



PITTSBURGH COAL MINING INSTITUTE OF AMERICA

## 2019 PCMIA/SME Pittsburgh Section Joint Meeting



Peter J. Bethell



Robert W. Hollis



Rick O. Honaker



H. Jaco Scholte

The 133rd Annual Meeting of the Pittsburgh Coal Mining Institute of America and the 74th Annual Meeting of SME Pittsburgh Section in Collaboration with SME Central Appalachian Section was held on October 23-25, 2019 at the Hilton Garden Inn, Southpointe, Canonsburg, Pa.

The program this year had an extra day beginning on the Wednesday with a Conference on Challenges and Opportunities in Coal Preparation arranged by Barbara Arnold and Peter J. Bethel. The attendance on Wednesday was 106. On Thursday there were 211 professionals plus 46 students for a total of 257. On Friday there were 192.

The President of the Pittsburgh Coal Mining Institute (PCMIA) is Dan Alexander and the Chairperson of SME Pittsburgh Section is Michael Trevits.

### Wednesday, October 23 (Day 1)

#### Keynote Address:

**Maximizing Profitability Through Processing Plant Performance Optimization** by Peter J. Bethell, Ph.D., Marshall Miller & Associates and Gerald H. Luttrell, Ph.D., Virginia Tech

**Abstract:** The demand for domestic coal declined sharply during the past several years as a result of slow growth in the global economy, increased competition from natural gas, and closures of older power stations to reduce carbon emissions. This shift in the

coal market has forced many producers to seek out new approaches for reducing costs and increasing productivity with limited capital investment. One of the most often overlooked business units that can offer such opportunities are coal preparation facilities.

The loss of just 1 ton per hour of metallurgical (coking) coal or 3-4 ton per hour of utility (steam) coal due to poor cleaning and blending practices can result in annual revenue losses exceeding one million dollars annually. To avoid these undesirable losses, this presentation provided some important optimization concepts that plant operators can utilize to increase plant efficiency and enhance profitability. Several case examples were also presented to illustrate the substantial economic impact of these essential optimization protocols in the coal preparation industry.

**New Technologies for Dense Media Cyclone Processing and Froth Flotation** by Robert W. Hollis and Jimmy Yu, The Daniels Company

**Abstract:** In the next few years the majority of coal preparation plants to be built in the USA are likely to be metallurgical coal processing plants. Heavy (dense) media cyclones and froth flotation circuits will find applications in these new plants. This paper presented some new developments and recent applications of GT Global proprietary Super-Large 3-Product heavy medium (HM) cyclones and jet flotation machines in the USA and abroad.



## PITTSBURGH COAL MINING INSTITUTE OF AMERICA

It also discussed the application of a Super-Large 2-stage 2-product gravity-fed HM cyclone in oil shale with throughput capacity of 1450 metric t/h and top feed particle size up to 356 mm (14 in) at separation densities of 2.4-2.5 SG. Jet flotation machines provided from GT Global have been successfully installed in the USA. Excellent flotation results have been achieved at two separate preparation plants in southern West Virginia. A third jet flotation cell is being installed in a Virginia plant in the fourth quarter of 2019.

**Applications for X-Ray Transmission Sorters in Coarse Coal Upgrading** by Rick Q. Honaker, Ph.D., University of Kentucky, Aaron Noble, Ph.D. and Gerald H. Luttrell, Ph.D., Virginia Tech

**Abstract:** Electronic ore sorters were first introduced to the minerals processing industry in the late 1940s. Since that time, faster microprocessors, improved sensors, and lower equipment costs have allowed this unique technology to evolve and become commercially attractive for a variety of applications. Recent test programs conducted on mobile sorter units indicate the ability to achieve excellent separation performances when treating run-of-mine (ROM) coal coarser than 12 mm. Techno-economic analyses have revealed that the upgrading of coarse ROM coal and the removal of rock prior to transportation are applications where significant economic benefits could be realized. This paper described the working features of x-ray transmission sorting technologies and provided technical and economic data from recent test programs.

**The South African Experience - Fine Coal Processing with Dense Medium Cyclones** by H. Jaco Scholtz and Ian Kitchenmaster, Fraser Alexander

**Abstract:** Spiral concentrators have been widely used in the South African coal industry on particle size ranges from 1mm down to 0.1mm. However, spiral processing is restricted in: achieving sufficiently low-cut points, efficient separation in a high near-gravity environment, and cut point control.

