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Guest Editorial – Special issue on Ground Control in Mining

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Ground control is the science of studying and controlling the behavior of rock strata in response to mining operations. Ground control related research has made significant advancements over the last 35 years and these accomplishments are well documented in the proceedings of the annual International Conference on Ground Control in Mining (ICGCM) [1]. The International Conference on Ground Control in Mining is a forum to promote closer communication among researchers, consultants, regulators, manufacturers, and mine operators to expedite solutions to ground control problems in mining. Fundamental research and advancements in ground control science comprise the central core of the conference mission. Providing information to the mine operators is a priority as the conference goal is solution-oriented information. In addition, the conference has included innovative technologies and ideas in mining related fields such as exploration, geology, and surface and underground mining. Many new ground control technologies and design standards adopted by the mining industry were first discussed at the conference [2–6]. Therefore, this conference is recognized as the best forum for introducing new ground control related research and products.

The 34th ICGCM was held on July 28–30, 2015 in Morgantown, WV. This year's event had 240 attendees with significant representation from mine operators. The event included 48 speakers in 10 different sessions during the three days of the conference. The international community was well-represented with 34 attendees from 6 countries, with China sending 15 representatives and Australia sending 10 representatives. A special session was held on the upcoming ground control conference to be held in China and the session was chaired by Professor Xiexing Miao and Professor Jiachen Wang of the China University of Mining and Technology of Xuzhou and Beijing, respectively. A remarkable number of industry representatives attended given the challenges currently faced by the mining industry.

Professor Syd Peng (West Virginia University), conference founder, delivered an exceptional presentation on identifying current research needs in coal mine ground control. Dr. Peng, on his own initiative, organized the First Conference on Ground Control in Mining in the summer of 1981. Dr. Peng keenly recognized that in order to advance the state-of-the-art in ground control, a forum was urgently needed whereby researchers, practitioners, equipment manufacturers, and government regulators could meet regularly and exchange information in a timely manner. The conference legacy and longevity is a tribute to Dr. Peng's tireless and persistent efforts to advance the science of ground control. Dr. Peng's presentation at this year's conference highlighted the research yet to be done in all areas to continue to advance the science of ground control and develop solutions to problems that have been persistent with current mine design, operational practices, and engineering interventions.

The topics covered at this year's conference included a wide-range of subjects and of particular note were the papers presented in the opening day sessions on ground control design tools and bump related research. Researchers from National Institute for Occupational Safety and Health's (NIOSH) Office of Mine Safety and Health's (OMSHR) Ground Control Branch opened the conference with three presentations on the latest design tool that provides insight into coal mine entry stability. Ted Klemetti (OMSHR) presented "A Procedure for the Rapid Assessment of Coal Mine Roof Stability Against Large Roof Falls", which discussed a non-linear regression equation for predicting the stability factor of supported entries for a given set of geotechnical conditions. The non-linear equation was based on analysis from over 600 FLAC3D numerical model results. Gabriel Esterhuizen (OMSHR) presented "Analysis of Alternatives for Using Cable Bolts As Primary Support at Two Low-seam Coal Mines", which discussed the practicality of utilizing the strength reduction method to assist with answering common questions asked by ground control practitioners. The research describes cable bolting solutions at two coal mines in similar ground conditions and the numerical model-based analysis demonstrated benefits of various support systems, verified by careful observations in the field. Ihsan Tulu (OMSHR) presented "A Case Study of Multi-seam Coal Mine Entry Stability Analysis with Strength Reduction Method", which discussed a case study mine under highly variable topography which led to unexpected roof conditions. The research describes the unexpected roof conditions that were encountered and solutions that were evaluated by the strength reduction method to effectively assess the likely success of different roof supports and coal mine entry stability.

Due to the recent bump fatalities in the coal mining sector, coal bump research was highlighted during the first day of the conference. Both Christopher Mark (MSHA) and Anthony Iannacchione

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(University of Pittsburgh) opened the bump related research session with a historical perspective on the evaluation of the risk and control of coal burst events in underground coal mines. Heather Lawson (OMSHR) and Eric Poeck (Colorado School of Mines) presented research related to new findings in coal bump prediction. Lawson presented "Dynamic Failure in Coal Seams: Implications of Coal Composition for Bump Susceptibility", which establishes that coal may be more inherently prone to bumping due to certain characteristics in its composition. Poeck presented "Energy Concepts in the Analysis of Unstable Coal Pillar Failures", which used a numerical-based analysis to illustrate that the widespread failure of several pillars in a compressive nature depends heavily upon the strength properties of the coal/rock interface. The session also included a presentation by Peter Zhang (Alpha Natural Resources, Inc.) which discussed the geotechnical risk management program at an operating room and pillar mine under deep cover to help prevent coal bump potential.

The conference also included discussions involving research related to underground limestone mines and a presentation entitled "Analysis of Roof and Pillar Failure Associated with Weak Floor at a Limestone Mine" provided insight on the first well-studied case of a weak floor leading to ground control issues in an underground limestone mine (presented by the Michael Murphy). The research showed the effect of a weak floor on long-term stability of underground limestone working, a unique scenario for a stone mine. Brent Slaker (OMSHR) demonstrated the practical application of photogrammetry, a new evaluation tool to assist with monitoring underground mine displacements. The method successfully detected both small and large rib movements at the same underground limestone mine.

A number of the papers discussed above are included in this special issue of the International Journal of Mining Science and Technology. All other papers from this year's (and previous years) conference can be found on the International Conference on Ground Control in Mining's website. We hope this special issue will provide useful references for engineers worldwide and for researchers and scholars in the field of ground control.

References

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