Hafez, Semnan, Iran. The goal of this study is determining a logical relationship between the alteration index (degree of alteration) and rock mass strengthen. The results showed, by increasing Argillic alteration, rock mass uniaxial and tensile strength decrease 84 and 41 percent respectively. However, in the moderate argillic rock, due to the presence of Iron-oxides the rock mass uniaxial strength increases 26 percent. It is included that presence of Iron Oxides reduces the negative effect of argillic alteration on rock mass strength. Keywords: Arglic-Iron Oxide Alteration, Uniaxial Compressive Strength, Tensile Strength.

WEDNESDAY, FEBRUARY 28

AFTERNOON

2:00 PM I ROOM 101E

Mining & Exploration: Management: the Challenges of a Changing Workforce

Chair: *J. Sexauer, Stantec*

2:00 PM
Introduction

2:05 PM
The Case for a Professional Master's Degree in Mining Engineering and Management

P. Nelson; Mining Engineering, Colorado School of Mines, Golden, CO

The future success of the mining industry requires a new kind of engineer – agile in management of business and technology, strategic in acquiring and controlling the flow of information, and astutely aware of the cross-culture, cross-sector and cross-disciplinary issues to be confronted in the complex environments of mining. At the Colorado School of Mines, the Mining Engineering department will launch a unique graduate educational experience for engineers with experience in the industry, and who aspire to leadership in the industry. This new on-line and on-campus graduate program will be transformative and focused toward advanced technology and management with executive content that involves industry leaders as instructors. The curriculum for the Professional Masters will be designed to build knowledge and skills in sustainability, strategic planning and decision science, management of information and technology, project and risk management, finance, valuation, policy, and social license. Mines will develop and prepare graduates who will be effective in influencing change and in solving current and future mining problems in a comprehensive, sustainable, and holistic manner.

2:25 PM
The Workforce is Changing – How Do I Communicate?

B. Archibald, B. Weaver, A. Gignac and R. Vogel; Q4 Impact Group, Canton, OH

In an industry historically dominated by "seasoned professionals" in the managemnt ranks, mine managers today could be Baby Boomers, Gen-Xers and Millenials. What's more, they could likley be manageing any of the generations as well. The rapidly changing complexion of the workforce and the inherent communication challenges are resulting in heightened levels of frustration at all levels and rapid loss of invaluable "tribal knowledge". It seems that nobody wants to talk to anybody anymore and efficiency is suffering. This session addresses the multi-generational issues faced in the mnining industry today by an industry-experienced team assembled specifically to help everyone at all levels get along and communicate effectively. The session helps attendees gain an understanding of the importance of the issue, why it exists and how to deal with it.

2:45 PM
Digital Reinvention at Barrick Nevada

E. Yalcin; SME, Elko, NV

Barrick Gold has a vision to transform its organization through the use of digital solutions; delivering enhanced safety, operating cost and production results. The organization began executing the vision at Barrick Nevada at the end of 2016, through the combination of in-house solution development and deployment of 3rd party solutions. These solutions include workforce productivity, predictive analytics and automation of select equipment within the underground, open pit and process divisions. The presentation will share lessons learned at Barrick Nevada from an organizational and technical perspective and discuss future opportunities.

3:05 PM
Approaches in Underground Strategic Mine Planning

K. Huss and B. King; Newmont Mining Corporation, Denver, CO

Newmont Mining is applying novel techniques and tools to unlock strategic value in its underground studies and operations. A case study is used to demonstrate how advanced custom models have been used to augment commercial software to provide guidance for an underground scoping study. Our process enables us to quickly evaluate a range of options and isolate value drivers while maintaining the rigor of an activity based schedule.

3:25 PM
Learn with Harry: Toward a Comprehensive Training Solution Using Serious Games

L. Brown, M. Peltier and M. Poulton; Desert Saber, LLC, Tucson, AZ

Following a multiyear research and development effort, we have created the Learn with Harry suite of "serious games," which is based on scholarly research into how adults best learn the complex nature of mining safety. These games emphasize high user engagement, critical thinking, customization, and evaluation. The Learn with Harry suite currently includes three games: Harry's Hard Choices, covering mine emergency response, Harry's Hazardous Day, covering hazards recognition and workplace examination, and Harry's Fatalgram Simulator, covering refresher fatalgrams and MSHA best practices. In this talk, we discuss the evolutionary development of Learn with Harry, aligning new game capabilities with mine operator needs. The game suite is currently being deployed and evaluated through an early adopter program. Industry feedback and training experiences will be discussed.

3:45 PM
The U.S. Mining Industry Workforce – A New Online Resource

C. Brandon; Automated Systems Alliance, Parker, CO

Since 2012 I've been reporting on labor trends in the U.S. job market at the annual SME convention. Annual reporting on a dynamic market doesn't make a lot of sense so beginning in 2017 most of this reporting will be moved online to make this information available in a timelier manner. This presentation will identify resources and discuss various visualizations available to understand employment trends in mining by location and commodity. The presentation will also include an assessment of mine counts by location, commodity, mine type, and status. Additional site development is anticipated as we begin to entrain data from other countries beginning with Canada.

