Karina J. Barbosa – ITASCA Australia

Senior Technical Engineer

Expertise

Mining, Rock Mechanics, Numerical modelling, and Mineral Processing (comminution).

Education

PhD, School of Earth and Environmental Sciences, 2019
The University of Queensland (UQ), Brisbane, QLD, Australia

MSc Geotechnical Engineering, 2011
Federal University of Ouro Preto (UFOP), Ouro Preto, MG, Brazil

BSc Mining Engineering (Honours), 2007
Federal University of Minas Gerais (UFMG), Belo Horizonte, MG, Brazil

Registration

Registered Professional Engineer of Queensland, QLD, area of geotechnical
Registered National Engineering Register – Engineers Australia

Qualification

Chamber of Mines Certificate in Strata Control for Metalliferous Mines, South Africa (Dec. 2011)

Honors / Awards

3MT, 2nd prize, School of Earth and Environmental Sciences, UQ (2016)

PhD scholarship UQ Centre of Coal Seam Gas, UQ (2015)

Silver Medal, 2nd best student of the BSc Mining Engineering, UFMG (2007)

Undergraduate Scholarship, exchange student, Tennessee Technological University (TTU) (2004)

Keynote Lecture/Poster

ARC Centre of Excellence for Enabling Eco-Efficient Beneficiation of Minerals, annual conference, Canberra, Australia, 2022

SPE Asia Pacific Unconventional Resources Conference and Exhibition - The New Energy Age: Building on Success, Brisbane, Australia, 2018

Dorothy Hill Women in Earth Sciences Symposium, the University of Queensland, Brisbane, Australia, 2017

BBUGS & BOHOGS Bowen Basin Underground Geotechnical Society & Bowen Hunter Open Cut Geotechnical Society, Moranbah, Australia, 2015

The Southern African Institute of Mining and Metallurgy Southern Hemisphere International Rock Mechanics Symposium, Sun City, South Africa, 2012

Professional Experience

Oct 2023 – Present	ITASCA Pty Ltd, Brisbane, QLD Senior Geotechnical Engineer
Sept 2014 – Sept 2023	The University of Queensland, SMI - JKMRC, Brisbane, QLD, Australia From Research Assistant/ PhD candidate to Postdoctoral Research Fellow
June 2012 – Aug 2014	Vale Pty Ltd, Mining Engineering Group, Brisbane, QLD, Australia Senior Geotechnical Engineer
July 2011 – May 2012	AngloGold Ashanti, West Wits Regional Rock Eng, Carletonville, South Africa Rock Engineering Technical Assistant
Dec 2006 – Jun 2011	AngloGold Ashanti, Nova Lima, Santa Barbara, and Sabará, MG, Brazil From Graduate to Rock Mechanics - Geotechnical Engineer

Project Experience

Investigating the Influence of Texture and Micro-mechanical Properties on Breakage Behaviour of Ores: Co-supervising a PhD candidate at UQ, who is applying the breakage approach to decouple the effect of rock properties from comminution devices. This research focuses on the deformation and failure process of minerals embedded within a rock to understand the complexities of heterogeneous samples and mineral associations influencing mechanical breakage and aiming to improve liberation. The methodology includes micro-scale measurements through indentation testing and numerical modelling simulation.

Utilising Hyperspectral Scanning Analysis for Geotechnical Characterization (ACARP C34033): This project hypothesised that mineralogy, particularly the identification of different clay types, played a role in controlling rock competence, which in turn has implications for geotechnical slope stability analysis. Hyperspectral imagery, high-resolution digital photographs, laser profiling data of rock chip samples and an impact breakage device were utilised. As a result, a functional workflow was developed to integrate hyperspectral imagery and rock properties collected from rock chips.

Driving Longwall Mining through Pre-consolidated Fault: Compiled information of geological and geotechnical data available on the pre-consolidation of fault planes in coal longwall mining in Australia. Provided recommendations that could apply to Carborough Downs, including geological/ geotechnical investigation, water pressure testing program of geological structures identified with potential for pre-consolidation, monitoring, and numerical modelling investigation.

Evaluation of Coal Mine Design Options: Completed geotechnical data collection and constructed numerical models using FLAC2D and UDEC to provide geotechnical inputs into Australia's short-term and long-term mine planning designs. Assessed the rock mass responses to coal longwall mining, evaluated the ground support performance, analysed the stability of pillars, and estimated the surface subsidence.

Boundary Element Method for Ultra-Deep, Hard Rock, Tabular-type Mine Layouts: Developed numerical modelling methodologies for geotechnical appraisal of mine layouts to complement the mine's Business Plan requirements for AngloGold Ashanti in South Africa. It included simulation of ground responses in the vicinity of shaft infrastructure, access ways and stoping areas. Developed risk assessment processes using numerical methods to identify seismic hazards in ultra-deep-level excavations.

Numerical Analysis of the Various Layout Options at Cuiaba Mine: Conducted pre-feasibility studies using numerical modelling analyses for AngloGold Ashanti in Brazil using various software and liaised with ITASCA to determine the rock mechanics constraints of mine designs, e.g., definition of optimal pillar widths, optimisation of the vertical level intervals for stoping panels, and requirements of structural support elements. Models were calibrated based on field measurements and data collection, and technical reports with recommendations were delivered.

