DEEP MINING 2017

ACG AUSTRALIAN CENTRE FOR GEOMECHANICS

CSIRO | The University of Western Australia | Joint Venture

Deep Mining 2017

Proceedings of the Eighth International Conference on Deep and High Stress Mining

28–30 March 2017 | Perth, Western Australia

Volume Two: Design and application

EDITOR Johan Wesseloo

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Australian Centre for Geomechanics

The Australian Centre for Geomechanics was formally established in 1992 as a University of Western Australia research centre in order to promote research excellence and continuing education in geomechanics, with particular emphasis on its application to the mineral and energy extraction sections of Australia's resource industry.

The Australian Centre for Geomechanics is an unincorporated Joint Venture involving:

- CSIRO Earth Science and Resource Engineering
- The University of Western Australia — School of Civil, Environmental and Mining Engineering

The Centre draws together its staff knowledge and experiences with the expertise within the two groups forming the Centre and facilitates a multi-disciplinary approach to research and education in geomechanics. Research undertaken by the ACG attracts both national and global support and the outcomes of the projects are utilised to promote safer mining and environmental geomechanics practices, operating efficiencies and to meeting community expectations for sustainable mining practices.

With the guidance of strong industry representation on the Board of Management, and close collaboration with senior representatives of the mining industry, research, training and further education activities are tailored directly to the needs of industry. The ACG Board expects the Australian Centre for Geomechanics to be the focal point for industry on geomechanics issues and to address the needs of industry through a collaborative interdisciplinary approach.

Technical Reviewers

The dedicated efforts of the peer reviewers have resulted in the high quality of the technical programme and the papers compiled for this publication. The editor thanks the following people who contributed their time and expertise as reviewers of manuscripts for the proceedings of the Eighth International Conference on Deep and High Stress Mining held in Perth, Western Australia. A technical and critical review of each paper was undertaken by a minimum of two reviewers for the production of this volume.

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Preface

The international conference series on Deep and High Stress Mining (Deep Mining) commenced in Perth in 2002, and was preceded with conferences in Johannesburg (2004), Quebec (2006), Perth (2007), Santiago (2010), Perth (2012), and Sudbury 2014.

The Eighth International Conference on Deep and High Stress Mining (Deep Mining 2017) is again welcoming mining personnel, researchers and consultants from around the world to Perth.

Humankind's hunger for resources is increasing the need to dig deeper into the Earth's crust to find new ore deposits as those located close to the surface are being mined out. Mineral reserves previously considered unmineable are now considered favourable. In Australia, the deepest mines are currently reaching operating depths of about 1,600 m. In Canada, depths of about 3,000 m are reached whilst in South Africa, operating levels are now nearing 4,000 m. Increasing mining depths create a unique set of challenges that need to be overcome to supply the world with the necessary commodities.

High stress conditions, however, are not limited to deep mining, and some mines experience problems commonly associated with deep mines at quite shallow depths. This is evidenced by several papers presented at previous Deep Mining conferences discussing stress induced problems at shallow depths, and even in quarries and open pit mines.

The rock mass' response to mining is complex and causes many challenges to deep mining operations. Some of these challenges appear in the form of seismicity and rockburst, where sudden and violent rock failure can put personnel and the mining operation at risk. Other rock masses experience squeezing ground conditions in which weak rock under high stress undergoes considerable deformation, to the extent that access is prevented. In these varying conditions, the design, installation and monitoring of appropriate and sufficient ground support systems is important.

Ground support technology, however, cannot be relied upon to negate the risks entirely. Geotechnical and financial risk assessment and management strategies form an integral part of the mining process and these strategies need to be improved as our knowledge and technology advances. Groundwater at depth also brings with it the challenge of dewatering and having to deal with highly corrosive environments where water may cause the deterioration of the ground support.

Since the beginning, the proceedings for the international conferences on Deep and High Stress Mining have provided an extremely valuable contribution to the state of the art literature on this important topic. Deep Mining 2017 continues this tradition and includes, among others, some valuable contributions to the design of ground support in dynamic and squeezing ground conditions, advances in numerical modelling approaches, seismic risk, geophysical methods to extract more information from seismic data, instrumentation, and geotechnical data management.

Thanks to the generous contribution of our open access sponsor SRK Consulting, for the first time, the conference proceedings are available online, free-of-charge. The papers can be accessed by scanning the QR code or from papers.acg.uwa.edu.au/deepmining2017.

Johan Wesseloo
Editor

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