Short Courses offered at the 16th North American Mine Ventilation Symposium

Course A

BBE REFRIGERATION: GUIDELINES FOR DETERMINING COOLING REQUIREMENTS AND SELECTING EQUIPMENT IN COOLING SYSTEMS

Presented by Rudolph Janse van Vuuren and Stephen Hardcastle

8:30 am – 4:30 pm

Mines in North America are getting deeper and are using more equipment, resulting in warmer temperatures in working places. This additional heat can be combatted by more air but beyond a critical threshold the air will act as a heat source and sending more and more air underground will not assist in lowering temperatures. Beyond this depth the air can be used as a carrier of mechanical cooling. Practical methodologies for determining cooling requirements and optimising distribution systems have become available in recent years. The course will outline some of these and the procedures to ensure that cost effective systems are design and implemented at the right time in the mine's life.

- Why mines are hot
- Mechanical compression refrigeration machines
- Air to water heat exchangers in mine cooling system
- Water distribution systems
- Surface cooling installations
- Underground cooling installations
- Selection of cooling systems
- Novel systems

Prerequisites: Some technical background (basic engineering qualification/background) would be beneficial.

Rudolph Janse van Vuuren has been involved with the design, building and commissioning of industrial and mine refrigeration systems for the past 14 years; of which many were turnkey installations. Rudolph has been directly involved with the design of the Palabora Mining Company Lift 2 refrigeration system and is currently also project managing the ventilation and refrigeration system design of the new De Beers Venetia Underground Project in South Africa. Past work include refrigeration systems for Gold Fields, Sibanye Gold, Harmony, Lonmin, Anglo Platinum, SASOL, Heineken Breweries and Hecla Mining.

Dr. Stephen Hardcastle the Managing Director of BBE Consulting Canada is a renowned expert in mine ventilation. As the former head of Mine Ventilation with CANMET, with the Canadian Government, he has over 30 years of industrial and applied research related experience. He has led major industry and consortia initiatives into mine ventilation optimization, automated ventilation control, diesel emissions reduction, alternate energy, contaminant monitoring and heat stress management.

Course B

PROJECT IMPROVEMENT THROUGH VENTILATION COST ANALYSIS AND DESIGN

Presented by Craig Stewart from Chasm Consulting / Ventsim Software

8:30 am – 4:00 pm

Mine ventilation has easily identifiable direct costs such as power, fan purchases and mining infrastructure. However, the indirect costs of ventilation through poor design, bad environmental working conditions, and lost productivity and safety often has implications greater than the direct costs combined. In addition, mine ventilation is often relegated to the rear of mine project and feasibility studies, whereas it should be considered integral to everything from planning design, mining methods and ore transport method selections, all of which have a direct effect on mine ventilation costs and effectiveness

This course will use a number of fictitious case studies to show how these costs can be measured and used to help justify improved ventilation infrastructure, design or systems. Using Ventsim modelling software we will explore the impact of good and bad ventilation design and how we can ensure ventilation can be made integral to good mine design and reduced overall mine project costs. Participants are invited to bring their own laptops to work through the examples, and a temporary Ventsim license will be provided for participants.

Participants need to bring a laptop, calculator, and note paper.

- Laptops must run Windows XP, Vista, Windows 7, Windows 8 or Windows 10
- DirectX 9.0C compatible graphics, screen size 1024 x 768 pixels or bigger
- Laptops with 'discrete' video cards such as ATI or NVIDIA will perform much better than types with integrated graphics such as INTEL.
- 2GB RAM minimum, 100Mb free hard drive space.
- Spare USB port
- Two button mouse with centre scroll wheel (important)

To ensure the software can adequately run on the laptop, participants will need to download and install the Ventsim™ Visual Viewer on to their laptops **BEFORE** the course.

The software can be downloaded from http://www.Ventsim.com/files/vvsetup4.exe

Participants are also encouraged to ensure they have 'administrator' access rights on the laptop in case additional or updated Ventsim™ software needs to be installed during the course. Some companies do not automatically allow this on corporate computers, so please check with your computer administrator first. If you can install the above file with your own access, it should be OK.