The washability characteristics of the C-lower and C-upper seams of Mbuyelo Coal's Welgemeend Mine

situated in the Mpumalanga Province in South Africa indicated an efficient low-density separation was required to produce products that are consistently within specification. Considerable test work done by the Coaltech Research program on a 25 t/h fine coal dense-medium cyclone (FCDMC) plant had shown that this process was capable of achieving sharp separation with good cut point control at low densities. As a result of the work done, it was decided to employ dense medium cyclones for treatment of the fine coal fraction from 1.0mm down to 0.1mm at Welgemeend. This paper provided an overview of the process selection, circuit design, equipment selection, challenges experienced and performance results of the 50 tph fine coal dense medium plant at the Welgemeend operation.

**LUNCH Keynote Address:**

**International Coal Markets** by Jim McCaffrey, CONSOL Energy

**New Spiral Technologies** by Barbara J. Arnold, Ph.D., PrepTech, Inc.

**Abstract:** Spiral concentrators are widely used for the beneficiation of fine coal in the nominally -1.0+0.15 mm size fraction and offer a number of advantages for fine coal beneficiation including low operating and capital costs, operational simplicity, excellent tolerance to variation in feed conditions, low maintenance, and high reliability. Spirals typically separate effectively at cut points between 1.70 and 1.80 specific gravity. Under more carefully controlled conditions of feed rate and percent solids, cut points around 1.60 can be achieved. The most noted limitation of current spiral models is the inability to achieve cut points below these levels to compete with other water-based technologies, such as teeter-bed separators, reflux classifiers, and water-only cyclones.

Spiral manufacturers have continued to improve spiral technology to meet this challenge. Building on successful developments of a two-stage circuit in one spiral assembly, manufacturers have introduced new low specific gravity cut point spirals. Test work has been completed, and these spirals are now finding ap-



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Jim McCaffrey



Barbara J. Arnold



Michael Parker Jr.



David Osborne

plication in the coal industry.

**Pressure Filtration for Fine Refuse Management and Fine Coal Particle Capture** by Michael Parker, Jr., Tons Per Hour, Inc.

**Abstract:** This paper demonstrated the use of pressure filtration for both fine refuse management and the capture/dewatering of fine coal particles lost with more widely used traditional equipment. Pressure filtration systems used for dry-stack refuse impoundment have become accepted and somewhat common in the coal preparation industry. The same technology is applicable for recovery of fine coal particles currently lost due to a lack of cost-effective methods to meet moisture specifications.

On recovered coal fines, pressure filtration, properly applied, will produce much lower moisture than vacuum technology with lower maintenance and less power consumption with no sacrifice of particle capture. Further, this paper showed that pressure filtration will recover a significantly greater percentage of fine particles with similar or better moisture reduction than centrifugal technology.

Laboratory test results have accurately predicted actual production, moisture and capture results. Laboratory results will also be used as basis of findings for the purposes of this paper. Even though the paper will provide relevant raw data on these operations, confidentiality and trade secrets will be honored to protect the intellectual property and investment of specific companies.

**Increased Revenue and Cost Savings by Recovering**

**Value from Plant Recirculating and Tailings Waste Streams** by David Osborne, Ph.D., Mike Barish, and Tony Toney, Somerset Coal International

**Abstract:** Effective recovery of fine coal and subsequent reduction in moisture to an acceptable level is mostly dependent on the following factors:

- Favorable economics, i.e., value of the product component obtained
- Capability and subsequent performance of the preparation equipment
- Extent to which the beneficiation of the total coal can be optimized
- Cost and acceptability of the disposal method for the barren tailings

The success of this approach will be influenced by many other factors, not the least being the proportion of fines in the raw coal and the nature of the ultimate tailings. Hence, as mining and subsequent transportation and handling has become progressively more mechanized, the proportion of fines has increased and the justification for maximized fine coal recovery has also increased.

However, the conundrum associated with including more fines is the added risk of increased moisture and the accompanying need for improved and cost-effective dewatering of both ultrafine coal and tailings. This paper described a successful pathway towards achieving the four outcomes described above and also includes three case studies that demonstrate the potential for increased revenue and cost savings by recover-



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ing value from plant recirculating and tailings waste streams.

