Back to school

Ailbhe Goodbody attended the School of Underground Mining in Kraków, Poland, to learn about new solutions in the fields of technology and economics in underground mining

This year over 500 registered participants attended, representing 98 companies and research institutes

The School of Underground Mining is the largest mining conference in Poland, and the 22nd edition was held on February 18-22 in the Qubus Hotel in Kraków. The conference, organised by the Mineral Economy and Energy Research Institute of the Polish Academy of Sciences (IGSMiE PAN), is aimed at both people working directly in the mineral and mining industries and those supporting the industries, such as subcontractors, research institutes and universities.

This year, there were over 500 registered participants representing 98 companies and research institutes, along with over 2,500 unique online viewers watching the conference live. Over the course of the conference, 255 papers and talks were presented across 20 sessions, covering topics that ranged from 'techniques and technologies in underground exploitation' to 'modern problems of the mining industry' and 'IT in mining'.

This year, for the first time, IT workshops were available for conference participants. Led by representatives from mining software companies Carlson Software and Maptek, the workshops gave the participants the opportunity to engage in the training by following the presenter's actions on their own computer screens.

"Over the course of the conference, 255 papers and talks were presented across 20 sessions"

MINING THE CRISIS

The conference opened with a plenary session called 'Mining the crisis – threats, strategy, tactics and action'. The global economic downturn has affected coal mining in Poland, most significantly with a decrease in fuel and energy prices, a large amount of unsold coal and the growing competitiveness of imports and other energy sources. The speakers agreed that the changing situation needs to be addressed, with particular reference to reducing the cost of coal production internally.

Herbert Wirth, president of the management board of KGHM Polish Copper, was more optimistic about the copper market, due to the increasing price of copper globally. Bogusław Ochab, president of ZGH Bolesław, spoke about the situation for zinc mining, which is dealing with a drop in prices.

Albert Tufts, president of Tauron Production, talked about the outlook for co-operation between the mining and energy sectors. There were also a number of papers on the economic environment of coal and the possible ways to deal with the downturn.

Andrzej Najgebauer, from Wojskowa Akademia Techniczna (Military University of Technology) in Warsaw, spoke about the modelling of decision support systems in crisis and conflict, and its applications for the mining industry. The university has designed an IT system to help manage crisis situations, such as a fire or a methane explosion, which looks at the patterns of how people react and generates outcome scenarios. The system can be used to train anti-crisis teams, and advises on what to do in emergencies.

NEW TECHNIQUES AND TECHNOLOGIES

Some prominent Polish mining companies spoke about the techniques and technologies used in their mines. In a session that focused on KGHM's strategy and the development of the organisation, a number of speeches focused on the analysis of the possible development of copper-ore mining technology at great depths: conditions that are associated with natural hazards.

Paweł Markowski discussed the use of new technology at KGHM's mines, a theme that was developed by Jarosław Kuzniar, who presented for the first time the method of exploiting copper ore using the activated cutting technology

One session focused on KGHM's mining strategy

(ACT), developed in association with Caterpillar.

Marek Czechowski, from KGHM's ZG Lubin processing plant, presented the company's project known as 'The Wall'. The project aims to secure a technologically and economically effective copper-ore mining technology with the support of a mechanised cutting machine, as an alternative to the blasting technology currently in use. Witold Pytel, from KGHM Cuprum, spoke about the I2Mine project with which KGHM is involved, along with an international consortium of mining companies, which focuses on innovative technologies and concepts for the intelligent deep mine of the future.

Wojciech Kedzia, who was chairing the session, closed by emphasising the role that innovation has played in allowing KGHM to deal with exploiting deeper deposits and the changing conditions in mining.

A number of representatives from LW Bogdanka's Bogdanka mine spoke at a session about new techniques and technologies at the mine, led by Sławomir Karlikowski, Bogdanka's chief engineer. In his introduction, he outlined the intelligent mine concept that is implemented at the site.

During the session, the system currently running in Bogdanka's Nadrybie field was publicly presented for the first time. In his talk, Roman Stec stressed the importance of the ploughs in use at Bogdanka. In addition, Mirosław Masiakiewicza, manager of mining works at Bogdanka's Stefanów field, discussed the longwall design that the mine uses. This is popular in Polish mining.

At the conclusion of the session, Łukasza Cieslikm, along with Artur Dyczko and Dominik Galica from IGSMiE PAN, looked at fixed asset management solutions using information technology currently being implemented at Bogdanka with the aim of creating an intelligent mine.