The Ventsim™ course will frequently refer to the Ventsim™ Manual. A PDF version of the

Ventsim™ manual is available from the HELP menu in the program installation. The manual is approximately 280 pages long. Participants are welcome to print the manual, however this is not essential and it can be accessed electronically when required.

Prerequisites: A basic understanding of ventilation theory is recommended.

Craig Stewart is a mining engineer with 26 years of experience in underground mining and ventilation. Craig is also the lead author of Ventsim™ software which was developed for a wide variety of mine ventilation analysis and design requirements, and is currently in use at over 1000 mines and 60 universities around the world. Craig regularly provides training courses in mine ventilation and Ventsim™ to mine personnel, government agencies and university staff and students.

Course C

DEVELOPMENT OF A PRINCIPAL MINING HAZARD MANAGEMENT PLAN FOR SPONTANEOUS COMBUSTION

8:30 am – 4:00 pm

Presented by Basil Beamish, B3 Mining Services Pty Ltd

The purpose of this course is to update participants on the major elements required to develop an effective principal mining hazard management plan for spontaneous combustion. This will include examples of the most recent techniques used for spontaneous combustion hazard assessment and how these are used to recognise the stages of spontaneous combustion development for a specific mine site situation. Case studies will be presented from recent mine site experience.

The course will be presented in four modules:

Module 1 – Spontaneous Combustion Processes and Mechanisms

- The spontaneous combustion spectrum and stages of heating development
- Processes involved in spontaneous combustion and factors influencing self-heating rates
- Mechanisms involved in spontaneous combustion and site behaviour

Module 2 – Spontaneous Combustion Hazard Assessment

- Appropriate sampling and testing strategies
- Interpreting test results
- Case study examples
- Unusual situations

Module 3 – Elements of a Principal Mining Hazard Management Plan

- Key reference documents
- Hazard identification and sponcom assessment
- Risk assessment and management controls

Module 4 – Trigger Action Response Plans

- Monitoring and detection
- Gas evolution testing
- Development of a Trigger Action Response Plan
- Case studies

Prerequisites: none

Dr. Basil Beamish CP (Min) RPEQ is the Managing Director of B3 Mining Services Pty Ltd and has over 36 years of experience in coal mine related hazards both operationally and from a research perspective. He is one of the world's leading experts in spontaneous combustion assessment for management planning and provides consultancy advice to coal mines in Australia and several overseas countries including the United States of America. More recently, Basil has worked with metalliferous mines to help them understand their risk profile from the hazard of spontaneous combustion.

Course D

CONTROL STRATEGIES AND TECHNOLOGIES FOR REDUCING EXPOSURE OF UNDERGROUND MINERS TO PARTICULATE MATTER AND GASES EMITTED BY DIESEL-POWERED EQUIPMENT

Presented by: Dr. Aleksandar Bugarski, National Institute for Occupational Safety and Health (NIOSH), Pittsburgh Mining Research Division (PMRD), Pittsburgh, Pennsylvania, U.S.A.; Dr. Jozef Stachulak, MIRARCO Mining Innovation, Sudbury, Ontario, Canada; Arash Habibi, Tronox, Green River, Wyoming, U.S.A.

8:30 am – 5:30 pm

The course will provide lectures and forum for discussion on various topic related to the efforts on reducing risks associated with exposure of workers in underground mines to particulate matter and gases emitted by diesel-powered equipment. The course is intended for mine health and safety professionals involved in various aspects of multifaceted and integrated efforts on curtailing diesel emissions and reducing exposures to diesel aerosols. The focus will be on advancements in technologies and strategies used to curtail diesel emissions at their source including retrofit type exhaust after treatment devices, advanced engines, and alternative fuels. The course would provide insight into the ongoing projects in the U.S. and Canada. The course should help underground operations to develop and support practical mine-specific programs to reduce miners' exposure to diesel aerosols and gases.

