

# **SME Annual Conference & Expo 2021**

Online  
1-5 March 2021

ISBN: 978-1-7138-3076-4

**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© (2021) by Society for Mining, Metallurgy and Exploration (SME)  
All rights reserved.

Printed with permission by Curran Associates, Inc. (2021)

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](mailto: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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

21-001	METHOD FOR UPDATING SPARSE EXPLORATION MODELS WITH CURRENT MINING GRADE <b>1</b> K. Wilkes, W. Wilkinson
21-002	CASE STUDY - IDENTIFYING UNSTABLE MATERIALS FOR DRAGLINE BENCH DESIGNS <b>3</b> E. Adams, W. Wilkinson
21-003	USING EXPERIMENTAL DATA TO VALIDATE A FLOTATION CELL CFD MODEL FOR DEVELOPMENT OF A DYNAMIC CFD-BASED SIMULATOR <b>5</b> R. Silva, J. Wallace, D. Lelinski
21-004	TROUBLESHOOTING MYSTERIOUS CONVEYOR PROBLEMS <b>11</b> A. Jennings
21-005	ANALYSIS OF STEEL PROP SUPPORTS SUBJECTED TO VERTICAL AND LATERAL LOADING <b>14</b> M. Khaled, T. Batchler
21-006	HOW TO KEEP YOUR PLANT RUNNING IN AN ECONOMIC DOWNTURN <b>20</b> E. Duda
21-007	REPURPOSING MINE TAILINGS WITH CERAMEXT™ TECHNOLOGIES <b>22</b> R. Guenther
21-008	A SECOND CASE STUDY OF FIELD TEST RESULTS FOR COMPARISON OF ROOF BOLTER DRY COLLECTION SYSTEM WITH WET COLLECTION SYSTEM <b>24</b> W. Reed, S. Klima, A. Mazzella, G. Ross, G. Roberts, J. Deluzio
21-009	FIELD TEST OF A CANOPY AIR CURTAIN ON A RAMCAR FOR DUST CONTROL IN AN UNDERGROUND COAL MINE <b>29</b> W. Reed, J. Colinet, S. Klima, A. Mazzella, G. Ross, M. Workman, T. Morson, J. Driscoll
21-010	ELECTROMAGNETIC INTERFERENCE (EMI) IN UNDERGROUND COAL MINES: A LITERATURE REVIEW AND PRACTICAL CONSIDERATIONS <b>36</b> C. Zhou, M. Reyes, M. Girman
21-011	APPLYING SMART PRINCIPLES TO IMPROVE SUPERVISOR COMMUNICATION AS A LEADING INDICATOR OF OSH <b>43</b> E. Haas, J. Wickizer, T. Manley
21-012	COPPER AND MOLYBDENUM RECOVERY INCREASED BY UPGRADING FLOTATION CELLS WITH CENTER LAUNDERS AT HUBBAY CONSTANCIA <b>51</b> G. Bermudez, P. Amelunxen, M. Medina, M. Taylor, R. Dube

