

Carsten Drebenstedt
Raj Singhal *Editors*

Mine Planning and Equipment Selection

Proceedings of the 22nd MPES Conference,
Dresden, Germany, 14th–19th October 2013

Volume 1

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Carsten Drebenstedt · Raj Singhal
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Carsten Drebenstedt
Institute of Mining and Special Civil
Engineering
TU Bergakademie Freiberg
Freiberg, Sachsen
Germany

Raj Singhal
MPES - CAMI - SWEMP
Calgary, Alberta
Canada

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Mine Planning and Equipment Selection

Preface



Raj K. Singhal

The International Symposium on Mine Planning and Equipment Selection (MPES) was started some twenty five years ago. Since then it has been held regularly becoming an internationally recognized event committed to technology transfer. It has been held in Turkey, Greece, Canada, Kazakhstan, Australia, Czech Republic, Brazil, India, Australia, China, Ukraine, Poland, and Italy. MPES is being held in Germany for the first time and it is the Twenty Second of the series.

The basic aim of MPES 2013 is to contribute to the development of highly productive methods and technologies for the various segments of the mining and mineral processing industries. Major topics to be covered at MPES 2013 are: Economic and Technical Feasibility Studies, Reserve Estimation, Mine Development Case Studies Design, Planning and Optimization of Surface and Underground Mines inc Transition from surface to underground mining; Drilling, Blasting, Tunneling and Excavation Engineering, New and innovative Materials handling Equipment, Mining Equipment Selection, Automation and Information Technology, Maintenance and Production Management

for Mines and Mining Systems, Mining: Health, Safety and Environment, and Rock Mechanics and Geotechnical Applications, Research & Development to improve health, safety & productivity in Mines, Environmental Issues in Surface and Underground Mining of Metalliferous, coal, uranium, and industrial minerals, Control of Effluents from Mineral Processing, Metallurgical and Chemical Plants, and Mine Site Closures and Rehabilitation.

MPES derives its strength from the coalition of various world wide institutions. MPES 2013 is supported by a number of organizations. To be noted are: Department of Mining, Metallurgical and Materials Engineering, Université Laval; China University of Mining and Technology, Beijing; The National Technical University of Athens, Greece (NTUA); Dipartimento di Geingegneria e Tecnologie Ambientali, Università degli Studi di Cagliari, Italy; Western Australian School of Mines, Curtin University of Technology, Australia; National Mining University of Ukraine, Dnipropetrovsk; International Journal of Mining, Reclamation and Environment; American Society for Mining and Reclamation; School of Mining and Petroleum Engineering, University of Alberta, Canada; Mining Engineering Department, Lulea University, Sweden; Faculty of Mining and Geology, VSB - Technical University, Ostrava, Czech Republic; Hokkaido University, Mineral Resources Engineering Department, Japan; Faculty Geoengineering, Mining and Geology, Wrocław University of Technology, Poland; Department of Mining, Metals and Materials, McGill University; Department of Energy and Geo-Environmental Engineering, The Pennsylvania State University; DIGET-Politecnico di Torino, Italy; School of Chemical, Environmental and Mining Engineering University of Nottingham, UK. Mining Engineering Department, University of British Columbia; Middle East Technical University Mining Engineering Department, Turkey; SASE, and Monash University Australia and Kyushu University, Fukuoka, Japan.

The organization and success of such a symposium is due mainly to the tireless efforts of many individuals, authors included. All members of the Organizing Committee and conference chairpersons have contributed greatly. The support of our plenary session, invited speakers, and co-chairs is gratefully acknowledged. In addition, recognition is accorded to my co-editor and Chair Person of this symposium Professor Carsten Drebenstedt who together with his two assistants Ms. Elisabeth Griessl and Richard Eichler have worked tirelessly to make MPES2013 a success. I also wish to acknowledge the contribution of Mohini Singhal (my wife) who has been involved with MPES since its inception. She is a committee member of MPES organisation and is an associate editor of the International Journal of Mining, Reclamation and Environment. She shares my work load and maintains the continuity of our work in my absence. We both are committed to make each symposium a successful one

