm shift has been made possible by recent technological advances, particularly the maturation of machine learning to a point where it can be readily and practically applied by solutions such as Maptek DomainMCF.

Ten years ago geologists could still do all the geological processes manually but it would take days or weeks. People today don’t have the time to manually generate different scenarios to consider.

Machine learning techniques and fast computers help geologists come up with 10 scenarios within an hour, evaluate those scenarios and choose one that is optimal for their operation.

Cloud computing has also made this approach more practical as there is no need for the capital outlay or maintenance costs – companies can just pay for computer time.

Safety and economics

The key benefits of the data driven approach are safety and economics. Safety is always going to be the highest concern, but what does that really mean?

‘In any open cut mine, geology determines whether the walls will stay up, and underground whether drives will stay up, so there’s a huge safety imperative around understanding your geological structures,’ explained Sullivan.

‘The geology is unchanging, it’s our perception of the geology that changes as we get more information.’

Without proper knowledge of the uncertainty in a model, value can also often be over or underestimated.

In a recently reported case a \$140 million dollar loss of value to the shareholders arose from overestimation.

A data driven approach removes much of the personal geological bias and makes for a consistent process.

Maptek stresses the importance of validating data and building interpretation parameters into the process that meet an operation’s unique requirements.

Every site has slightly different geology, so the architecture must match the individual workflows.

‘Preparing for a data driven approach requires thinking, planning and analysis – and time. Early adopters can reap the benefits of Domain MCF right now,’ concluded Sullivan.

Gold standard licensing

Shandong Gold has standardised on online licensing for Maptek™ software to enable access to secure design and modelling tools for its large workforce.



Shandong Gold in China has increased its Maptek™ Vulcan™ software usage and transitioned from dongle and internal network access to Maptek Account licensing.

By October 2020, 561 users were logging into the unified application environment to run Vulcan.

Maptek Account streamlines software access, with borrowing and fail-safe modes for working offline. Simplified deployment and management extends to release updates.



Shandong Gold can view and manage software usage within the user base, with improved transparency around reporting and tracking support cases.

Mining businesses benefit from standardising providers and interfaces across their operations and regions.

As the impact of COVID-19 began to be felt, the advantages of online licensing for a large geographically dispersed business like Shandong Gold became apparent.

More than 500 Shandong Gold staff from 30 operations completed online introductory Vulcan training delivered by Maptek reseller Pioneering Inc. during 2020.

Vulcan is available in multiple languages, including Chinese, facilitating uptake of the design and modelling tools.

Feedback from the training, implementation and usage helps guide ongoing software development.

For example, one of the outcomes of the customer-developer relationship has been refinement of CAD tools to facilitate a more automated, integrated design approach.

Maptek Account licensing works where you do

Customers who have transitioned to Maptek Account licensing are embracing the 'work from anywhere' model that matches business conditions and supports flexible staffing arrangements. Advantages include adaptable licensing options and simplified software deployment for all Maptek applications in a single location.

Maptek Account also provides the gateway to an advanced extension toolkit that expands the capabilities of Maptek applications. With a Maptek Extend licence, customers can access packages and materials including the Workflow Editor, application programming interfaces (APIs) and software development kits (SDKs) in Python and C#/.NET.

Self-register for free at account.maptek.com

Benefits for Users	Benefits for Businesses
Convenient access to licences anywhere, anytime	Standardised licensing across sites and regions
Streamlined licence provisioning	Elimination of the need to trace dongles
Fail-safe mode protects work during intermittent internet connectivity	Better management of software seat allocation and usage
No more hassles arising from lost dongles	Unified software download and distribution
Context-aware support for quick resolution of issues	Customised spans for licence borrowing and inactivity timeouts

Fragmentation solutions

Improve mining performance by quickly producing accurate and detailed fragmentation analysis from 3D point clouds.

Maptek™ fragmentation solutions allow users to improve digger and haul fleet productivity, crusher throughput and overall blast performance by quickly producing accurate and detailed fragmentation analysis from 3D terrestrial or photogrammetric derived point clouds.

Powerful and accurate fragmentation analytics improve productivity and performance from mine to mill. Blasting costs, schedule conformance, dig rates and crusher performance are all affected by fragmentation. Tracking fragmentation metrics on a blast by blast basis can help to understand blast design parameters and the impacts they are having on your mining performance.

Maptek software handles point cloud data of various file formats, and allows integration with third party acquisition devices, such as drones and UAVs.

Two analysis solutions are offered and enabled with Maptek™ PointStudio™ software – Fragmentation Analysis, and the machine learning FRAGx solution in collaboration with PETRA.

Spatial analysis

Fragmentation Analysis generates a detailed PDF report on the classification of particle rock sizes, including a table of percentage values to size passing sieve with a corresponding S-curve graph.

Users can quickly view coloured particle rock sizes in 3D, making it easy to characterise any that are not correctly defined.

This approach uses spatial analysis techniques to identify rock sizes, eliminating the need for scale bars in the scene and other perspective effects that may influence 2D image-based fragmentation solutions.

The solution is suitable for anyone with high quality point cloud data from terrestrial LiDAR or UAV LiDAR.