- 21-013 TECHNOLOGIES AND PRACTICES FOR REMOTELY MONITORING GROUND STABILITY IN U.S. UNDERGROUND METAL MINES **55**  
M. Boltz, D. Chambers, K. Dehn, D. Benton, S. Warren
- 21-014 SHALE GAS WELL STABILITY UNDER THE INFLUENCE OF UNDERGROUND LONGWALL COAL MINING **63**  
D. Su, P. Zhang, H. Dougherty, M. Van Dyke, R. Kimutis
- 21-015 PRIORITIZING ELECTROMAGNETIC INTERFERENCE TESTING OF DEVICES USED IN UNDERGROUND COAL MINES **69**  
J. Homer, N. Damiano, C. Jobes, M. Reyes, J. Carr
- 21-016 COPPER PRESTRIP TO COPPER CYANIDE **76**  
S. Dixon
- 21-017 AN OVERVIEW OF EXISTING EMI STANDARDS APPLICABLE TO MINING **80**  
M. Girman, M. Reyes, C. Zhou
- 21-018 CRITICAL REVIEW ON HYDROMETALLURGICAL TECHNIQUES AND POTENTIAL APPLICATION FOR COPPER EXTRACTION IN THE DULUTH COMPLEX **86**  
W. Xie, M. Laputka
- 21-019 COMPARISON OF NANO MESO INORGANIC POLYMERS TO PORTLAND CEMENT & GEOPOLYMERS FOR MINE TAILINGS STABILITY & CONTAINMENT OF THE TOXIC RCRA 8 METALS & OTHER LEACHATES **92**  
T. Brammer
- 21-020 NON-SOLVENT BASED SURFACE TREATMENTS FOR SUSTAINABLE MINERAL PROCESSING APPLICATIONS **103**  
B. Sansao, J. Johnson, W. Cross, A. Romkes, J. Kellar
- 21-021 USING TECHNOLOGY TO SUPPORT BEST PRACTICE FOR TAILINGS STORAGE FACILITIES (TSF) MANAGEMENT, GOVERNANCE AND DISCLOSURE **107**  
N. Pollock, H. Arvidson
- 21-022 A MULTI-TECHNOLOGY APPROACH TO OPTIMIZING THE CARBON-IN-LEACH (CIL) CIRCUIT AT THE HAILE GOLD MINE **110**  
J. Rozelle
- 21-023 USE OF ROCK STRENGTH CHARACTERIZATION AND SIDE-SCAN SONAR TO IMPROVE UNDERWATER ORE RECOVERY IN A FLOODED DRAGLINE OPERATION IN CENTRAL FLORIDA **114**  
J. Woosley
- 21-024 THE INFLUENCE OF DEPOSITIONAL ENVIRONMENT ON DYNAMIC FAILURE POTENTIAL IN U.S. COAL SEAMS **117**  
H. Lawson, D. Hanson
- 21-025 DYNAMIC FAILURE CLASSIFICATION WITHIN THE CONTEXT OF REGIONAL GEOLOGY: A CASE STUDY FROM THE UINTA AND PICEANCE BASINS **127**  
H. Lawson, M. Mastalerz, D. Hanson
- 21-026 EVALUATING THE HBU "FINANCIALLY FEASIBLE" COMPONENT FOR AN UNDEVELOPED MINERAL PROPERTY **136**  
J. Beck

- 21-027      DISPERSION CHARACTERISTICS OF COAL AND ROCK DUST MIXTURES IN DRY AND WET CONDITIONS **140**  
K. Ajayi, I. Perera
- 21-028      BEYOND SOCIAL LICENSING: EMPLOYING CREATIVE CAPACITY BUILDING TO DEVELOP PROBLEM SOLVING AND DESIGN CAPABILITIES AMONG MINING COMMUNITIES IN COLOMBIA **146**  
L. McDonald, A. Freese, J. Lucena, C. Maya, M. Gamarra, O. Restrepo
- 21-029      SME 2021: THE USE OF DENSE MEDIUM TECHNOLOGY TO UPGRADE INDUSTRIAL MINERALS AND METAL ORES **148**  
D. Woodruff, L. MacNamara
- 21-030      INTERSTAGE SCREENING EVOLUTION, RETROFITTING OCEANAGOLD'S HAILE GOLD MINE'S CIL INTERSTAGE SCREENS WITH URETHANE SCREENING SURFACES AND THE INCREASED SAVINGS AND PERFORMANCE **152**  
J. Rozelle, E. Mortensen, A. Nicosia, P. Stasio
- 21-031      LUNAR IN-SITU RESOURCE BENEFICIATION **155**  
K. Kingsbury
- 21-033      POTENTIAL STRATEGIES TO MITIGATE HEALTH HAZARDS OF DPM IN MINES - A NOVEL PERSPECTIVE **158**  
S. Azam
- 21-034      ELECTROMAGNETIC HAULAGE SYSTEM **164**  
B. Rout, P. Nagayach
- 21-035      MINE OPERATOR SOCIAL RESPONSIBILITY NECESSITATES GEOMONITORING **167**  
T. Rudolph, J. Brune, P. Goerke-Mallet, J. Kretschmann
- 21-036      HOW CLOSE AND FAR UNDERGROUND PUMP STORAGE PLANTS ARE FROM REALITY: STATUS QUO AND CHALLENGES **173**  
S. Nowosad, A. Hutwalker, O. Langefeld
- 21-037      FROM DIESEL TO BATTERIES: ISSUES, CHALLENGES AND SOLUTIONS TO UPGRADING A MINE'S POWER INFRASTRUCTURE FOR THE CHANGE **177**  
J. Onsager, D. Zabel
- 21-038      CFD SIMULATIONS OF TWO-PHASE FLOW IN METSO-RCS5 FLOTATION MACHINE AND METALLURGICAL MODELING **182**  
H. Fayed, S. Ragab
- 21-040      EMPLOYEE ENGAGEMENT AND EMPOWERMENT FOUNDATIONS OF CONTINUOUS IMPROVEMENT **189**  
M. Fein
- 21-041      AUTOMATION, CLOUD COMPUTING, AND SUITABLE SOCIAL SYSTEM; RELATIONSHIP, EMPATHY, AND CONSTANT LEARNING ARE THE PERFECT COMPLEMENTS FOR THE SUCCESS OF THE MINE PLANNING SOFTWARE IN THE 2020'S **192**  
P. Herrada, P. Alegria

