



Steven A. Keim

Current Position

Vice President

Profession

Mining Engineering

Years' Experience

8

Education

PhD – Mining & Minerals Engineering, Virginia Polytechnic Institute & State University, Blacksburg, VA (2011)

BS – Mining & Minerals Engineering, Virginia Polytechnic Institute & State University, Blacksburg, VA (2008)

Professional

Registrations

PE - WV

Society for Mining, Metallurgy and Exploration (SME) – Registered Member (04151568)

Affiliations

Co-Chair—Advisory Board for Central Appalachian Section of SME

Summary of Experience

Dr. Keim provides engineering services for energy & mineral resource projects including geologic modelling, reserve estimation, mine planning, and financial modelling.

Significant Projects & Experience

- > College-level teaching in Rock Mechanics, Ground Control and Mine Surveying
- > Geological modelling and subsequent reserve estimation and financial modelling for Securities and Exchange Commission (SEC) and Joint Ore Reserve Committee (JORC) compliant reporting for domestic and international projects.
- > Preparation plant based experience, including daily plant logistic management, development of protocols for preparation plant efficiency studies to maximize plant yield and quality and analysis of potential upgrades/enhancements
- > Risk assessment experience, including risk matrix and RISKGATE methods
- > Participation in expert witness teams for various litigation cases
- > Management & participation in projects pertaining to independent, third-party verification of production tonnage to ensure correct allocation of royalty payments
- > Participation and management of due diligence teams for large scale deep mine and surface mine acquisitions, including operational assessments as related to attainable production enhancements and operational improvements

Specific Projects

- > China: Evaluation of low permeable reservoirs for coalbed methane recovery as related to environmental, financial and safety factors, including development of best practices for coalbed methane recovery and modelling reservoir characteristics
- > Turkey: Development of degasification plan in advance of mining and development of predictive modeling for gassy coal seams for Methane to Markets partnership
- > United States. Management of United States Department of Energy (DOE) funded carbon sequestration project for injection of carbon dioxide in depleted coalbed methane wells
- > Mozambique. Estimation of plant yield for large scale surface mine through analysis of exploration based washability data, flotation release curves and coal sizing data, including the development of predictive model for plant yield & quality based upon slimcore data, thus eliminating the need for large diameter exploration drill holes
- > Australia. JORC compliant reserve reporting pertaining to greenfield coal deposit, including multiple iterations of potential mine plans and mining methods and estimation of preparation plant yield and product quality



Awards

- > 2014 SME J.W. Woomer Award (formerly the Young Engineers Award) - given to one recipient annually for distinguished contributions to the advancement of coal mining.
- > Old Timers Award, which is presented to the outstanding undergraduate mining engineering student at Virginia Tech
- > Outstanding Ph.D. student award in Mining and Minerals Engineering at Virginia Tech.

Professional History

2017-Current

Vice President

Marshall Miller & Associates, Inc.

2011 - 2016

Mining Engineer

Cardno, Inc. (formerly Cardno MM&A, Marshall Miller & Associates, Inc.)

Responsible for managing Government sponsored petroleum based projects, including domestic carbon sequestration project and Turkish coalbed methane optimization project. Reservoir modeling analyst with experience focusing on gas drainage in complex geological settings and carbon dioxide injection prediction. Mining engineer with responsibilities including reserve evaluation, computer modeling, financial analysis

2008 – 2011

Graduate Research Assistant

Department of Mining & Minerals Engineering, Virginia Tech

Responsible for research pertaining to extraction of coalbed methane in low permeable coal reservoirs. Compared multiple degasification strategies in varying geological conditions through detailed 3-dimensional reservoir modeling software. Investigated microscopic and macroscopic reservoir phenomena to derive analytical production prediction equation

2008

Graduate Engineering Intern

Marshall Miller & Associates, Inc.

2007

Coal Preparation Intern

Arch Coal, Inc.

2006

Underground Coal Mining Apprentice Intern

Alpha Natural Resources

2005

Undergraduate Research Assistant, Reservoir Characterization

Virginia Center for Coal and Energy Research



**Conference
Presentations and
Papers**

- > Keim, S., Diminick, E. *Carbon Dioxide injection in Unmineable Coal Seams, Vansant, VA: Project Update*. WVCMIM/CAS SME Fall Meeting. White Sulfur Springs, WV. October 2015.
- > Keim, S., Karmis, M. *Sustainable Degasification Strategies; A Case Study in the Quinshui Basin of China*. AERIES Conference. Charleston, WV. April 2013.
- > Keim, S., Ripepi, N., Luxbacher, K., Karmis, M.; *Assessment of Coal Mine Methane: Modeling of Capture Strategies*. 22nd World Mining Congress and Expo. Istanbul, Turkey. September 2011.
- > Keim, S., Ripepi, N., Luxbacher, K., Karmis, M.; *The CO₂ Sequestration Potential of Horizontal Coalbed Methane Wells: A Detailed Reservoir Model*. Annual SME Meeting and Exhibit. Denver, CO. February 2011.
- > Keim, S., Luxbacher, K., Karmis, M.; *Decreased Carbon Footprint through Effective Coal Degasification*. Annual SME Meeting and Exhibit. Paper 10-090. Phoenix, AZ. February 2010.
- > Keim, S., Luxbacher, K., Karmis, M.; *Advanced Modeling of Coalbed Methane Degasification in a Low Permeable Reservoir*. *International Coalbed and Shale Gas Symposium*. Paper 0904. Tuscaloosa, AL. May 2009.

**Refereed Scholarly
Work**

- > Multiple Authors. *Monitoring CO₂ Storage and Enhanced Gas Recovery in Unconventional Shale Reservoirs: Results from the Morgan County, Tennessee Injection Test*. *Journal of Natural Gas Science & Engineering*. April 2017
- > Keim, S., Luxbacher, K., Karmis, M.; *A Numerical Study on Optimization of Multilateral Horizontal Wellbore Patterns for Coalbed Methane Production in Southern Shanxi Province, China*. *International Journal of Coal Geology*. Volume 86. 306-317. 2011.
- > Multiple Authors. *A Regional Handbook for Coalbed Methane Degasification in the Southern Shanxi Province, China*. Report to United States Environmental Protection Agency. August 2011.