Technical Session I: EVOLVE-Central Appalachia (Evolve-CAPP)
Tuesday, April 26, 2022, 2:00 – 4:00 PM

Presentation 1.1
Title: Introduction to EVOLVE-Central Appalachia (Evolve-CAPP)
Presenter: Department of Energy (DOE)
Abstract: Developing

Presentation 1.2
Title: EVOLVE-Central Appalachia (Evolve-CAPP) - Basinal Resource Assessment
Presenter: Virginia Center for Coal and Energy Research (VCCER), Virginia Tech
Abstract: Developing

Presentation 1.3
Title: EVOLVE - Central Appalachia (Evolve-CAPP) – Technology Evaluation for Extraction of Critical Minerals from Coal
Presenters: Rick Honaker, PhD
Professor
University of Kentucky Department of Mining Engineering
Abstract: Developing
Title: Carbon-Based Products
Presenters: Pending
Abstract: Developing
Technical Session II: Underground Mine Stability and Dust Control
Wednesday, April 27, 2022, 9:00 – 11:00 AM

Presentation 2.1
Title: Remote Underground Investigation and Stability Analysis of Historic Underground Limestone Mines
Presenters: Al Campoli, PhD, PE
Principal Consultant
RESPEC
Abstract: Developing

Presentation 2.2
Title: Underground Mine Stability/Blast Analysis and Damage Control
Presenters: Dave Newman, PhD, PE
President
Appalachian Mining & Engineering, Inc.
Abstract: Developing

Presentation 2.3
Title: Observed Trends in Geotechnical and Hydrogeological Data for Appalachian Underground Coal Mines
Presenters: Kevin Andrews, CPG
Vice President/Principal Geologist
Marshall Miller & Associates
Abstract: The geotechnical and hydrogeological characteristics of coal seams and rock strata above and below mineable coal beds are often studied to assess potential groundwater inflow to a mine, to evaluate the effect of groundwater inflow on mine stability, and to assess the potential for mining to adversely affect aquifers and streams. Geotechnical and hydrogeological characterization of coal and rock in the roof and floor of a mine also provides vital information for ground control design and
mitigation measures such as grout and resin injection. Important characteristics include hydraulic conductivity, Rock Quality Designation (RQD), and lithology, among many others. Field investigations often include drilling, geological and geotechnical core logging, downhole geophysical logging, laboratory rock strength testing, and packer (Lugeon) testing. Analysis of geotechnical and hydrogeological data collected over the last 30 years provides a means to better understand the typical range of values encountered in Appalachian coalfields and to identify empirical relationships amongst the main parameters. Coal seams and sandstone units are generally considered to be better aquifers relative to other lithologic units, but quite often the most prominent aquifer in coal-bearing regions is the shallow Stress-Relief Fracture Zone, an aquifer with its hydraulic conductivity predominantly created by the frequency and nature of fractures in the rock. By analyzing the relationships amongst the main geological, geotechnical, and hydrogeological factors associated with mineable coal seams and mine roof and floor material, the current research provides a valuable reference for the coal mining industry in Appalachia.

**Presentation 2.4**

**Title:** Laser Scanning and Drone Mapping in Underground Mines  
**Presenters:** Richard Bishop  
Research Associate, PhD Candidate  
Virginia Tech Mining & Minerals Engineering  
**Abstract:** Developing

**Presentation 2.5**

**Title:** Dust Control in Underground Mines  
**Presenters:** Setareh Afrouz, PhD  
Postdoctoral Associate  
Virginia Tech Mining & Minerals Engineering  
**Abstract:** Developing
**Presentation 2.6**

**Title:** Dust Control in Underground Mines (Part 2)

**Presenters:** PhD Candidate  
Virginia Tech Mining & Minerals Engineering

**Abstract:** Developing
Technical Session III: Mine Automation and General Topics in Mining  
Wednesday, April 27, 2022,  
2:00 – 4:00 PM

Presentation 3.1

Title: Autonomous Roof Bolter Operations Using Robotic Operations  
Presenters: Steve Schafrik, PhD, PE  
Associate Professor  
University of Kentucky Department of Mining Engineering  
Abstract: Roof bolter operators have one of the hardest jobs in underground mining operations. The drilling operation is demanding and requires a constant supply of heavy and difficult to maneuver tools and consumables. The operator is also always aware that they are responsible for making the area safe for the mine to advance. This talk is about a different approach to automating an underground machine that has been difficult to automate. In this project, the handling of the drill steels, roof bolts, etc. is performed by a robotic arm. The robot's motions are timed with automated control of the drill's hydraulic system. The operation is not totally autonomous, relying on the operator as a supervisor and to maintain the consumables. This approach allows the operator to take control and to still operate the machine.

Presentation 3.2

Title: Underground Shuttle Car Automation  
Presenters: Z. Agioutantis, S. Schafrik, J. Sottile, and V. Androulakis  
University of Kentucky  
Abstract: In the complex working environment of a mine, moving repetitive tasks from human to autonomous control will be of critical importance for establishing a framework that will improve personnel safety and mine productivity. Industry leaders such as Komatsu, Sandvik, Caterpillar and others are investing large resources towards the development of automated underground equipment.
Shuttle car operation is the repetitive movements between the always moving face and the feeder breaker of an underground coal mine. Currently, the shuttle car operator is exposed to numerous hazards such as fatigue related incidents and incidents caused by poor visibility conditions, soft tissue injuries, noise and dust. By automating the shuttle car, the operator can be removed from this potentially dangerous environment to the safer location of a control room. The challenges in autonomous underground tramming operations include a GPS-denied environment, poor communications and low visibility.

This presentation will focus on the development of a 1:6 scale shuttle car equipped with an array of sensors for range measurement, inertial measurement as well as four 2D LiDAR scanners. The lab-scale prototype features a data management and visualization system, a navigation system which incorporates a path planning module and a real-time decision making module, as well as a real-time mapping system. Simulations in a mock mine section have been conducted for accessing the reliability of the prototype to navigate around underground pillars.

**Presentation 3.3**

**Title:** Automated Shuttle Car Docking  
**Presenters:** Joseph Sottile, PhD  
**Professor**  
**University of Kentucky**  
**Abstract:** Developing

**Presentation 3.4**

**Title:** Mining Litigation  
**Presenters:** Dana Howard  
**Member**  
**Stoll Keenon Ogden, PLLC**  
**Abstract:** Developing
**Presentation 3.5**

**Title:** Kentucky's Coal Heritage Trail

**Presenters:** Steve Gardner, PE

Principal
Synterra

**Abstract:** Coal mining began in Kentucky in the 1800's and development of railroads led to tremendous expansion in the early 1900's. Tens of thousands of people came to the Appalachian Mountains to work the mines including many immigrants fleeing Europe plus thousands of African Americans seeking a better life. Coal camps sprung up throughout the coal fields with ones in the mountains by necessity having to be self-sufficient communities that depended on one thing, COAL. With the decline of coal in recent decades Kentucky coal fields communities turn their eyes to tourism to help fill the void left by closed mines. There are numerous attractions throughout the region that already exist. The Kentucky Coal Heritage Trail is designed to become the link between these attractions and sites giving those that are looking for their heritage numerous places to go while visiting Kentucky. Linkages with similar trails in West Virginia and Virginia will be included. This presentation will showcase several recent projects that are designed to help bolster the economy of the region and honor those who helped build the economy of this nation.

**Presentation 3.6**

**Title:** Recent Trends in United States Coal Mining Activity

**Presenters:** Steve Keim, PhD, PE

President
Marshall Miller & Associates

**Abstract:** Developing