**Advances in Coal Processing Technology** by Gerald H. Luttrell, Ph.D., Virginia Tech (Presented by Peter Bethell)

**Abstract:** Coal preparation plants utilize low-cost solid-solid and solid-liquid separation processes to remove impurities such as waste rock and surface moisture from run-of-mine coals. The processes utilized in these facilities have historically consisted of mature technologies that were highly reliable and industrially proven. This conservative approach to plant design served the industry well for nearly half a century. However, during the last several decades, plant operators have been forced to develop and deploy new technologies in an attempt to lower costs and improve performance.

The new push for technology development has been necessary to combat issues associated with an increasingly challenging reserve base and to respond to increased domestic competition in fuel production by the gas industry. As a result, many of today's modern coal preparation facilities have become as sophisticated and complex as processing operations utilized in the chemical and mineral processing industries. This Presentation provides a brief overview of the current state-of-the-art of the domestic coal preparation industry. Noteworthy examples of some of the promising new technological innovations for coal upgrading that are currently under development have also been highlighted.

Note: The Proceedings of this Coal Preparation Conference are available in a SME book entitled Challenges and Opportunities in Coal Preparation.

**Thursday, October 24 (Day 2)**

### OPENING SESSION

The welcome and opening remarks were provided by Michael A. Trevits, Xtraction Science and Technology, Inc. and Chairperson SME-Pittsburgh Section.

#### Keynote Address:

**Sustaining Safe Ventilation Practices in U.S.**

**Coal Mining Operations** by Keith G. Wallace, Practice Leader/Principal Engineer, SRK Consulting (U.S.) Inc.

**Abstract:** The last major coal mine disaster in the United States occurred in 2010. This presentation reviewed MSHA and NIOSH statistics regarding mine fires and explosions and respirable coal dust exposures since this disaster. The data suggests a decrease in fires and explosions but an alarming increase in certain types of respirable dust exposures during this period. The data is difficult to use to determine if there is a general improvement in mine ventilation at U.S. coal mining operations.

Technical competence in the field of mine ventilation is discussed along with what other countries require for personnel to operate and engineer coal mine ventilation systems. The concept of a certification in mine ventilation is also presented.

### Technical Session 1: ETHICS

Session Chairs: Heather Trexler, Tetra Tech and I. Berk Tulu, West Virginia University

**The Practical Side of the Ethics Coin for the Mining Engineer** by Gary M. Hartsog, President, Alpha Engineering Services, Inc.

**Abstract:** The Mining Engineer (or Surveyor) who holds a PE (or a PS) license carries a commitment and responsibility for having formally agreed to practice ethical behavior that the non-licensee does not formally carry. While the discussion and study of ethics for the PE or PS can be esoteric and sterile, this discussion will leave the theoretical discussion for others and focus on the practical side of ethical practice of the profession in the mining community.

While there are always gray areas and there will always be differences in opinions of how a PE is to conduct oneself, the fact that such considerations must be made is not at debate.

This presentation discussed, from a practical standpoint, how ethical considerations might affect the PE or PS as they work in the mining industry as an em-



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Michael A. Trevits



Keith G. Wallace



Heather Trexler



I. Berk Tulu



Gary M. Hartsog

ployee of a mining company or as a consultant. Case studies were examined where the ethical considerations of the PE or PS could impact the individual's professional conduct.

**International Coal Resource/Reserve Reporting** by Paul D. Anderson, Director of Geological Services, John T. Boyd Company

**Abstract:** This presentation discussed the evolution of codes currently used to report Coal Resources/Reserves for public and private financing. These systems are designed to ensure that misleading, erroneous, or fraudulent information relating to coal (and other mineral) properties are not published and promoted to investors, and were often developed in response to financial crises caused by such misreporting. The presentation discussed the current systems and their effectiveness.

**Ethics** by E. James Hamilton, P.E., Esq., Energy BU Risk Manager, GAI Consultants, Inc.

**Abstract:** Hamilton conducted a fast-paced engineering ethics problem solution-oriented program based on the Pa Engineering Code of Ethics. The focus will be on discussing analyzing brief ethical scenarios in the context of the applicability of the Pa Code of Ethics as set forth in the Pa Professional Engineering Regulations. Interactive audience participation was welcomed.

