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A message from Reutech Mining

The year 2017 will be remembered as one of the most successful years in the history of Reutech Mining and I would like to take this opportunity to thank all of our clients, suppliers, contractors, distributors and industry partners for your support. At the outset we knew that this year would be tough, but you have made it less intense than anticipated and without you we couldn’t have accomplished everything that we set out to do.

Our flagship MSR product series continued to show strong growth across various international markets. We achieved major breakthroughs with our radar based Perimeter Intrusion Monitoring Solutions (PIMS) at various sites across Africa and the revolutionary Sub Surface Profiler (SSP) is starting to make a significant difference at a number of underground mining operations.

Ludwig Mies van der Rohe’s, one of the pioneers of modernist architecture, said that “It is not possible to go forward while looking back”. I think this quote is of particular relevance to Reutech Mining as we set our sights on 2018.

The year ahead will see us launch a number of new and innovative products, integrated software suites and value added services. We will be building towards the premium event on the industry calendar - the Slope Stability 2018 conference that will be hosted in Spain during April, and we hope to see most you of there.

May you enjoy a blessed festive season with family and friends. Whether you are heading for the beaches or the ski slopes please travel safely.

See you in 2018!!

Jan de Beer
Mining Executive

AfriRock 2017

Reutech Mining was an exhibitor and a premier sponsor at AfriRock 2017, which was held at the Cape Town International Convention Centre from 30 September to 6 October 2017. The theme of the conference was "Rock Mechanics for Africa" and it was hosted by the Southern African Institute of Mining & Metallurgy (SAIMM) and the South African Institute of Rock Engineering (SANIRE).

The conference was well attended by local and international delegates. Reutech Mining’s Regional Marketing and Sales Manager, Alex Pienaar, presented a paper titled The sub-surface profiler: A giant leap for ground penetrating radar, whilst Randall Overmeyer, Regional Marketing and Sales Manager of Africa gave an overview of the company’s products and services.

Reutech Mining also hosted a rooftop client function at the Cartel Rooftop Bar in Cape Town. This event provided the ideal opportunity to unwind social with both existing and future clients.

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The Turkish Coal Corporation (TKİ), an Economic State Entity, was established in 1957 and has been operating for 60 years. Its activities are carried out in accordance with the "Turkish Coal Operations Main Statute of the Institution".

There are 3 operation directorates affiliated to TKİ which produces and markets coal in different parts of the country (TKİ ELİ, TKİ OLI, TKİ ÇLI).

TKİ plays an important role in the daily lives of the Turkish citizens as the majority of Turkey’s lignite production and half of their coal-based energy needs are supplied by the coal thermal power plants from projects of TKİ. Coal for industrial enterprises are also supplied by TKİ coal.

TKİ ELİ
The Aegean Lignite Establishment Directorate was established in 1978 as ELİ. It was established as the Directorate of the Turkish Coal Corporation (TKİ). ELİ continued with its activities in order to meet the fuel and energy needs of Turkey in the most economical way. For the benefit of the country, they have evaluated the existing lignite reserves within the framework of the general policy of Turkish Coal Corporation.

With 12,000 people employed by ELİ, 14 million tons of raw coal is produced each year. 8 million tons is from underground mining operations and 6 million tons is from open pit mining operations. 70% of the coal that is produced is sold to Turkey’s Thermal Power Plants and the remaining 30% is for the heating of houses and the industrial sectors.

The Turkish Coal Corporation (TKİ) opened a tender in May 2017 for a slope monitoring solution. HDG, Reutech Mining’s partner in Turkey, won the tender and delivered Reutech Mining’s MSR400 Radar to the Soma Coal Mine. In July 2017, Reutech Mining successfully commissioned the system and finalized the training.

MALA Geoscience hosts MSR User Conference

MALA Geoscience recently hosted its North American MSR user conference during the third quarter of this year in Elko, Nevada. The user conference once again proved invaluable for both current and potential MSR users alike. On day 1 users were given the opportunity to present site specific case studies to their peers. This resulted in the sharing of ideas among users who have all applied the MSR in a variety of different ways. A case study was presented where the MSR’s ability to scan a large section of an extremely fast moving wall on a 24/7 basis for several months proved to be an insightful application to the group. The high data point spacing of ScatterX was also demonstrated by ways of an interesting case study that dealt with the tracking of a prominent high wall feature. On the second day users attended a ScatterX masterclass hosted by one of Reutech’s senior system engineers.
Reutech Mining Partners with sensemetrics, Inc

Reutech Mining is excited to announce the recent addition of sensemetrics, Inc., as a distributor for its full product portfolio, which includes the class leading Movement and Surveying Radar (MSR) range in the North American region. Reutech Mining welcomes sensemetrics to our global group of distributors and will through our ever-growing list of industry partners continue to focus on driving future product development and maintaining high levels of customer service for current products.

Based in San Diego, California, sensemetrics, Inc develops cloud-based enterprise-level sensor management and data analytics solutions for the construction, infrastructure, mining, and oil and gas industries. The sensemetrics integration platform reduces the cost of sensor management and powers smarter decision-making through cutting edge technology that makes configuring, managing and monitoring a variety of industrial sensors simple. This new alliance forms an integral part of an overall strategy that will align Reutech’s products and services with the requirements of the mining environment of the future.

