SME Annual Conference & Expo 2024

Phoenix, Arizona, USA
25 - 28 February 2024

ISBN: 978-1-7138-9650-0

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571

Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2024) by Society for Mining, Metallurgy and Exploration (SME)
All rights reserved.

Printed with permission by Curran Associates, Inc. (2024)

For permission requests, please contact Society for Mining, Metallurgy and Exploration
at the address below.

Society for Mining, Metallurgy and Exploration Inc.
12999 East Adam Aircraft Circle
Englewood, CO 80112-4167

Phone: (303) 948-4200
Fax: (303) 973-3845

cs@smenet.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Contents

24-001 A Case Study: Successfully Managing Excessive and Rapid Slope Deformation in an Open Pit Mine Utilizing Slope Monitoring Radar Systems 1

24-002 A History of Gold Mining in Oatman & Gold Road, Az 7

24-003 A Holistic Vision for a Systems Approach to Resource Governance 13

24-004 A Study on the Impact of In-Seam Rock Partings on Coal Pillar Strength Based on Field Instrumentation and Numerical Modeling at the Maple Eagle Mine 20

24-005 A Surface Geotechnical In-Pit Underground Portal Relocation: An Operations-Based Case Study 29

24-006 Additional Damage to Buildings and Infrastructure Induced by Long-Term Surface Movements Above Longwall Mining 35

24-007 Additives for Magnetic Separation of Iron Ore Ultrafines 45

24-008 Alteration and Geochemistry of Clinkers in the San Juan Basin, New Mexico 49

24-009 An Integrated Method to Classify Ground-Fall Accidents and to Estimate Ground-Fall Trends in U.S. Mines Using Machine Learning Algorithms 57

24-010 Analysis and Repair of Failed Copper SX Plant Mix Boxes: An Application of First Principles 68

24-011 Analyzing the Effectiveness of Fire Suppression Systems to Extinguish a Fire on Mobile Mine Equipment Used in the Mining Industry 74

24-012 Best Practices for Ensuring Safety in Field Studies: A Comprehensive Guide for Mining Researchers and Operators 82

24-013 Can Fly Ash Pond Closure Expertise be Applied to Mine Tailings? 96

24-014 Canopy Air Curtain to Reduce Diesel Particulate Matter Exposure for Underground Blasters 105

24-015 Case Study: Improved Bit Life Utilizing Advanced Cryogenics in Drilling and Blasting 114

24-016 Challenges of Design and Fabrication of Fiber Reinforced Polymer (FRP) Flanges—A Review 120

24-017 Characterizing Fire in Large Underground Ventilation Networks Using Machine Learning 128

24-018 Circular Economy in the Metallurgical Mining Industry 134

24-019 Comparative Mineralogy of the 5-Element Arsenide Vein Systems of the Black Hawk District, Grant County, New Mexico 140

24-020 Concerns with the Environmental Susceptibility of Mine Utility Vehicle and Rubber-tired Mantrip LITHIUM-ion Batteries 145

24-021 Corrosion Strategies at the Resolution Copper Project, Arizona 154

24-022 Critical Minerals and Acid Mine Drainage in Black Hawk Mine Waste, Grant County, New Mexico 165

24-023 Demonstrating the Financial Impact of Mining Injuries with the Updated Safety Pays in Mining V2.0 Web Application 172

24-024 Designing a Rockfall Testing Program for Open-Pit Mines to Investigate Runout and Bench Catchment 182

24-025 Determination of Incombustible Content with Portable Spectrometers Using Chemometric Modelling: Preliminary Results 190

24-026 Development of a Comprehensive Mine Plan Approach for the Extraction of Icy Regolith on the South Pole of the Moon Using Surface Mine Modelling Software 196

24-027 Processing Marcasite Copper Ore with Iron Depressant, Hybrid Reagents, Advanced Data Analytics, Visiofroth™ and Breakthrough Expert Control of Entire Flotation Plant—Fundamentally Transforming Doe Run Buick Mill to Create Value and Expand Ore Resources 200