### **Technical Session 2: ABANDONED MINES/RECLAMATION**

Session Chairs: Robert Kimutis, NIOSH and Jef-

fery Kravitz, Ph.D., retired MSHA

**Pennsylvania's Abandoned Mine Land (AML) Emergency Program** by Richard Beam, Professional Geologist Manager, Bureau of Abandoned Mine Reclamation, Pennsylvania Department of Environmental Protection

**Abstract:** The Pennsylvania Department of Environmental Protection's Bureau of Abandoned Mine Reclamation (BAMR) implements an Abandoned Mine Land (AML) Emergency Program to address suddenly occurring, high-priority, abandoned mine land (AML) problems that occur throughout Pennsylvania's coal fields. BAMR maintains two field offices; one in eastern Pennsylvania (Anthracite Region) in Wilkes-Barre and one in western Pennsylvania (Bituminous Region) in Ebensburg. Both field offices maintain in-house construction crews with significant equipment available to respond and address many small AML Emergencies (hazards) such as pothole subsidence and mine drainage breakouts.

For larger AML Emergencies such as subsidence events causing structural damage to homes, businesses, and roads; mine fires; coal refuse fires; landslides; or other large-scale or complex AML problems, projects are completed by outside contractors. The contractors are hired through solicitation of bids or proposals with very short timeframes between bid issue and bid opening. Over the last five years (2014-2018), BAMR has addressed approximately 87 AML Emergency projects each year with the average annual cost being just under \$5 million annually. This presentation will provide some background information about Pennsylvania's



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Paul D. Anderson



E. James Hamilton



Robert Kimutis



Jeffrey Kravitz



Richard Beam

AML Emergency Program; some summary statistics; and highlight, through both photos and videos, some typical projects recently completed under the program.

**Elco-Allenport Abandoned Mine Fill** by George Watson, TITLE, Micon

**Abstract:** In June 2018 Micon was notified of an “Emergency Project” identified by the Pennsylvania Department of Environmental Protection Bureau of Abandoned Mine Reclamation. The Department became aware of posted U-Tube videos that depicted young adults entering an abandoned coal mine situated on the high bluff overlooking the railroad and the river below near Elco-Allenport, Pennsylvania. The videos were disturbing in nature as the participants video discussed poor quality air while visually showing poor quality roof conditions as they traveled and recorded their ‘adventure’.

The project entailed equipment deployment to a remote location at the top of the bluff and laying ‘slick lines’ for material pumping a distance of 1100’ horizontally and 450’ vertically down the side of the bluff at an extreme angle of descent. No access was available from the railroad upslope to the portals or mine entrances.

Micon successfully filled the old portal building (in the side of the bluff) as well as (2) open slope entrances to the abandoned mine with a Minova supplied material. Inspectors from the PADEP Bureau of Abandoned Mine Reclamation were onsite during the entire project and were impressed with Micon’s ability to perform the work and complete the project in an ex-

treme scenario.

**Why Coal Mines Should Want to Reduce Their Methane Emissions** by Santosh Lakhan, Principal, Environmental Commodities Corporation

**Abstract:** While mine methane emissions from coal mines remain unregulated, coal mining companies have the opportunity to generate additional revenue by voluntarily reducing their methane emissions. ECC has successfully deployed a mobile incinerator on the active Bailey Coal Mine in Pennsylvania. The mobile incineration system has been well received by safety regulators and mine operators. The system, which has been in operation since December 2017, has been approved for deployment on all underground coal mines in Pennsylvania.

In addition to reducing the coal mines emission liability, the project generates royalties for the mine without creating a cost or operating burden for the mine. ECC is currently expanding its project at the Bailey Mine and is projected to reduce approximately 200,000 tonnes of carbon dioxide equivalents annually. ECC is also currently in discussions with numerous other mining companies who are experiencing pressure from local constituencies to control their methane emissions. Many in the mining industry believe that coal mine methane regulations are inevitable and are trying to proactively reduce their exposure.

**PCMIA STUDENT LUNCHEON Address:**

**The Best, Next Best, and Worst: Embracing Uncertainty in Work and Life** by Patrick W. Dennison,



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**George Watson**



**Santosh Lakhani**



**Patrick W. Dennison**



**Michael J. Brnich**



**James C. Erlinger**

Partner/Attorney, Fisher & Phillips, LLP

**Abstract:** Success can be unpredictable, even if you work smart and work hard. At times, the professional world can seem daunting and hectic leaving many young professionals disengaged from work and eventually regretting educational and occupational decisions, especially when what you believed life would be like after college fails to live up to expectations. Indeed, you may encounter situations where you feel as you can't get ahead in your career or generally go through your days feeling frustrated or disengaged. But know that you can take control of both your personal and business life by taking action while embracing uncertainty.