- 21-042 UNIT OPERATIONS IN PIONEERING WORKS FOR MINING ON THE MOON **196**  
V. Tenorio, K. Galla, K. Kingsbury
- 21-043 OPTIMIZATION OF MINING OPERATIONS IN UNDERGROUND MINING  
COMBINING A STRATEGIC PLAN AND WIRELESS TECHNOLOGIES **199**  
K. Hague, V. Tenorio
- 21-044 PERMITTING A LIMESTONE QUARRY BENEATH THE WATER TABLE IN  
STRUCTURALLY CONTROLLED LITHOLOGIES TO IMPROVE PRODUCT  
QUALITY AND INCREASE RESERVES IN NORTHWEST GEORGIA **204**  
E. Mallard, J. Patterson, J. Horsley
- 21-045 A DYNAMIC MODEL-BASED PLATFORM FOR GRINDING MILLS **211**  
W. Xie
- 21-046 CHARACTERIZING THE MITIGATION OF SUBSTRATE DAMAGE WITHIN  
UNDERGROUND STRUCTURAL LINERS THROUGH UTILIZATION OF  
WATERJET TECHNOLOGY FOR REHABILITATION WORK **216**  
J. Bourgeois, H. Miller, E. Charrier
- 21-047 WHEN THE OPEN HOUSE IS CLOSED; A PLAYBOOK FOR VIRTUAL PUBLIC  
ENGAGEMENT **225**  
T. McClure, S. White, M. Miller
- 21-048 FAST FORWARD PREDICTION OF AIRFLOW AND TEMPERATURE IN  
UNDERGROUND MINES USING ARTIFICIAL INTELLIGENCE TECHNIQUES **227**  
T. Dias, C. Lu, G. Danko
- 21-049 SIMULATION-BASED TRAINING: BUILDING THE FUTURE ROCK MECHANICS  
WORKFORCE **237**  
E. Ardakani, B. Reid, J. Oke
- 21-050 THE DOMESTIC URANIUM BOOM **242**  
**T. McNulty**
- 21-051 ECONOMICAL, LOW-PROFILE CAPACITIVE LOAD CELLS FOR UNDERGROUND  
MINING TOOL WEAR ESTIMATION AND MATERIAL CLASSIFICATION TO  
PROMOTE WORKER SAFETY **245**  
A. Oltmanns, A. Petruska
- 21-052 GEOFINGERPRINTING COLUMBITE-TANTALITE MINERALS, USING LIBS, XRF,  
AND RAMAN SPECTROSCOPY **250**  
S. Kessinger, P. Diwakar, K. Chen, E. Duke, J. Kellar
- 21-053 THE SEQUENTIAL COPPER ANALYSIS METHOD – UPDATE GEOLOGICAL,  
MINERALOGICAL, AND METALLURGICAL APPLICATIONS **253**  
G. Parkison, E. Iasillo, F. Garcia, F. Pinto, N. Ericson
- 21-054 SPACE MINING INDUSTRY; A TECHNICAL REVIEW **259**  
J. Julian, P. Sadeghi
- 21-055 A SMARTER LOCK: APPLYING RECENT AND EMERGING TECHNOLOGY TO  
IMPROVE LOCKOUT/TAGOUT **263**  
D. Parks, H. Nickerson, J. Frazier, V. Raj, C. Sunderman, M. Rola, K. Johnson,  
A. Miller

- 21-056 DIGITAL SOLUTIONS FOR MINING WITH ARTIFICIAL INTELLIGENCE **268**  
F. Rietschel, K. Becerra
- 21-057 BASF INTELLIGENT MINE POWERED BY INTELLISENSE.IO – A COMBINATION OF  
MINERAL PROCESSING AND INDUSTRIAL AI TECHNOLOGY **272**  
I. Flanagan
- 21-058 ADAPTING MINERAL RESOURCE ESTIMATES ACROSS SOFTWARE PACKAGES **274**  
G. Clarkson
- 21-059 GEOMIMIC© IN MINING **277**  
M. Javier
- 21-060 RAPID CONSTRUCTION METHODOLOGIES HELP OWNERS/OPERATORS  
IMPLEMENT REPAIRS TO THEIR CRITICAL INFRASTRUCTURE ASSETS **282**  
T. Kline
- 21-061 POTENTIAL LITHIUM RESOURCES IN NEW MEXICO **287**  
V. McLemore