24-028 Dewatering over 8,000 tpd of Copper Tailings at a Mine site in Peru with the Largest Filter Press in the World: Case Study and "Lessons Learned" 207

24-029 Digital One Enterprise Expert Operating System on Production Line at Doe Run's Buick Mill—Expert-Control of Flotation, Grinding and Things (EOT) 209

24-030 Efficiency of Carbon Sorbents in Removing Zinc from Mine Water: A Comparative Case Study of the Rothschönberger Stolln Water 218

24-031 Engineering a Large Eco-Friendly Reinforced Sloped MSE Wall System to Increase the Size of a Flat, Work Area of a Mine 227

24-032 Enhancement of Ultrafine Phosphate Flotation Using Eriez' Cavtube Column Flotation Technology 229

24-033 Enhancing Robotic Perception for Autonomous Roof Bolting Using an Event Based Machine Learning Framework 242

24-034 Enhancing Ventilation and Development Planning in Underground Stone Mines: Insights from a CFD-Based Study 251

24-035 Enrichment Feasibility of Tellurium, Gold, and Silver from Copper Tailings 260

24-036 Estimating Air Blast Velocity Using Optical Flow Algorithm 270

24-037 Examining Pull-Out Tests for Grouted Rib Bolts: A Comprehensive Analysis 278

24-038 Experimental and Numerical Analysis on Failure of Soil Slopes Induced by Increasing Pore Water Pressure 288

24-039 Experimental Study on Position Evolution and Load Transfer Law of Support in Large Dip Angle Stope Based on Digital Twin 299

24-040 Explosion-Proof Enclosure Failure to Contain a Lithium-Ion Battery Thermal Runaway 314

24-041 Fleet Efficiency Evaluations for Optimal Cycle Times Through Various Blast Designs in the Sorted Geological Formation Under Constrained Operating Conditions 322

24-042 Geochemistry of Critical Minerals in Mine Wastes at Hillsboro and Steeple Rock Districts, New Mexico 328

24-043 Geochemistry of Critical Minerals in Mine Wastes in New Mexico 335

24-044 Geochronology and Critical Mineral Potential of Selected Laramide Porphyry and Related Deposits in Southwest New Mexico 344

24-045 Geology Says Otherwise 351

24-046 Geopolymerization of Mining Tailings as an Alternative for Its Use in the Construction Industry 359

24-047 Geosensing for Exploration—New Technology for Underground Directional Drilling 367

24-048 Geoistical Evaluation of Polymetallic Veins 372

24-049 Ground Control Monitoring: A Comprehensive Guide for Mine Operators on Instrumentation and Data Acquisition Currently Used by the National Institute for Occupational Safety and Health (NIOSH) 382

24-050 Hierarchical Training Pipeline for Event-Based Robotic Perception Models for Autonomous Roof Bolting 394

24-051 HMX Based Electronic Initiation System for Blasting in High Temperature Ground and/or Extremely Reactive Ground 403

24-052 Impacts of ESG on the Copper Supply Chain—The New Critical Mineral 407

24-053 Improved Drilling Controls Through Forecasting 420

24-054 Innovative Approaches to Building Technical Capability for a Modern Mining and Metals Organisation 426

24-055 Investing in Sustainable Tailings Management:Reduce Risk by Considering Environmental andUtility Costs During Pre-Feasibility 433

24-056 Kickstarting Culture Change 441

24-057 Lessons Learned From Near-Miss Events: Use of the Critical Decision Method to Identify Strategies to Improve Haul Truck Safety in Mining 450

24-058 MILP Production Scheduling Models for Evaluating Continuous Improvement Projects 461

24-059 Mine Ventilation Pathway Simulation on a Hypothetical Shale Gas Well Breach Utilizing the Longwall Instrumented Aerodynamic Model (LIAM) 473

24-060 Mineralogy And Geochemistry of Heavy Mineral Beach-Placer Sandstones in New Mexico 483

24-061 Minimizing Leaching of Al, Co, Cu, Fe, Li, and Ni During Discharge of Lithium-Ion Batteries 491

