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THE AEOLUS PROJECT: AN INNOVATIVE ONLINE PLATFORM FOR THE EDUCATION OF MINE VENTILATION PROFESSIONALS

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INTRODUCTION

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- Strategic Plan
- Building Educational Modules for a Global Audience
- Sourcing Content
- Revision and Maintenance
- Summary

The AEOLUS Project

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PROJECT OVERVIEW

- WHY?
- Who?
- What?
- Where?
- How?
- When?

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PROJECT OVERVIEW

- The mining industry has repeatedly acknowledged that there is a shortage of practicing mine ventilation professionals (U.S., Australia, South Africa and Chile, others).
- This poses a significant concern or threat to the success and sustainability of the entire industry (Brake and Nixon, 2004, Esterhuizen, 2010, Henriquez, 2010, Mills, 2012).
- Consensus among most practicing mine ventilation engineers and technicians is that that there are too few professionals engaged full-time in mine ventilation, and that "part-timers" may have insufficient expertise to meet the needs of the industry.
- In the U.S., there exist few opportunities for professional development in the field outside of undergraduate coursework at an accredited University, occasional short courses and the North American Mine Ventilation Symposium.
- Hairfield and Wallace note that less than half of teaching faculty are experienced ventilation professionals (2006).

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PROJECT OVERVIEW

- Australia and South Africa both have legislative requirements to require the presence of qualified ventilation practitioners on-site, and for a minimum standard of competency.
- In those countries, there remains a significant concern that mine ventilation practice is often misunderstood or misapplied by those responsible for its implementation (Brake, 2015).
- For the rest of the world, there exists no standard for practice or competency in the field of underground ventilation, and
- …no requirement for the presence of a qualified ventilation engineer or technician to oversee the ventilation system.

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PROJECT OVERVIEW

- For many professionals, the only available forum for the dissemination of process and technical innovation in the field comes from symposia or meetings sponsored by their local professional society (e.g., SME-AIME, AusIMM, MVSSA, etc.).
- Often, securing the approval and funding for a local trip is difficult, much less a multi-day, international visit solely for the purpose of professional development.
- Many operate in countries or locations without a representative industry body or professional association.
- In light of these challenges (cost, location, language, etc.) it was decided to first identify both fundamental principles and leading practices from around the world, and then create a professional development system for the practice of mine ventilation.
- This would be offered to ventilation professionals through an innovative, online platform that will be both freely available and easy to access, and with a protocol for peer review and expansion as new technology and practices emerge.

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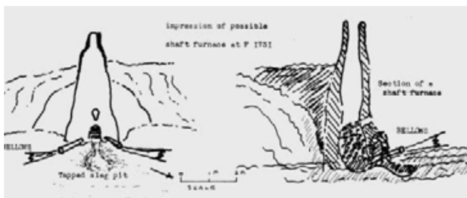
PROJECT OVERVIEW

- As long as there has been underground mining there have been improvements made to the technology and processes involved in mine ventilation practice.
- Some areas of innovation remain in a constant state of flux (e.g., automation technology, auxiliary ventilation componentry, etc.).



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EDUCATIONAL STRATEGY

- STEM education is a current focus within the U.S. primary and secondary (University) educational systems, and the subject of significant funding and research.
- A recent meta-analysis of 225 studies published in the National Academy of Sciences notes the significant improvement in student outcomes achieved by "active learning" techniques when compared to more traditional approaches (lectures).
- Nobel laureate and "active learning" pioneer Dr. Carl Weiman explains that students learn best by doing, and that immediate feedback is essential to this process.

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EDUCATIONAL STRATEGY

- Another goal of the program authors is to overcome the tendency towards overly technical style or impenetrable language when writing the training modules.
- Although second-nature to research engineers and academics, such a technical communication style can be off-putting to the novice, or to underground mining practitioners that are among the targeted demographic.
- A balance is sought, whereby complex and abstract topics may be explained simply without the loss of meaning or context.

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COURSE DELIVERY / ACCESS

- How do you reach potential users across:
  - Different industries (i.e., mining, tunneling, civil construction, etc.)?
  - Different languages, cultures, time zones?
  - Different skill levels (novice to expert)?

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COURSE DELIVERY / ACCESS

- Electronic, web-based courses provide the most customizable, accessible and flexible platform for knowledge transfer.
- Many options available for Learning Management Systems (LMS), optimized for various educational means (e.g., primary education, higher education, corporate training, etc.)
- Within the LMS, it is possible to:
  - State the learning objectives
  - Organize course content and schedules (order)
  - Communicate information directly to the learner in a variety of methods and styles
  - Assess understanding and retention of course content
  - Obtain direct feed-back from students, often in real-time

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COURSE DELIVERY / ACCESS

- Once the decision to use an LMS was made- the selection of the "best" option was critical.
- Needs for the Aolus Project LMS included:
  - Free, open-source solution
  - Optimized for secondary education and corporate training needs
  - Easy to learn and navigate for both course developers and students
- After exploring many options, Canvas was ultimately selected as the LMS used.