“sensemetrics, Inc is excited about our expanding collaboration with Reutech Mining, a world leader in radar sensing technologies. We are committed to the continued expansion of our platform and the added benefits that true 3D Real Aperture Radar brings to our existing partner portfolio of geospatial, geotechnical, and environmental sensing technologies,” said Cory Baldwin, President, sensemetrics, Inc.

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Reutech Mining increases market share in Russia

Over the past year, Reutech Mining has increased its market share in Russia by almost 100%. The number of -50°C MSR systems deployed in extreme weather conditions throughout Russia and its neighbouring countries has doubled. This great feat is thanks to the efforts and hard work of Reutech Mining’s partner and distributor, The VIST Group.

Reutech Mining is looking forward to a challenging year ahead within the Russian region, but firmly believes that new developments and continuous operational support will ensure another astonishing year.

One of Reutech Mining’s -50°C MSR systems deployed to the Russian region
This case study focused on the effectiveness of two preconditioning patterns namely the conventional 4 hole pattern and 5 hole pattern.

**METHOD: FACE PRECONDITIONING**

**A. DETONATION DURING PRECONDITIONING**

Detonation of the production and four face-perpendicular pre-conditioning holes were sequenced with 1 millisecond delays chronologically as follows:

- Detonate face-perpendicular preconditioning holes above the grade line
- Detonate the burn cut and then the rest of the production holes
- and lastly, alternate the positions of the face-perpendicular pre-conditioning holes after each blast

Detonation of the production and five face-perpendicular pre-conditioning holes were sequenced at 1 millisecond delays as follows:

- Detonate face-perpendicular pre-conditioning holes above the grade line
- Detonate the cut and then the rest of the production holes
- Alternate the position of the face-perpendicular pre-conditioning holes after each blast

**Figure 1: Position of preconfitioning holes**

**Figure 2: Location of preconfitioning holes**

**Figure 3: Different views of preconditioning and production holes drilled into the face**
During investigations between the 4 hole and 5 hole pattern trials the following attributes were investigated:

1. Hole depths and diameter post firing
   - There was less hole length after blasting in the 5 hole pattern indicating better mining advance.
   - The post blast hole diameter was larger in the 5 hole pattern than the 4 hole pattern.

2. Rock mass fracturing
   - There is more intense fracturing from the 5 hole pattern than from the 4 hole pattern.

3. Hanging wall profiles
   - The data obtained from the hanging wall indicated a smoother hanging wall using the 5 hole pattern and intermediate to minor fracturing on the hanging wall were observed using the 4 hole pattern.

4. Face advance
   - The 5 hole pattern showed better face advance than the 4 hole pattern.
   - The higher intensity of face fracturing resulted in easier scaling and barring down providing a higher advance rate.
   - 5 hole advance rate generally 0.5m better than the 4 hole pattern.
B. QUANTIFICATION BY MAKING USE OF A BOREHOLE CAMERA

After preconditioning holes were fired, several boreholes were drilled into the face to determine how well preconditioning worked. The amount of fractures per meter are counted and a borehole fracture log is created for each borehole viewed. The logs will indicate other fractures, borehole breakout, hole closure, etc. The amount of fractures per meter are counted and the fracture count is then converted into a face burst risk rating.

The 4 hole pattern results:

- 48.6% Very low risk
- 23.0% Low risk
- 23% Medium risk
- 5.4% High risk

The 5 hole pattern results:

- 79.1% Very low risk
- 12.4% Low risk
- 8.1% Medium risk
- 0.4% High risk

This indicated that a higher majority of mining faces were prone to rock burst when using the 4 hole pattern than when using the 5 hole pattern.

C. QUANTIFICATION BY MAKING USE OF THE SUB SURFACE PROFILER GPR

The mine decided to reduce the number of people at the face during the quantification of the preconditioning effectiveness. The Sub Surface Profiler (SSP) was used to investigate this effectiveness of both the face patterns.

1. The face burst risk per meter for each blast hole

The 4 hole pattern results:

- 48.6% Very low risk
- 23.0% Low risk
- 23% Medium risk
- 5.4% High risk

The Sub Surface Profiler (SSP)
1. The 4 hole pattern:
   - GPR images from four pattern produced weak reflections from 1m to 3m ahead the face, which indicate that there were less changes in material properties and least number of discontinuities
   - Beyond that, the rock mass ahead of the face is not consistently fractured across the full width and may therefore be more prone to face bursting

2. The 5 hole pattern:
   - GPR images from the five face-perpendicular pre-conditioning practice produced a significant difference in the nature of fracturing ahead of pre-conditioned faces as compared to four face-perpendicular pre-conditioning practice
   - Consistent fracturing is much further ahead of the face (5m-7m) indicating less potential for face bursting

More recent results from the GPR:

Conclusion:
Mining at deep levels or in areas of high stress will always expose people/equipment to areas of potential strain bursting.
The Deep level gold mine now only uses the 5 hole pattern for pre-conditioning for the following reasons:
- Deep fracturing away from the face
- Reduces risk of face bursting
- Transfers stresses away from the production face
- Improves ground conditions, improves the hangingwall and sidewall fracturing (less shallow dipping fractures)
- Reduces fracturing over hangingwalls and improves face conditions (i.e. less sockets and better face shape)
- Reduced seismicity, rockburst incidences, accidents and injuries resulting from rockburst and falls of ground

Deep level goldmine shown that through a combination of techniques that strainburst risk can be reduced. Continuous monitoring, using the best available methods from low-tech borehole monitoring to high-tech ground penetrating radars (GPR).