Using PointStudio, 500,000 points can be processed in approximately 4 minutes, with speed dependent on the volume of input data.

Powerful combination

Maptek PointStudio and PETRA FRAGx capabilities combine to enable powerful machine learning fragmentation analysis on a variety of point cloud types.

FRAGx leverages the power and speed of AI by training models for a particular dataset and giving greater data clarity.

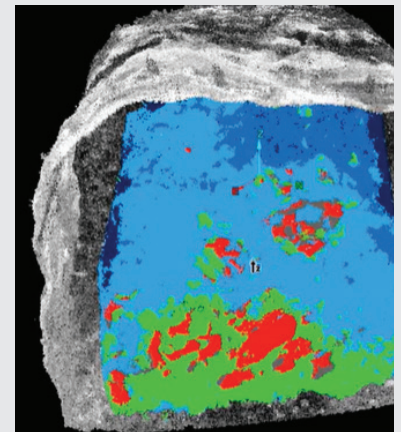
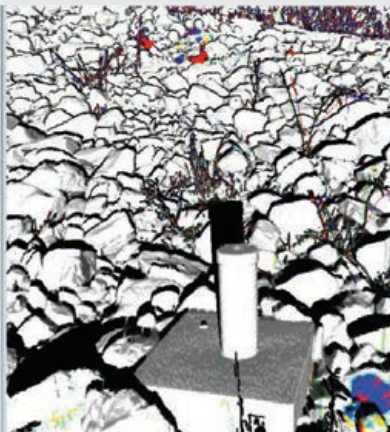
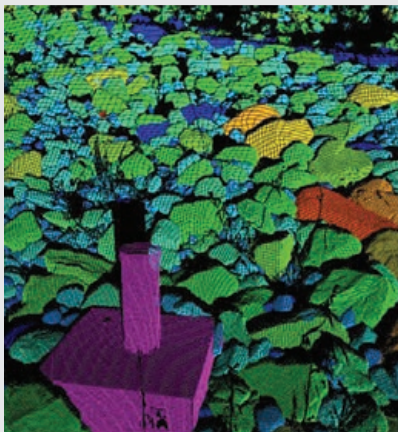
It works reliably, even on the distorted, noisy or lower precision point clouds often associated with underground working areas.

'FRAGx 3D fragmentation assessment removes people from harm's way by automatically scaling and providing accurate analysis for hard to access areas such as underground drawpoints and open cut cast blasts,' said PETRA CEO Penny Stewart.

'Additionally, unlike traditional photography-based delineation techniques, there is no need to manually correct the fragmentation assessment,' Stewart added.

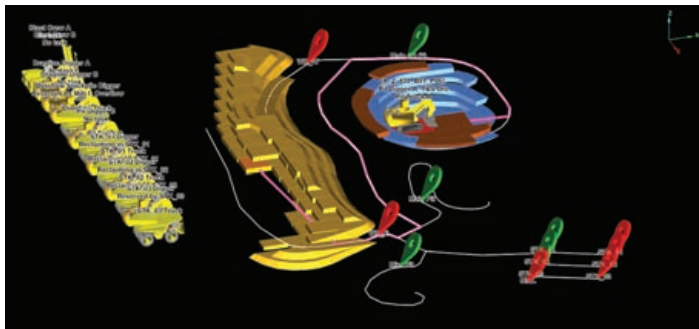
Mine staff tasked with managing fragmentation for blast optimisation, haulage, wall stability or mine to-mill improvements can access the Maptek solutions.

The 3D visual assessment approach is supported by predictive blast analytics offered in Maptek BlastLogic™.



Efficient equipment allocation

Optimisation solutions help planners trade off timelines for schedule completion against available equipment resources.



Visual insights into equipment allocation with Evolution Epoch



Compare results from Resource Levelling Allocation runs

Mine planners know the challenges of choosing tasks for a given piece of mining equipment. What looks like the best assignment now could have an unwanted knock-on effect later in the schedule.

Unintended consequences of poor selection can include long periods of inactivity for expensive equipment waiting for a task to be available, or diggers assigned to a task that could be done more efficiently by other equipment.

The issues stem from not being able to look ahead to see if the current activity selection would result in poor resource utilisation further down the track.

Idle machinery is effectively burning money – studies show that unexpected downtime can cost tens of thousands per incident.

Avoiding unnecessary equipment downtime when scheduling has always been easier said than done – until now.

Maptek™ Evolution Epoch was released in 2019 as a user-controllable interactive short term activity scheduler using genetic algorithms. A genetic algorithm is an optimisation technique that mimics natural selection to solve complex optimisation problems

Epoch can be configured to provide any level of detail for schedulers.

Now, the Resource Levelling and Allocation (RLA) tool provides a set of equipment allocations to inform Epoch which equipment should be assigned to which task. Equipment is therefore assigned to tasks that it works most efficiently in.

This maximises productivity and utilisation, increasing throughput of material and resulting in a shorter overall schedule.

Maximising resource utilisation is one of the primary objectives for any short term planner. However, on any site, there are many interdependent systems that impact equipment availability and usage.