After all, as Teddy Roosevelt once said, "In any moment of decision, the best thing you can do is the right thing, the next best thing is the wrong thing, and the worst thing you can do is nothing."

**PCMIA Awards Presentation** by Dan Alexander, Ph.D., Adjunct Professor, West Virginia University and President of PCMIA.

PCMIA Exceptional Service Award **Joseph A. Sbaffoni**, President, JAS Consulting, LLC

Stephen McCann Educational Excellence Award **Royce J. Watts**, Special Assistant to the Dean (Emeritus Professor) Statler College of Engineering and Mineral Resources, WVU

Donald S. Kingery Memorial Award **Jeffery H. Kravitz, Ph.D.**, President of JHG & Associates Consulting, LLC and Chief (Retired) Scientific Development for Technical Support, MSHA

Donald S. Kingery Student Grant Award **Kevin Toe**, John and Willie Leone Family, Dept. of Energy and Mineral Engineering, Penn State University

PCMIA.SME Student Design Awards **Ricky Shipe**, WVU Presidents Service Award **Dan Alexander**, Ph.D. President PCMIA

Mike Kotch Memorial Scholarship Award **Jose Priante** Quiala, Penn State University

SME Pittsburgh Section Student Grant Award **Daniel S. Ausherman**, WVU

Claude Goode Memorial Scholarships **Alec J. Elliott**, WVU; **Joelson P.M. Alves**, Penn State

### **Technical Session 3: TECHNOLOGY**

Session Chairs: Michael J. Brnich, Jr., retired NIOSH and James C. Erlinger, MSHA

**NIOSH Refuge Alternatives Research** by David S. Yantek, Lead Research Engineer, NIOSH

**Abstract:** NIOSH is performing research on refuge alternative (RA) concerns including heat/humidity build up, breathable air, blast resistance, and communications. An update was provided on RA cryogenic air supply research with respect to heat/humidity and breathable air. In addition, information was presented on built-in-place RA contamination ingress and purging. An overview of research on pressure relief valve and stopping/door system blast resistance was also given. Finally, through-the-earth communication as an option for built-in-place RAs was discussed.

**Reducing Surface Mobile Equipment Accidents Through Technology** by Matthew J. Wharry, Gen-



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**Dan Alexander Awards Joe Scaffoni**



**Jeffrey Kravitz Receives Award from Dan Alexander**



**Dan Alexander and Kevin Toe**



**Michael Brnich Presents Award to Ricky Shipe**



**Bob Kudlawiec Presents Presidents Service Award to Dan Alexander**



**Michael A. Trevitz Awards Jose Priants Quiala**



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Michael Trevits and Daniel S. Ausherman



Michael Trevits with Alec Jeffrey Elliott and Joelson Alves

**Abstract:** MSHA has made the prevention of powered haulage accidents and mobile equipment a priority for 2019 and beyond, with an initial focus on three areas: accidents involving mobile equipment collisions, seat belt use, and belt conveyor safety. In this session, the focus was on ways to address mobile equipment collisions. Since 2003, the Mine Safety and Health Administration (MSHA) has identified 22 fatal accidents (24 fatalities) involving surface powered haulage and machinery that could have been avoided had a Collision Warning System (CWS) been installed and properly used. These included machine to machine, machine to vehicle, and collisions involving pedestrians. This presentation provided a closer examination of these preventable accidents and an overview of the technologies used with Collision Warning and Collision Avoidance Systems.

**Workplace Examinations with NIOSH EXAMiner Software** by Brianna M. Eiter, Ph.D., Research Behavioral Scientist, NIOSH

**Abstract:** Hazard recognition and risk assessment are critical skills for all mineworkers. These skills are especially important during pre-shift inspections and workplace examinations when examiners are tasked with finding and fixing hazards. To ensure mineworkers can effectively perform workplace examinations, NIOSH developed an interactive training tool called

EXAMiner. EXAMiner is a software application that gives mineworkers the opportunity to practice their hazard recognition skills by performing simulated workplace examinations. The tool utilizes several training strategies to address key mineworker hazard recognition competencies. EXAMiner not only includes a set of panoramic images for trainers to use to develop hazard recognition materials. This presentation will provide a demonstration of the software's capabilities and offer ideas on how to incorporate EXAMiner into your training plan.