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COURSE DELIVERY / ACCESS

Home
Announcements
Assignments
Discussions
Grades
People
Pages
Files
Syllabus
Outcomes
Quizzes
Modules
Conferences
Collaborations
Attendance
Settings

THIS COURSE IS UNPUBLISHED — Only Teachers Can See This Course Until It Is Published

Need help setting up your course?

Setup Checklist

Diesel Particulate Matter

Jump to Today | Edit

The AEOLUS Project

Health Effects, Measurement and Control of Diesel Emissions in Underground Mines

Diesel-powered equipment is ubiquitous in today's mechanized underground mines. While largely responsible for the efficiency and productivity of modern mines, diesel equipment also produces significant hazards to human health, especially in sub-surface environments. These hazards present a challenge to mine ventilation engineers and technicians tasked with protecting the health and safety of the workforce. This course provides an overview of the desultory health effects, measurement techniques and control of diesel emissions in underground mines and facilities.

Learning Objectives

1. **Identify emissions control technologies.**
2. **Identify health risks associated with diesel emissions exposures.**
3. **Explain the role of environmental sampling in diesel emissions control.**
4. **Identify four types of contaminants produced by diesel equipment underground.**
5. **Explain the ALARA principle as it relates to diesel emissions control.**
6. **Demonstrate knowledge of engineering controls for reducing DPM emissions.**

Get Started

About the Aeolus Project

COURSE DELIVERY / ACCESS

2.2 Particulate Emissions

The particulate emissions from diesel engines, commonly referred to as diesel particulate matter (DPM) constitute a two-pronged threat the health of humans. Firstly, the particles that constitute DPM are generally less than one micron in diameter; second, these tiny particles adsorb a variety of toxic chemicals (e.g., aromatic hydrocarbons, aldehydes, etc.). In combination, DPM carries these harmful chemicals deep into the lungs and respiratory system, where they can be transported in to the body.

Figure 2.1 shows a graphical representation of DPM as it occurs in diesel exhaust emissions.

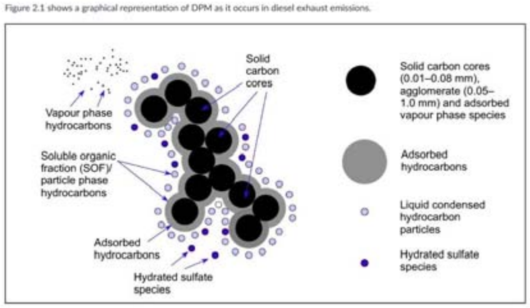

Figure 2.1: Aerosol diesel particulate matter (Twigg and Phillips, 2009).

CONTENT & CURRICULUM DEVELOPMENT

- From the beginning of the project, this resource was designed as a global means for technology transfer.
- In practice, mine ventilation can vary greatly from region to region, or even within neighboring mines.
- The curriculum was designed to be as inclusive as possible; even where/when conflicting views are present.
- The focus is on education, not on regulatory compliance or licensure.

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CONTENT & CURRICULUM DEVELOPMENT

- Each of the following regions was visited by the development team:
  - Africa
  - Australasia
  - North America
  - South America
  - Western Europe and Scandinavia
- In total, the team visited:
  - 13 active underground mines
  - 10 University campuses
  - Many additional mining companies, consultants and regulatory bodies
- Visits ranged from 10 – 14 days in each region, spaced over a 12-month period.

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CONTENT & CURRICULUM DEVELOPMENT

- Only two countries visited currently have a certification program or regulatory requirement for mine ventilation professionals (Australia and South Africa).
- Additional time was spent in each of these locations to study the architecture of training and curriculum for their certification programs.
- During these trips, the greatest needs for ventilation knowledge and resources were identified for each region and group.
- Exceptional practices and installations were identified for use as case studies.
- Additional resources were collected (e.g., ventilation courses, textbooks, etc.)