Geotechnical Field Investigations, Data Collection and Interpretation: Appraised rock-related stability conditions at various sites from AngloGold Ashanti in Brazil, e.g., closed Faria Mine main adit level; Cruzeiro's embankments in the proximity of Mina Velha's steep open pit walls; rockwall conditions in tunnels of company's hydroelectric; large underground primary crusher excavation at Cuiabá Mine; walls in a new developed shallow ventilation shaft at Córrego of Sítio Mine; and routine strata control and fieldwork in open pit and underground at Córrego of Sítio.

Rock Laboratory Tests in Brazil: Conducted uniaxial and triaxial compression, tensile and Brazilian strength, shear testing, point load index, and porosity determination; drafted reports of rock behaviour and material properties determination at the Mining Engineering Department at UFMG.

Papers and Publications

Journal Articles

Barbosa, K., Hilden, M. and Yahyaei, M. (2022). Analysis of force-deformation and force-time profiles of 3D-printed specimens of single and binary mineral composition tested with Short Impact Load Cell. Minerals Engineering, 189, 107887 1-16.
https://doi.org/10.1016/j.mineng.2022.107887

Barbosa, K., Hodder, K. and Yahyaei, M. (2022). Experimental study on mechanical properties of 3D-printed specimens of iron oxide, quartz, and bedded composites under uniaxial compression and indirect tensile strength. 3D Printing and Additive Manufacturing.
https://doi.org/10.1089/3dp.2021.0247

Barbosa, K., Esterle, J. and Chen, Z. (2020). Scaling compressive strength from mini-cylinder specimens of sub-bituminous coal. Rock Mechanics and Rock Engineering, 53 (6), 2839-2853.
https://doi.org/10.1007/s00603-020-02083-6

Barbosa, K., Esterle, J., Van De Wetering, N. and Chen, Z. (2020). Shore hardness measurements of sub-bituminous coal microlithotypes. International Journal of Coal Geology, 217, 103341, 103341.
https://doi.org/10.1016/j.coal.2019.103341

Barbosa, K., Esterle, J, Bonfils, B. and Chen, Z. (2019). The use of short impact load cell to derive geomechanical properties of sub-bituminous coal and mudstone. Journal of Natural Gas Science and Engineering, 72 103018, 103018.
https://doi.org/10.1016/j.jngse.2019.103018

Barbosa, K., Chalaturnyk, R., Bonfils, B., Esterle, J. and Chen, Z. (2019). Testing impact load cell calculations of material fracture toughness and strength using 3D-printed sandstone. Geotechnical and Geological Engineering, 38 (2), 1065-1096.
https://doi.org//10.1007/s10706-019-01073-y

Barbosa, K., Esterle, J. and Ruest, M. (2016). A workflow to build a model investigating coal cleat upscaling conditioned by the lithotype. The APPEA Journal, 56 (1), 331-340.
https://doi.org//10.1071/aj15024

Conference Papers

Reyes, F., **Barbosa, K.**, Evans, C. , Jokovic, V. and Wilkie, G. (2022). Towards grade engineering using X-ray microtomography. IMPC Asia Pacific 2022, Melbourne, VIC, Australia, 22-24 August 2022. Carlton, VIC Australia: The Australian Institute of Mining and Metallurgy.

Jokovic, V., **Barbosa, K.J**., Ndimande, C., Hilden, M., Runge, K. and Yahyaei, M. (2022). Measuring the effect of hybrid classification in a pilot-scale test. IMPC Asia-Pacific 2022, Melbourne, Australia, 22-24 August 2022. Carlton, VIC, Australia: The Australasian Institute of Mining and Metallurgy.

Barbosa, K., Miceli, H. and Lois-Morales, P. (2021). Characteristics of single-particle breakage from Short Impact Load Cell guiding Precision Rolls Crusher tester. Procemin - GEOMET 2021, Santiago, Chile, 20-22 October 2021. Gecamin.

Lois-Morales, P., **Barbosa, K.**, Evans, C. and Yahyaei, M (2020). A geometallurgical approach to comminution using primary breakage properties of ores. Procemin - GEOMET 2020, Santiago, Chile, 23-27 November 2020. Gecamin.

Barbosa, K.J. and Vieira F.M.C.C. (2012). Numerical modeling-based evaluation of sublevel design options for the Cuiabá gold mine, Brazil. The Southern African Institute of Mining and Metallurgy Southern Hemisphere International Rock Mechanics Symposium, Sun City, South Africa, 14-17 May 2012.

Vieira, F.M.C.C. and **Barbosa, K.J**. (2010). Numerical modeling-based evaluation of layout design options for the Cuiabá gold mine – Brazil. XV Brazilian Congress Soil Mechanic and Geotech Engineer, COMRAMSEG, Gramado, Brazil, 17 - 22 October.

Gama E.M., Pinto C.L., Timóteo L.G.M., **Barbosa K.J.,** and Cordeiro, R. (2006). Mechanic comportment of rocks in laboratorial testes. IV Brazilian Congress OP/ IV Brazilian Congress UG Mine, IBRAM / DEMIN, Belo Horizonte, Brazil.