'The resource allocation process has historically been very time consuming, even for experienced engineers,' Evolution Team Lead Luke Berry said.

Automatic downrating of equipment and automated secondary equipment allocation were introduced in Evolution 2020.

'While the allocation of primary equipment was a manual step, downrating removed the potential to over-allocate equipment and secondary equipment allocation ensured production was maximised,' said Berry.

'Now that Maptek has signed off on RLA, users will gain automated levelling and allocation of resources that maximises equipment usage, ensuring output remains high, while minimising downtime.'

Resource Levelling Allocation is a cloud-based service like other Evolution optimisation processes.

After configuring an Epoch setup, users simply upload the job for processing and the results are delivered in minutes.

Maptek welcomes industry feedback on the new Resource Levelling Allocation tool.

Resourcing the future

Maptek™ recognises industry excellence in digital mining practices and supports vocational survey training.



Women in Resources award

Inaugural Maptek™ Women in Resources Technological Innovation Award winner Larnie Mackay is driven to provide a better future for underground coal miners.

Maptek CEO Eduardo Coloma said Larnie perfectly embodied the spirit of the award.

The Underground Digital Transformation Project Lead at Anglo American Metallurgical Coal claimed the new award in September as part of the BHP 2020 Women in Resources National Awards.

Mackay, who is based at Moranbah North mine in Queensland, was recognised at the awards hosted by the Minerals Council of Australia for her innovation and perseverance in developing the first, and so far only, electronic tablet device certified for unrestricted use in underground coal mining in Australia.

'I hope this award will ensure all our coal mine workers have a device underground so they have safety information at their fingertips and are able to make calls to the surface whenever they require assistance. Removing paper from our operation assists in Anglo American's sustainability roadmap,' Mackay said.



Vocational survey training

Surveying students from TAFE SA in Adelaide, South Australia, were recently introduced to Maptek™ 3D laser scanners and point cloud data processing solutions.

Maptek has long supported the vocationally oriented training that includes certificate and diploma courses covering a broad range of surveying practices.

The certificate has a strong practical emphasis including field work and software exercises that complement survey computations taught in the classroom, and leads into a diploma course covering specialist skills and knowledge in all aspects of surveying.

The Maptek training session focused on mine survey processes such as deformation and fragmentation analysis, volumetric reporting and general topographic modelling.

Maptek Technical Sales Manager, Jordan Herrmann said it was a joy to teach such an energetic class of future technical experts.

University partnerships

Maptek runs online classes for mining and exploration geology students, and awards innovative mining engineering projects.



Camborne School of Mines students learn Vulcan software skills to prepare for work in industry



Dr Bob Johnson with Iven Tan, Joven Tan, Zulfiqar Ali, Gal-Erdene Battengel and University of Adelaide Postgraduate Research Coordinator, Associate Professor Chaoshui Xu

Linking academia with industry

Camborne School of Mines (CSM) was founded in Cornwall, UK as a specialist mining school in 1888, and merged with the University of Exeter in 1993. CSM provides undergraduate, postgraduate and research degree programs in Earth Sciences.

Since 2018 Maptek™ Edinburgh has conducted classroom training in Vulcan™ and Eureka software for around 60 MSc Mining and Exploration Geology students. The students spend the week learning geological and block modelling techniques, practical skills which will help prepare them for work in industry.

As a result of COVID-19, classes switched to online training, including Q & A sessions with a Maptek instructor. The students were enthusiastic and keen to learn software skills. The online delivery proved successful for the large group, and will continue in 2021.

'CSM has been using Vulcan for several years, and considers skill development in industry-leading visualisation and modelling packages a key objective of postgraduate MSc teaching programs in mining-related disciplines,' said Benedikt Steiner, Senior Lecturer in Exploration and Mining Geology.

'Maptek Senior Geologist, David O'Neill is instrumental in maintaining a close industry-academia link, and has enthusiastically provided numerous training and seminar sessions for CSM students, for which we are very grateful,' he added.

'I've thoroughly enjoyed my project and it's really enhanced my geological modelling, resource modelling and estimation skills. Having used a range of software now, Vulcan is by far my favourite,' commented Mining Geology masters student, Hayden Eysers.

Modelling for success

Claiming the 2020 Maptek™ Mine Design Prize was an important accomplishment for the winning team of Zulfiqar Ali, Iven Tan, Joven Tan, Gal-Erdene Battengel and Bing Liu. The annual competition is open to final year University of Adelaide Mining Engineering students.

This year's project was a life of mine plan for a copper and gold resource. It required evaluation of data accompanied by research to determine economic parameters suitable for the chosen style of mining.

A combination of open cut and underground mining was needed to maximise the commercial exploitation of the resource.

Maptek Senior Technical Sales Specialist, Steve Sullivan said the winning team provided the best integration and transition between the open cut and underground mining phases of this project.

'Their research provided pragmatic selection of mining equipment within a geotechnically safe operating design,' Sullivan said.

Maptek founder Bob Johnson presented the award, and spoke to the students about the importance of getting geological models right.

The prize was first introduced in 2010 and is part of the long history Maptek has of supporting students and academic institutions.

Learn more about Maptek University Partnerships: www.maptek.com/university



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