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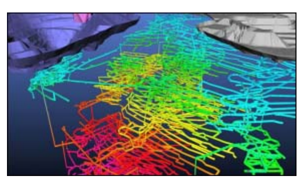
CONTENT & CURRICULUM DEVELOPMENT

- The information collated by the development team was divided into topics that were considered essential elements of mine ventilation practice for the purpose(s) of this project.
- In total, the following 12 areas of fundamental knowledge were identified:
  - Basic Mine Ventilation Theory
  - Bulk Air Heating and Cooling
  - Coal/Trona/Potash Mine Ventilation Systems
  - Diesel Emissions and Control
  - Dusts and Abatement
  - Fan Engineering
  - Gases and Gaseous Contaminants
  - Metal/Nonmetal Mine Ventilation Systems
  - Mine Ventilation Modeling and Simulation
  - Mine Ventilation Surveys
  - Ventilation Economics
  - Ventilation System Automation and Monitoring



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COURSE REVISION & MAINTENANCE

- A significant goal of the project is to provide an educational resource, not to just meet the current needs of the industry, but to provide a platform for the training of future mine ventilation professionals.
- The digital nature of the modules themselves and use of a free, open-source LMS is specifically designed to allow for revisions, additions and improvements to be made rapidly and easily.
- More difficult questions surround the identification of new sources of content and the parties responsible for maintenance and revision of the training modules.

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COURSE REVISION & MAINTENANCE

- The development team has identified and proposed that the modules be maintained by the UVC of the SME.
- The UVC membership consists of respected industry professionals from varied backgrounds and experience levels, with representatives from Academia, Government, and Industry (Operators and Technical Experts).
- The committee incorporates the widest possible body of knowledge, experience, and needs, in keeping with the desire to be as inclusive as possible.
- Younger members are expected to contribute by identifying weaknesses in the curriculum and emerging industry needs, while more experienced members will be relied upon for the development of innovative solutions and content (all in collaboration).

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COURSE REVISION & MAINTENANCE

- First, a member of the community of ventilation professionals would make a request, e.g., to highlight a recently developed new technology or innovative process with implications for mine ventilation practitioners.
- The committee, either collectively or through a designated representative then would forward this case to a recognized expert in the area of the request.
- Upon consideration, the expert reviewer would make a recommendation as to what course would be revised and how the new information would be incorporated into the curriculum.
- Finally, the revised material would be approved by an independent party prior to being released for public consumption.

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SUMMARY

- The program outlined in this paper provides a workable solution to one of the most prominent and potentially crippling problems currently faced by the mining industry, and specifically the field of underground ventilation.
- The proposed series of educational modules will allow for the standardization of mine ventilation education around the world, and promote the transfer of industry best practices and innovative technology in the most rapid and accessible format possible.
- The format of the resource allows it to be used by interested parties of the widest possible range of backgrounds and experience levels.

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SUMMARY

- The identification of a framework for ownership and maintenance following the completion of this project ensures that the program is capable of being continuously modified and improved to meet the needs of industry professionals long into the future.
- Although it is not an explicit goal of this program, it is also hoped that the overall strategy employed for capacity-building in the field of underground ventilation here may serve as an example for how the problem might be addressed by other specialist groups within the mining industry (e.g., rock mechanics, blasting, etc.).

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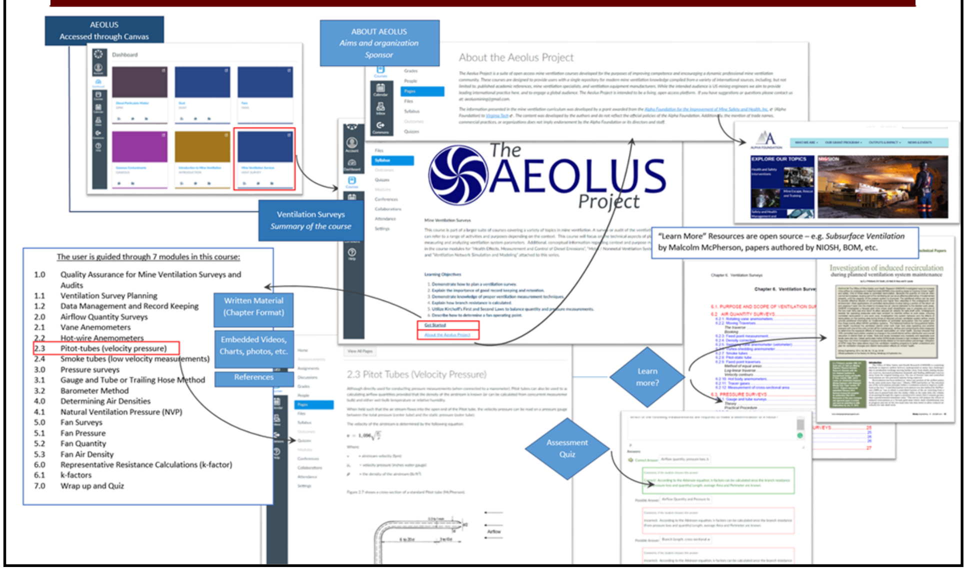
SUMMARY



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QUESTIONS?

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