



identify which types were most often involved in Sand and Gravel and Stone mining operations separately. Fatalities were also categorized by mine sizes, occupations, total experience, job experience, and age. A series of statistical and time series analyses were performed on the number of fatalities and violation citations in the aggregate and for stone mines to determine whether the violation citations could have relative impacts on the fatality trend in this period.

2:25 pm
Prediction of the Whole Body Vibration in Mining Truck Driver seats using Artificial Neural Network

*J. Sattarvand¹, M. Rahim DeP² and M. Mirzaei²;
¹Mining and Metallurgical Engineering, University of Nevada Reno, Reno, NV and ²Mining Engineering, Sahand University of Technology, Tabriz, Eastern Azerbaijan, Iran (the Islamic Republic of)*

The research is conducted to study the Whole Body Vibration (WBV) of the truck fleet operating at a Caoline mine during various operational conditions in order to identify critical causes of the low back pain health issues among truck drivers. For this purpose, Root Mean Squares (RMS) of the vibrations in different speeds, loaded weights and load distribution profiles inside the truck buckets at different haul road qualities are measured through instrumentations on truck body and driver seats. Then, vibrational health risk at all operational conditions is analyzed according to ISO 2631-1 standard. An optimization model is constructed in the next step to enhance the working health condition of the drivers and artificial neural network (ANN) is used to predict the vibrational health risk of different scenarios. Results showed that the mining haul road quality, truck speed, and the materials distribution quality have significant effects on the WBV respectively, whereas the load weight had a negligible effect on RMS of the vibrations.

2:45 pm
Pre-shift Inspection Training for Industrial Aggregates using Serious Games

L. Brown, M. Peltier and M. Poulton; Lowell Institute for Mineral Resources, University of Arizona, Tucson, AZ

Motivated by MSHA's 24 "Rules to Live By," we are developing "serious games" to address three training objectives: 1) Improve workers' technical competencies in the site inspection process; 2) Facilitate efficient communication and understanding of related rights and responsibilities, within the operational structure of the organization; and 3) Augment workers' situational awareness during the course of daily job activities. In this talk, we will present a serious game for pre-shift inspections in sand, gravel, and cement that features a realistic gaming world and modular content. The game was developed in close collaboration with industry stakeholders and addresses many of the top 20 types of MSHA violations, ranging from high-risk guarding and ground control problems to relatively minor housekeeping issues. We will discuss important factors in the game design, as well as initial results and industry feedback. A virtual reality-enabled adaptation, using commodity VR headsets, will also be presented.

3:05 pm
An Affordable Mine Monitoring and Proximity Detection Tool for Aggregate Mining Operations

J. Sattarvand and V. Abdollahi; Mining and Metallurgical Engineering, University of Nevada Reno, Reno, NV

Proximity detection systems and mining equipment monitoring instrumentations are not normally utilized in aggregate mining operations due to the high capital cost involved in purchasing these technologies; however, a considerable number of loading and hauling machines are working in aggregate operations and the risk of fatal accidents seems to be higher than that of large-scale operations. The paper describes cons and pros of a new mobile applications-based technology developed for enhancing the operational safety of the truck drivers. The technology aims to decrease the complexities involved in current mine monitoring systems by designating all truck instrumentation to a conventional tablet and all data communications are done based on the mobile telecommunications infrastructures that dramatically decreases the production and installations costs. By knowing the position of all equipment and even personnel around a machine, the system sends required warnings to the related truck or loader drivers to take care of their surrounding objects. The system has been tested in a mine with the intensive foggy condition and has considerably improved the safety level.

3:25 pm
A Review and Evaluation of Mine Safety and Health Regulation in USA and Major Mining Countries

B. Abbasi; Golder Associates Inc., Reno, NV

This paper reviews Mine Safety and Health Regulation in USA, Australia, Canada and China. Mining operation is inherently risky. These risks, hazards and disasters are very similar in different mines. To improve working environment safety different agencies have developed strict and extensive set of laws and regulations and these systems share many attributes. Despite similarities between the separate systems of mining law, the disaster record is significantly and meaningfully varies. Several arguments have been made as to the cause of this, including geographical difficulties, Miner's training, and lack of up to date regulations the meet the needs of current mining operation. This article explores similarities and differences between the mining safety and health regulation in the major mining countries and introduces some of the key reasons in the gap in safety.

TUESDAY, FEBRUARY 21
AFTERNOON

2 pm Room 112

Industrial Minerals & Aggregates: Non Traditional Aggregate Sources

*Chairs: S. Stokowski, TEC Services, Lawrenceville, GA
R. Winn, R.E. Janes Gravel Co, Slaton, TX*

2 pm
Introduction

2:05 pm
Types of Non-Traditional Aggregate Sources – You Made a Cementitious Material out of What?

M. Lee; Westward Environmental, Boerne, TX

We are all familiar with the standard sources for aggregates such as limestone, granite, sand & gravel and so forth. For most markets, sources are nearby and the availability of material isn't a concern. For the rest, locating and economically extracting naturally occurring materials isn't a given. Alternative sources for construction materials is a must have in order to keep costs in check. This presentation will look at different types of non-traditional sources being used to make different kinds of aggregates.

2:25 pm
The Study of Utility of Tailings for Shotcrete Production

A. Bascetin, d. adiguzel and S. Tuylu; Mining Engineering, Istanbul University, Istanbul, Avcilar, Turkey

In recent years the fact that mining tailings cause serious environmental problems resulted in increasing number of studies about their disposal, storage and usability in various areas. Therefore the new studies about using the tailings for some purposes such as using in shotcrete or producing concrete have been increasing recently. The study is focused on applicability of tailings for producing shotcrete. Under this scope it is considered that mining tailings can bring many advantages in case of that they are used instead of sand, silt or fine aggregate in shotcrete applications. Most important advantages can be listed as decreasing shotcrete cost, decreasing amount if mining tailings to be disposed and the contribution to be provided on sustainable production of sources. In this study, effect of mining process tailings, which will be added to shotcrete mixture on various ratios to obtain required strength was investigated.



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