



## NIOSH Short Course Outline

### **Title: Control of Methane Gas in Underground Mining Operations**

**Instructors:** Dr. C. Özgen Karacan, Heather N. Dougherty, Robert B. Krog, Christopher J. Pritchard, and Dr. Gerrit V.R. Goodman

**Date:** June 12, 2010, 9:00 am – 5:00pm

### **Description of the course:**

This short course reviews methodologies to control methane gas in underground coal and metal/non-metal mining operations. The basics involve moving a sufficient quantity of intake air from the end of the tubing or curtain to the face, mixing intake air with methane gas liberated at the face, and then moving methane-contaminated air away from the face. Underground mining operations are pursuing increased cutting depths beyond the standard 20 foot distance from the end of the ventilation curtain or tubing. As these cutting depths increase, airflow quantities reaching the face area often decrease due to the difficulties in maintaining tubing or brattice setback distances. This course examines the impacts of machine-mounted scrubbers and water sprays for increasing face airflow during mining.

This short course also gives a description of newly developed NIOSH software suite oriented for methane control in longwall mines. The software suite contains four main modules to predict dynamic elastic properties of coal-measure rock; predict performance of gob gas ventholes; predict ventilation methane emission using borehole, longwall and mining parameters; and predict the best degasification system using an expert system.

The first part of this course includes the techniques used in data preparation, handling, and processing techniques to select the predictive determinants in these programs using different mathematical and statistical approaches, as well as the artificial neural network environment. A description of parameters and their affects are also discussed in this part. The second part of the course will be an introduction of the software suite itself and its applications for different prediction purposes will be presented.

The targeted audience for this short course will be mining and ventilation engineers, professionals in degasification system design for longwall mines, professionals in VAM and GHG reduction and carbon trading area, and university students and faculty who work in these fields.

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### **Dr. C. Özgen Karacan**

Özgen Karacan has B.Sc, M.Sc, and Ph.D. degrees, all in petroleum and natural gas engineering, from Middle East Technical University in Ankara, Turkey, where he holds adjunct faculty position as associate professor of petroleum and natural gas engineering. He has worked as post-doctoral researcher and research associate at the Pennsylvania State University. He has more than 15 years of research and academic experience in various fields of earth sciences specialized in perforating, coalbed methane recovery, reservoir modeling and simulation and methane control in coal mines.

Dr. Karacan is currently employed by NIOSH OMSHR as a lead research engineer. In his current position, he is working on methane control in coal mines, and is responsible for development of new prediction methods and reservoir characterization and simulation in coal bed reservoirs for coal bed and coal mine methane production.

Dr. Karacan has served on various scientific merit review, awards, grants and promotion committees in NIOSH, DOE and American Chemical Society. He has authored and co-authored more than 100 technical papers, edited topical issues for journals, organized sessions and has given numerous invited presentations in conferences and workshops. He has been reviewing technical articles for several indexed journals and he is currently serving as Editor-in-Chief of International Journal of Coal Geology.

### **Mr. Robert B. Krog**

Robert Krog has B.A. B.Sc.H, and M.Sc degrees, in Economics, Geology and Mining Engineering from Queen's University Ontario. He currently is a PhD. Candidate at West Virginia University in the Mining department. He has more than 10 years of research and academic experience in various fields of mining engineering covering ventilation systems and methane control in coal mines.

Mr. Krog is currently employed by NIOSH OMSHR as a research engineer. In his current position, he is the principal investigator for the project 'methane control in coal mines', and is responsible for development of ventilation options for larger longwall gobs and districts.

Mr. Krog served on various SME groups and he has authored and co-authored more than 20 technical papers.

### **Heather Dougherty**

Heather Dougherty has been working for NIOSH PRL in the Dust Control, Ventilation, and Toxic Substance Branch (DCVTSB) in the Ventilation group since January 2009. Before this, Heather was a mine engineer for Emerald Mine in Waynesburg working with operations on ventilation, roof control and degasification for over 6 years. Heather got her BS from West Virginia University in 2002, her MBA in 2005, and is currently working on her MS in Mining Engineering. She is also a registered professional engineer in the state of West Virginia.

### **Chris Pritchard**

Chris has a BS and MS from Michigan Tech in Mining Engineering and is a registered Professional Engineer. He initially worked for MSHA Coal Mine Safety and Health in ventilation, ground control and special investigations and graduated from the Mine Safety Academy's Mine Inspector Program.

He worked 27 years in the Wyoming trona mines as a supervisor and engineer in ventilation, planning, production, projects and rock mechanics. He is a certified Mine Foreman and Mine Examiner.

He joined the NIOSH Spokane office in 2008 and has worked in Metal Non-Metal mine fires and ventilation areas. He has multiple professional publications in the area of mine ventilation, safety and mine closure.

### **Dr. Gerrit V.R. Goodman**

Dr. Gerrit V.R. Goodman earned his B.S. in mining engineering from the Pennsylvania State University and a Masters and PhD degree in mining engineering from Virginia Tech. Dr. Goodman joined the U.S. Bureau of Mines and NIOSH in 1987 as a mining engineer in the Respiratory Hazards Control Branch at Pittsburgh Research Center where he directed research programs in the elimination of respirable silica and coal dusts, with particular emphasis on the operators of underground coal continuous mining and roof bolting machines. He has authored or co-authored nearly 60 research publications and has lectured extensively in the U.S. and abroad. He is currently the Team Leader of the Ventilation Section of Dust Control, Ventilation and Toxic Substances Control Branch in the Office of Mine Safety and Health where he manages research projects in the application of reservoir engineering principles for controlling methane in gobs, in longwall methane control, and in evaluation of belt air ventilation.