**Using Data Analytics to Optimize Performance of Underground Coal Extraction Equipment** by Joseph Hirschi, Ph.D., Productivity Analyst, Komatsu Smart Solutions

**Abstract:** Constant attention must be given to efficiency and safety for today's mining operations to be successful. Technology is at the core of Komatsu Smart Solutions' efforts to bring mining performance to the next level. Case studies are presented illustrating how "smart" mining equipment delivers data that is processed with sophisticated analytics to identify productivity trends and opportunities for improvement. This information is utilized to enhance operator training, optimize machine performance, and enable proactive equipment maintenance. Examples of increasing equipment utilization, reducing production cycle times,



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David C. Yantec



Wesley Shumaker



Brianna M. Eiter



Joseph Hirchi



Dan Alexander

eral Engineer, MSHA

improving maintenance planning, and lowering parts usage costs are provided. Incorporating this data-driven intelligence into engineering future mining equipment and technology is also discussed.

### **OPENING SESSION Keynote Address:**

**The Future of Minerals Education: Landmines and Opportunities** by Hugh B. Miller, Ph.D., Colorado School of Mines and SME President

**Abstract:** The ability to recruit quality employees is critical to the success of any company whose core business is dependent upon skilled labor utilizing mechanized technology in dynamic operating environments. Nowhere is this truer than the mining industry, where economic viability extends beyond a good ore-body and is usually the product of well managed operations, sound engineering, and a highly trained and motivated workforce.

Unfortunately, the aging demographic of professionals in the mining industry is contributing to an attrition rate that has been outpacing the capacity to develop qualified replacements. When coupled with the steep decline in the number of new engineers graduating from U.S. academic programs in mining, economic geology, and mineral processing/extractive metallurgy, the resulting scarcity of young professionals represents a genuine threat to the industry. A major factor in this dilemma is the long-term loss of degree granting programs over the last 30 years. This presentation provides an overview of the challenges that mining related academic programs are facing and what initiatives

SME and other organizations are doing in an attempt to mitigate these threats.

**SME Awards Presentation** by Michael A. Trevits, Xtraction Science and Technology, Inc. and Chairperson SME – Pittsburgh Section

Let's Learn About Coal K-5 **Evan Murray, Carson Sauvageot, Maddox Ochap**

SME 25 Year Awards **Timothy Michael Barton, J. Eric Sherada, Timothy H. Bailey**

SME Pittsburgh Section Distinguished Member Award **Michael P. Fazio**, Senior Development Engineer, Strata Worldwide, LLC

John T. Boyd Memorial Young Engineer Awards **Brett A. Ashley**, PE, Mining Engineer, Rosebud Mining Company; **Matthew R. Gray**, Mine Ventilation and Emergency Branch Chief, MSHA

John N. Murphy Early Career Professional Award **Michael Keener**, Surveyor/Draftsman, CONSOL Energy

### **Technical Session 4: ENGINEERING PROJECTS**

Session Chairs: Robert Kudlawiec, Tetra Tech and Michael Trevits, Xtraction Science & Technology Inc.

**Assessment of the Market for Electronic Technology for Underground Coal Mining Applications** by Tom LaTourrette, Ph.D., RAND Corporation and David Snyder, NIOSH

**Abstract:** The MINER Act of 2006 required underground coal mine operators to develop accident re-



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Hugh B. Miller



Bob Kudlawiec



Michael Trewitz



Tom LaTourette



David Snyder

sponse plans that are technologically feasible, make use of current commercially available technology, and reflect the improvements in mine safety gained from experience under other worker safety and health laws outside of mining. The Act also assigned NIOSH the responsibility to enhance development of new mine safety and health protection technology and technological applications and to expedite the commercial availability and implementation of such technology.

Additionally, mine operators are increasingly seeing a need to automate their operations using sensors and a vast array of electronic technologies. All of these directives and initiatives share a common goal: to implement current technology into the mines. This presentation discussed a RAND Corporation assessment project to identify and analyze the barriers to implementing new technology in the market for safety and health protection technology in underground coal mines. The assessment will involve a interviews of key stakeholder decision makers. The plan for the assessment and details of how to participate will be discussed.