24-062 Navigating Operational Hurdles in SAG Mills: Identifying and Addressing Common Challenges 495

24-063 New Life for the Veragold Mine—Low Risk Tailings Storage 506

24-064 NIOSH Gas Well Stability Research: Investigation into the Causes of an Anomalous Shale Gas Well Casing Deformation at a Deep Longwall Mine 510

24-065 NIOSH Miner Act Extramural Research for Silica Dust 520

24-066 Driving Open Autonomy and Innovation 532

24-067 Optimizing Froth Zone in Larger Flotation Cells Through Innovative Spider Crowder Upgrade 538

24-068 Ore Control Technological Innovations at Peña Colorada Mine 543

24-069 Outlining a Roadmap for the Deployment of a Digital Twin System for the San Xavier Mine Laboratory 550

24-070 Perceptive Track Projection—Creating Context Sensitive Path, Velocity, and Auxiliary Activity Projections for Use in Autonomous Safety Intervention Systems 554

24-071 Practical Application of Surfactants for Respirable Silica Dust Control 558

24-072 Practical Applications of the Hill of Value Approach in Strategic Planning for Openpit Mining 566

24-073 Pressure Balancing Tests at a Colorado Coal Mine 572

24-074 Principal Horizontal Stress Contributing to Massive Roof Collapse at the Subtropolis Mine 581

24-075 Processing Marcasite Copper Ore With Iron Depressant, Hybrid Reagents, Advanced Data Analytics, Visiofroth™ and Breakthrough Expert Control of Entire Flotation Plant—Fundamentally Transforming Doe Run Buick Mill to Create Value and Expand Ore Resources 590

24-076 Building Our Future Project: Inspiring Young People to Follow Their Dreams and Aspirations 597

24-077 Quantifying the Texture of Coal Images with Different Lithotypes through Gray-Level Co-Occurrence Matrix 603

24-078 Rare Earth Elements (REE) and Other Critical Minerals in Late Cretaceous Coal and Related Strata in the San Juan and Raton Basins, New Mexico: Preliminary Observations 615

24-079 Real-Time Dust Monitoring in Occupational Environments: A Case Study on Using Low-Cost Dust Monitors for Enhanced Data Collection and Analysis 625

24-080 Secrets of the Bond Ball Mill Grindability Test 635

24-081 Selection and Application of Cutoff Grades in Underground Mine Planning—Practical Application 642

24-082 Sulfide Tailings as Potential Secondary Sources of Critical Minerals: Tellurium 647

24-083 Testing of Ground Truth Instruments for Use in Evaluating Haul Truck Collision Warning and Avoidance Systems 659

24-084 Testing, Design, Commissioning and Operation—A Disc Filter Life Experience on a Backfill Plant 667

24-085 The Bond Legacy 673

24-086 The Potential of Lithium: Peruvian Case 692

24-087 Thermal Runaway Pressures as a Function of Free Space in Sealed Containers for Lithium Titanate Cells 704

24-088 Underground Mine Ramp Design for Beginners 714

24-089 Unlocking Microbial Potential to Develop Innovative and Environmentally Responsible Technologies 723

24-090 Using Augmented Reality Assistance in Mine Rescue 730

24-091 Using Event-Based Imaging and Deep Learning to Generate 3D Surface Maps for Autonomous Roof Bolting 735

24-092 Utilizing Big Data Statistical Techniques in Python to Optimize Geometallurgy Workflow for Metallurgical Test Work Sample Selection 743

24-093 Validation of Modeled Rockmass Permeability Against Field Measurements in a Longwall Mine 749

24-094 Wearable Sensors for Continuous, Real-Time Monitoring and Risk Assessment of Mine Workers Health and Safety 760

24-095 A Hydrodynamic Approach for Sizing and Selection of Hydrocyclone—Parametric Scaling and Process Optimization 771

24-096 Downstream Improvements on Upstream Dams: An Owner's Perspective of a Paradigm Shift 778