This symposium is designed to provide a forum for the presentation, discussion and debate of state-of-the-art and emerging technologies in the field of mining. Authors from over 20 countries with backgrounds in computer

science, mining engineering, research, technology and management representing government, industry and academia concerned with mining and mineral production have contributed to these proceedings. The contents of this volume of proceedings will be of interest to engineers, scientists, consultants and government personnel who are responsible for dealing with the development and application of innovative technologies to the minerals industries.

Raj K. Singhal

Chair, International Organizing Committee

Preface



Carsten Drebenstedt

It is the heart of Europe where Germany is located. It is a country with a lively and rich cultural scene on the one hand and with a modern industry and service sector on the other hand.

The German people look back on a wide heritage of traditions and an eventful but turbulent history. However, it is true that each change presents new challenges that permit our people to grow and to develop new ideas, up until today.

Various leading manufactures in the fields of mechanical engineering, logistics as well as in the lifestyle industry and the sector of microelectronics have their roots in Germany.

The national industry always relayed on a functioning resource production, since Germany is also a mining country with an established metallurgical industry. Germany ranks number twelve in the world mining production (World mining data 2011). So, for example, Germany is leading the lignite mining in the world. It extracts annually 170 million tonnes of lignite at 3 open cast mining districts. Lignite is an important resource that secures the supply of

electricity and heat. Beyond that it is valuable for the chemical production. Other energy sources extracted are hard coal, crude oil and natural gas.

Germany ranks number three in the world regarding the extraction of potashes, which are used worldwide as fertiliser for the agricultural sector. Furthermore, mining in Germany also includes the extraction of valuable industrial minerals under the top ten in the world, like hard salt, bentonite, kaolinite, barite, fluorite, graphite ... as well as various kinds of construction materials, like lime, clays, aggregates ... in a mass of over 500 million tonnes.

Mining machinery and specialised technical equipment that bear the quality seal "made in Germany" are in great demand around the world. So the largest hydraulic shovels and high productive and safe underground continuous and mobile equipment produced in Germany. In the equally considered is German expertise regarding Know-how transfer of technology, shaft sinking or remediation of former mining sites.

The intensive and substantial engagement with firsthand knowledge of specific features in the field of mining goes far back in German history. Already in the 16th century mining laws were introduced, the mining authority was established and the first technical mining book was published in the ore mountain region of Saxony by the father of mining Georgius Agricola. In the year of 1765 the first mining school in the world was founded in Freiberg.

Up until today this institution uses state-of-the-art equipment in the field of mining and metallurgy for research purposes and hands-on education for students. The university's own underground mine make it possible to undertake research and teaching under real operation conditions. Various collections of for instance minerals and ores from all over the world contribute furthermore to the excellent educational environment.

Through the analysis of technical processes as well as through the detailed description of deposit characteristics it is possible to continuously improve the resource extraction process and the resource management sector regarding efficiency and sustainability.

The people that live within the mining districts highly benefit through the value chain that reaches from the resource to the finished product. Then as now, new business ventures are established and the art and cultural lifestyle flourishes.

Dresden, the federal state capital of Saxony attracts every year hundred thousands of tourists through its unique charm of historical buildings and art treasures.

Mining tradition, modern resource production as well as innovative industrial fields unite in Saxony. In the region of the cities Freiberg and Dresden, located within the heart of Germany.

Reason enough to host one of the world's most important mining conference of the year 2013 at exactly this important traditional mining region. While participating in the conference and various discussions you will also

get the chance to discover the federal state capital of Saxony, Dresden and the mining city of Freiberg. Tradition and innovation will enable the holistic reflection of the topical question of “mine planning and equipment selection” in order to guarantee a modern resource production.

With best regards and Glückauf



Prof. Dr. Carsten Drebenstedt

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