Prerequisites: General understanding of the underground mining diesel issues

Dr. Aleksandar Bugarski is the lead research engineer with National Institute for Occupational Safety and Health (NIOSH), Pittsburgh Miningd Research Division (PMRD) Primary focus of his research is assessment and control of exposure of underground miners to diesel pollutants and characterization of diesel aerosols. Dr. Bugarski has extensive experience in testing and evaluating technologies for curtailment of diesel particulate matter and gaseous emissions in underground environment and laboratory. He received his Ph.D. from Mechanical and Aerospace Engineering Department of West Virginia University for his work on characterization of particulate matter emitted from in-use heavy-duty diesel engines.

Dr. Jozef Stachulak is manager of strategic ventilation and diesel research at Mirarco Mining Innovation. Dr Stachulak has extensive experience in mining industry at various capacities including those as operating mine foreman, assistant mines ventilation engineer, chief mine ventilation engineer for Inco-Ontario Division, and the global manager for strategic ventilation for Vale-Base Metal. Jozef hold MS in mining from University Science and Technology Cracow, Poland and Ph.D in mining and metallurgy from McGill University, Montreal, Canada. He is also adjunct professor at McGill University, Montreal, Canada, invited lecturer at University of British Columbia, Vancouver, Canada and guest lecturer at University of Toronto, Toronto, Canada.

Arash Habibi is a mine engineer withTronox Alkaki trona mine in Green River, Wyoming. He is currently a mine supervisor in Services and Production Department. He also has experience in mine ventilation designing, short and long term ventilation planning, and addressing other day-to-day ventilation challenges. He is the engineering resource for diesel particulate matter program at the mine, working closely with maintenance and safety departments. Arash holds MS in mining from Missouri University of Science and Technology (MS&T). As a Ph.D. candidate at MS&T, he is currently conducting research on characterization of dust and diesel aerosol in the mine atmosphere.

Course E

FANS AND FAN SYSTEMS

Presented by Kevin J. Lownie, Howden

8:30 am – 5:30 pm

The purpose of this one day course is to provide ventilation engineers with a sound understanding of how fans work and how they function within a ventilation system. The course content broadly covers: geometric similarity, viscosity, Reynolds Number, boundary layer, basic aerofoils, impeller stall, surge and stall, parallel operation of fans and system stability, understanding fan performance characteristics, relating mine ventilation duty to fan performance, in situ fan testing and compliance assessment, rotor dynamics and fan foundations, VOD implications for fatigue failure of impellers, fan performance and reliability.

Prerequisites: some reasonable level of knowledge about mine ventilation systems.

Kevin Lownie has 40 years of experience in fan development, air and gas handling systems and associated equipment in mining, mineral processing and power utilities.

Course F

VENTILATION MODELING MISTAKES, MISSTEPS, and RESULTS

Presented by Brian Prosser and John Bowling of Mine Ventilation Services, a new division of SRK

8:30 am – 4:30 pm

The course will discuss common mistakes that are made when developing ventilation models and conducting ventilation investigations. The class will start with the reasons for conducting a ventilation study with computer models. This will include discussion on how ventilation models are useful for the study of systems, and what are the model limitations. It is important for engineers to be able to make adequate and educated assumptions when developing a design strategy based on modeling.

The course will discuss the development of a ventilation models and common mistakes or missteps that are frequently encountered during this process. Real life examples will be provided to identify common mistakes and to demonstrate their outcome with respect to the ventilation study. Examples of ventilation modeling mistakes and missteps will be included for discussion/demonstration that will include simulations developed from full ventilation surveys and from empirical data.

Prerequisites: An interest in ventilation modeling and design. Although the course will not involve network modeling, it will refer to concepts and methodologies used during the ventilation network modeling process.

Brian Prosser, PE is a Principal Consultant with over 20 years of ventilation experience. He has conducted studies for both hard rock mines and coal mines throughout the world. He has developed both climatic simulation models for deep mining operations and fire simulation models to assist in the planning of the health and safety aspects of mine designs. He has conducted numerous ventilation surveys used to develop network models.

John Bowling, PE, MS is a consultant with over 5 years of experience in mine ventilation system design and analyses for coal, metal, non-metal and industrial minerals around the world; plans, coordinates and conducts ventilation surveys of underground mines; manages the quality assurance program for MVS; and provides short courses in underground mine ventilation measurement, planning and modeling.