TECHNICAL SESSIONS

MONDAY, FEBRUARY 26
AFTERNOON

1:30 PM | ROOM L100A

Dreyer Lecture

Recipient and Lecturer: *Robert Schafer*

Lecture: TBD

MONDAY, FEBRUARY 26
AFTERNOON

2:00 PM | ROOM 200ABC

6th North American Iron Ore Symposium: Mining & New Projects

Chairs: *G. Hudak, University of Minnesota*
D. Gagnon, DRA Americas

2:00 PM
Introduction

2:05 PM
Advantages of Using UAVs in Pueblo Viejo
J. Ozoria; Mining, Dominican College Of Engineers, Architects and Surveyors (CODIA), Santo Domingo, Santo Domingo, Dominican Republic

The time in projects of any kind has always been a fundamental issue from the start of construction to the operation itself, when it comes to earthworks on a large scale such as an open-pit mining operation; it is when we realize how valuable it's the time. The main objective of this presentation is to expose the advantages that make the UAV technology in mining a valuable and important tool for the management of geospatial information more efficiently and the control of the different material types in a mine with space limitation asPV. it will show the benefits of managing a mining operation with UAV. Substantial improvements in Pueblo Viejo from the area of safety, efficiency, quality and planning once implementation began. Today in Pueblo Viejo there are many applications that are carried out day by day with the use of UAVs. From the end of month report, stockpile inventory, construction monitoring, mine plans, slope monitoring, blast analysis, chess reporting. Undoubtedly, the UAVs in Pueblo Viejo came to stay, since the limitation of space and having different material types being dumped on top or beside each other. With the incorrect tracking the control of grades will be lost.

2:25 PM
An Evaluation of Rock Weathering Experiments at the MN DNR Hibbing Laboratory and Field Research Site and Their Importancein Developing Geochemical Models
S. Koski and Z. Wenz; Minnesota Department of Natural Resources, Hibbing, MN

Since the mid 1970's, a focus of the DNR Hibbing laboratory and field research site has been the development and evaluation of the humidity cell kinetic test procedure and field scale rock weathering experiments. These experiments have allowed for the assessment of the relationship between sulfur concentrations, leachate pH and solute release rates for varying rock types and mine wastes along with the ability to understand rock weathering geochemistry over decades of monitoring. In 2014 an experiment was initiated to develop a laboratory rock weathering procedure that would allow leachate solute concentrations to become limited by mineral saturation and sorption. The experiment consisted of standard humidity cells, a variant of the humidity cell, and 4 kg rock filled columns. The different experiment methods using the same two rock types have shown that similar rock types may generate different leachate compositions when following different experiment protocols. This can provide insight into geochemical processes occurring in these experiments and may allow for more accurate representations of full scale mine waste weathering and data to be used in geochemical modeling.

2:45 PM
Automation Application Realities for North American Iron Ore Laboratories
B. McBain; IMP Automation Canada Ltd., Oakville, ON, Canada

Extensive experience has been gained in the mechanization and automation of iron ore laboratories since the mid-2000s, when the first series of IMP automated labs gained a foothold in the Australian mining sector. Because of the large scale operations that often handled sample streams from several mines, these labs feature front-to-back automation that manage several hundred to a few thousand samples per day. In addition, a stringent focus on safety and regulatory compliance resulted in design strategies to limit worker access and ergonomically-challenging demands. IMP's first North American iron ore lab opened in 2014 at the TATA Steel Mineral Canada site near Schefferville, Quebec, but for various reasons this lab is a hybrid of manual and pseudo-automated processes. For the North American market, there are automation considerations to be made on the basis of lessons learned in both Australian and Canadian labs. This presentation will review the practical importance of such factors as mine output and ore type, labour factors, safety requirements and specialty iron production. It will also discuss some of the aspects to be considered in port laboratory specifications.

3:05 PM
Dominga Iron Project Update – Andes Iron
M. Rojas[1], H. Alegria[1], F. Porcile[1], M. Mlinar[2] and B. Eisenbraun[3]; [1]Dominga Project, Andes Iron, Saniago, Las Condes, Chile; [2]Coleraine Labratories, Natural Resources Research Institute, Coleraine, MN and [3]Barr Engineering Company, Hibbing, MN

A Chilean mining company Andes Iron SpA owns and is developing the Dominga Mine and associated port project. This is a greenfield project located in La Higuera, some 70km from La Serena in Chile's Coquimbo region. Andes Iron SpA, founded in 2011, acquired the Dominga project from its former owner, Minería Activa. The mine design will be consist of two open pits and include a processing facility for the extraction and beneficiation of magnetic iron ore, with copper as a byproduct. The Dominga project is expected to have a 26-year project life span. The initial investment is expected at $2.5