

Advanced Mine Ventilation (MINE 632)

Group A – for Graduate Students with Mining Background

Instructor: Yi Luo, Ph.D. and PE, Associate Professor
Lecture Hours: Monday 5:00 – 7:50 PM
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Credit Hours: 3

Textbook: Hartman, H. L.; J. M. Mutmansky, R. V. Ramani; and Y. J. Wang; 3rd Ed., 1997, *Mine Ventilation and Air Conditioning, 3rd Ed.*, John Wiley & Sons, NY, 730 pp.

References:

1. McPherson, M.J. *Subsurface Ventilation Engineering*, <http://www.mvsengineering.com/index.php?cPath=25>
2. Code of Federal Regulations, Title 30, Mineral resources, U. S. Government Printing Office, Washington, D.C.
3. Gas Explosion Handbook - to be distributed
4. Materials provided at Google group site, please check your email for the invitation and activate your user account

Objectives: Advanced topics in mine atmospheric control including control of methane, dust, humidity, and heat. Also covers leakage characteristics, fan selection, analysis of ventilation networks, and planning of mine ventilation system.

Organization of the Course: The course will be offered partially in lecture setting and partially in the form of directed studies.

Lecture Topics:

1. Coal mine ventilation systems
 - a. Common US coal mine ventilation practices
 - b. Bleeder ventilation systems
 - c. Bleederless ventilation systems
 - d. Auxiliary ventilation
2. Formulation and solution of ventilation networks
 - a. Formulation of ventilation networks
 - b. Hardy-Cross method
 - c. Solution using Excel
3. Coal spontaneous combustion
 - a. SponCom problems in the world and US
 - b. Detection methods for coal's propensity for spontaneous combustion
- d. Air leakage through ventilation stoppings
- e. Applications of VNetPC 2003
- f. Ventilation simulation for a planned coal mine with large longwall panels.

4. Gas explosions in mines
 - a. Chemical reactions
 - b. Explosive conditions
 - c. Explosion heat and pressure
 - d. Lower and upper explosive limits when multiple gases involved.
5. Coal mine fires and detection
 - a. Fire ratios
- b. Explosibility detection
- c. Application cases
6. Coalbed methane recovery
 - a. Methane and coal mine production and safety
 - b. Methane emission mechanism
 - c. CBM recovery technology and its development

Suggested Topics for Independent Studies

Each student can select one of the following ventilation topics to work on. He/she is responsible for finding the materials, conducting an independent study, preparing a report on the findings and presenting the results to the class. The student should follow the SME publication guideline to prepare the report.

1. Bleeder and bleedless ventilation system
2. Coalbed methane recovery: methods, efficiency and applications
3. Coal spontaneous combustion: mechanism, controlling factors, prevention
4. Gas content and emission characteristics of coal
5. Cost of mine ventilation estimation: capital and operating costs
6. Mine seals: design and constructions
7. Investigation of mine disasters caused by insufficient ventilation, gas explosions, spontaneous combustion, etc.
8. Propagation of gas and dust explosion in mine entries
9. Other topics pertinent to mine ventilation

Grading

1. **30%** Longwall mine ventilation network simulation project. The students are assigned to simulate the ventilation network of a longwall mine in its planning stage (mine map and basic ventilation requirements are provided). The students are required to perform ventilation simulation to meet the requirements. Tasks include proper determination of airway resistances, ventilation planning, regulator placement and sizing, etc.
2. **30%** Mid-term exam covering most of the lecture materials
3. **35%** Report and presentation of independent studies