**Overview and Progress Update of Arch Coal's Leer South Mine** by Nate Waters, Senior Engineer, Arch Coal, Inc., Sentinel Mining Complex

**Abstract:** Arch Coal's Leer South Mine is located in Barbour County, West Virginia. This new longwall operation will produce an estimated three million tons of premium, High-Vol A coking coal annually. The mine will be similar in virtually every respect to Arch's existing Leer longwall mine, and will operate in the same 200-million-ton reserve base as the Leer opera-

tion. The Leer mine is widely regarded as one of the lowest-cost, highest-quality and highest-margin coking coal mines in the U.S. coking coal industry.

**HazardAvert Proximity Detection for Mobile Equipment and Belt Conveyors** by Mike Walling, General Manager-Proximity Detection, Strata Worldwide

**Abstract:** Mobile equipment and heavy machinery continues to be one of, if not the largest, contributor to injuries and fatalities in the mining industry each year. While there have been significant strides taken to make the industry safer, there is still a way to go. With an assortment of different types of technology out there, it is up to industry and the manufacturers of safety systems to educate the masses of available technology.

Strata Worldwide created an electromagnetic based proximity detection and collision avoidance system that will work on all types of equipment and can protect all personnel. The technology works in both methane-rich environments (Intrinsically safe and/or explosion proof compliant) as well as surface hard rock environments.

A leading cause of injuries have been attributed to mobile equipment and, mobile bridge conveyors and other types of conveyor systems. Strata Worldwide was the first company in the US to outfit a conveyor machine with electromagnetic technology. The state of Pennsylvania has approved the electromagnetic technology for use on conveyors. The system is a unique and customized solution and a great example of why



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**Let's Learn About Coal**



**Timothy Michael Barton, J. Eric Sherada, Timothy H. Bailey**



**Michael Trevitz Awards Michael Fabio**



**Michael Trevitz and Brett A. Ashley**



**Michael Trevitz and Matthew R. Gray**



**Michael Trevitz Awards Michael B. Keener**



Nate Waters



Mike Walling



Heather Dougherty



Peter Zhang



Mike Mosser

working with regulators and operators, we can continue to make the mining environment safer year after year with the goal being zero fatalities.

**Assessing the Stability of Unconventional Shale Gas Wells in Longwall Barrier Pillars** by Heather Dougherty, Ph.D. and Peter Zhang, Ph.D., NIOSH

With the shale gas boom over the past decade, many shale gas wells have been drilled through the Pittsburgh coal seam to the Marcellus shale formation. The gas wells in longwall barrier pillars are influenced by longwall mining, and their stability has been a concern for both the mining and gas industries. Even though longwall barrier pillars are generally larger and gas wells are farther away from the longwall gob, the longwall-induced subsurface movements could still be significant and gas well damage is still possible.

NIOSH has been conducting research on gas well stability in longwall pillars to provide technical guidance for state and federal regulatory agencies as well as the coal and gas industry. The research team has performed several case studies and developed numerical models to evaluate the stability of shale gas wells in longwall barrier pillars. This presentation involves an evaluation of a cluster of six unconventional gas wells located within a gas well pillar in the mains. The stability of the gas wells was evaluated based on longwall-induced movements and stresses at the gas wells. In addition to the case study results, general discussions were also presented about the safe distance from gas wells to longwall gob.

**LUNCH Keynote Address:**

**Evolving Markets for Appalachian Coal** by Jason Bostic, Vice-President, West Virginia Coal Association.

**Abstract:** Since the implementation of regulatory policies beginning in 2008, the dynamics of Appalachian coal have changed dramatically with traditional markets changing most dramatically for thermal coal shipments. Similar, but less dramatic, changes have occurred in the metallurgical and industrial steam coal markets for Appalachia. Understanding why these changes have occurred will help the Appalachian coal industry adapt and hopefully stabilize its production outlook going forward.