Bogdanka: ploughing ahead

Caterpillar has sold a second longwall plough to the Bogdanka mine. This follows the success of the first plough, which broke the world record for daily production from a plough-equipped longwall in February 2012, with an output of 24,400t of coal from a single face (see 'Lessons in eastern Exploitation', *MM* April 2012.)

The installation of the new plough started at the end of October 2012, and it is now fully operational. "The second Bogdanka plough system is quite different to the first one we supplied, with regards to its drive systems," explained Dr Michael Myszkowski, product manager AFC/plough at Caterpillar, in an interview with *MM*.

"The first was based on standard two-speed synchronous motors, while the second system has variable-frequency drives (VFDs) in conjunction with our 'Mark II' intelligent controlled start transmission (CST) drive system. It is a complex system, with a few thousand parameters for each drive; everything must be set so it works in the difficult underground conditions."

The main reason for the different type of system was the limitations of the conventional system, as VFDs allow for greater flexibility. Myszkowski added: "On two-speed motors, there are only two speeds: 1m/sec and 3m/sec. With VFDs, you can set any speed between 0-3.6m/sec, so it can be varied according to necessity."

There is also a different type of gearbox for the plough: a CST gearbox, like those already used for armoured face conveyors (AFCs). CST gearboxes are more sensitive to torque limitation. The plough systems can be controlled from the surface, without operators required on the face, making it safer and more efficient. There are some other changes too, but the drive system is the most significant change. Myszkowski commented: "We have been investigating these challenges for around 30 years, and I'm not afraid to say this development represents a huge step forward."

The plough system is a larger capital investment for a mine, but Myszkowski said that if mining companies look at the economic results and calculate the costs, they will see that the system will quickly pay for itself in mines with coal seams below 1.8m thickness.

He concluded: "Our plough will mine more and cleaner coal than any shearer can. I think that, in the future, we will slowly but surely change all our plough systems to this type of drive configuration. Based on our experience in Poland, I think that mines in other countries will take on this technology as well. I think it is the future."

IT AND GEOMATICS

IT in mining is a very broad theme that can look at a number of areas, but it is an increasingly important topic. Several presentations focused on data processing in cloud computing. Romuald Gacka and Robert Bigos, from IBM Poland, looked at its advantages for the mining industry, ►

The conference was aimed at both people working directly in the mineral and mining industries and those in support roles

This year, for the first time, IT workshops were available for conference participants

while Tomasz Templin from the University of Warmia and Mazury examined current trends and prospects in the cloud computing model. Bolesław Zaras from Advicom Spółka focused on the implementation of cloud computing in JSW's mines, and Łukasz Konisiewicz from Eurotronic spoke about the shared computer working environment for company owners.

Several speakers also examined the tools and systems related to enterprise asset management (EAM), which is the optimal management of the physical assets of an organisation to maximise value. There were lectures from the point of view of system suppliers, such as IBM Poland and ITG KOMAG, and system users, such as JSW, EL PAK and AIUT. The general conclusion of these papers was that software used to improve resource management can eliminate a lot of unnecessary costs by overhauling planning policies.

Other papers also looked at the broader topic of using enterprise architecture to improve business processes. Robert Michalski, from PAK KWB Konin, gave an interesting presentation that characterised the system of business process management and workflow. The PAK KWB Konin mine was the first mine in Poland to completely eliminate paper documents, instead using digital versions of documentation.

"A session on mining geomatics, sponsored by Bentley, focused on modelling information in mining and geology"

A session on mining geomatics, sponsored by Bentley, focused on modelling information in mining and geology. Artur Krawczyk, from AGH University, presented a paper on the differences between the object-oriented analysis, design and programming used for GIS and the relational model used for storing spatial data in GIS systems.

Several presentations covered the application of terrestrial laser scanning (TLS) to scan the underground workings of mines. Paulina Lewinska, from AGH, discussed the results of modelling and animation with point cloud laser scanning that was performed by students from the university's Koło Naukowe Grafiki Komputerowej student association.

Grzegorz Patykowski, from KGHM, presented three types of laser scanning technology used in the mining industry:

- scanning machines and objects in redevelopment projects, which can significantly shorten the duration of the project;
- scanning unusual geological phenomena (such as karst in an underground mine); and
- the scanning of underground workings to take deformation measurements.

Slawomir Kubiak, from LW Bogdanka, examined the use of laser scanning at Bogdanka, where it was used to measure the deformation of the excavation pit enclosure.