**Technical Session 5: VENTILATION AND DEGASIFICATION OF COAL MINES**

Session Chairs: Mike Mosser, NETL and Vasu Gangrade, NIOSH

**Overburden Fracture and Permeability Development Near Gas Wells Located in Longwall Abutment Pillars** by Steven J. Schatzel, Ph.D., Research Geologist, NIOSH

**Abstract:** More than 1500 unconventional shale gas wells have been drilled ahead of longwall mining in PA, WV, and OH. These wells are designed to be protected by chain pillars or abutment pillars so that the casing experiences minimal movement in response to mining. Differences in overburden depth, geology, topography and mining methods create a range of ground responses in subsidence and induced fracture networks near gas wells that may affect well casing stability. The 1957 PA Gas Well Pillar regulations



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Vasu Gangrade



Steven J. Schatzel



Gary Dubois



Pramod Thakur

have guided the placement of gas wells. However, the advent of longwall mining has made the 1957 PA guidance no longer applicable.

Ground movement within these longwall pillars is being experimentally characterized and modeled to extrapolate results to other well sites. From a ventilation research perspective, NIOSH researchers were asked to characterize a worst-case scenario where a temporarily shut-in shale well experienced a breach proximal to active mining. Analysis of the transport network for gas movement towards the mine void, and the safety hazards it might produce, is a key task for this NIOSH project. Ultimately, these research efforts aim to insure worker and public safety.

**Plugging In-Mine Boreholes and CBM Well Coal Bed Laterals with Polymer Gel Prior to Mine Through** by Gary DuBois, PE and Stephen Kravits, President/CEO, Target Drilling

**Abstract:** Horizontal degasification boreholes drilled from within the mine or from surface CBM horizontal wells have proven to be effective in recovering coal mine methane and coal bed methane for degasification and commercialization. The purpose of this presentation is to describe the successful plugging of horizontal underground degasification boreholes and Coal Bed Methane Wells (CBM) each with multiple horizontal laterals drilled in the coal, including sidetracks. To date, 1,451,398 gallons of cross-linked polymer gel have been pumped to plug 97 underground horizontal boreholes and 36 CBM wells' coal bed laterals, totaling one hundred-eighty-two (182) miles. This includes in-mine remediation plugging whereby

polymer gel is mixed and pumped underground to plug client's boreholes or coal bed laterals after mine through determined other plugging materials were not successful.

The quantity of gel pumped is almost two times the calculated volume of the boreholes and coal bed laterals, including sidetracks. The polymer gel effectively squeezes into the fracture system of the coal displacing gas and water demonstrating an affinity to attach itself to everything, including adhering to the inner wall of the borehole providing an impenetrable skin, minimizing gas and water migrating back into the borehole as evidenced by mining into the boreholes and coal laterals. Lastly, Target Drilling has developed protocol used to design the gel chemical mixture specifically for each well including, but not limited to, placing specifically designed sample gel mixtures in the produced water samples taken from the borehole or CBM well coal laterals to verify the specifically designed gel formula will cure as designed.

**Horizontal Drilling and Its Applications** by Pramod Thakur, Ph.D., President, ESMS LLC

**Abstract:** Horizontal drilling from the surface has recently emerged as the most effective gas production technology for coal, shale and other low permeability reservoirs. The technology was first developed for in-mine drilling and degasification. All 4 components of the system were discussed, namely: the drill rig, the power unit, guidance system and the downhole dill monitor. Applications of horizontal drilling for mine degasification as well gas production from non-mineable, deep reserves were also discussed. Coal



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seams to a depth of 10,000 feet contain 10 times more gas than the Marcellus shale reservoir in the USA alone. Secondary recovery of gas from coal by CO<sub>2</sub> sequestration and tertiary recovery of all BTU in coal by Underground Coal Gasification were briefly discussed. In each case, horizontal drilling from surface plays a great role.

The Wednesday evening Reception was held in the area where the vendors were set up just outside the

meeting rooms and the Thursday evening Reception took place outside in the Courtyard to take advantage of the beautiful fall weather. There were 22 manufacturers exhibiting their products and services at the meeting. The joint meeting Coordinator was Mary E. DelRosso assisted by her daughter Diana. Lisa L. Krepps was responsible for PCMIA. AV arrangements were by Jessie Mechling and Christina Bedillion of NIOSH. The next Joint PCMIA/SME Pittsburgh Section Meeting will be held October 16-18, 2020.



Opening Session



Diana and Mary DelRosso at the Registration Desk



Rachel Boothby, GMS



Kevin Ewusiak with Kim Cranmer