Evaluation of New Technologies for Mine Rescue Training

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Presentation Outline

- Project team
- Partnerships
- U. S. rescue teams
- Rescue team exercises
- Evaluating technologies

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Our courteous and knowledgeable staff
A few of our partners

- Industry
- Labor
- Manufacturers
- Enforcement
- Academia
Rescue Team Data

- 670 underground coal mines*
- 247 underground metal/nonmetal/stone mines*
- 265 state and company u/g mine rescue teams~
- 138 coal teams
  - 1005 members
- 127 m/nm/stone teams
  - 951 members

*Source: MSHA 2005
~Source: MSHA 2007
Rescue Team Exercises and Technology Evaluation
From 2004 to date, 31 mine rescue teams underwent training simulations at Lake Lynn Laboratory, some several times a year.
Problem solution map for an underground exercise allowing both the mine fire brigade and rescue team to work together
Technologies to aid Mine Rescue Teams

Dawson, WV mine rescue team – c. 1940

USBM mine rescue team – c. 1920
Lighted Team Link Line

- Luminescent wire
- 27 feet long
- Team can move along line
- Team can step off line using a retractor
- Patented - not in commercial production
Trainees were asked the following question -

*The lighted lifeline is an improvement.*

- **Strongly Agree:** 70%
- **Agree:** 20%
- **Disagree:** 10%
- **Strongly Disagree:** 0%
Wayfinding Technologies

- Reflective materials
- High intensity LEDs
- Chemical lightsticks
- Strobe lights
- Handheld lasers
- Turbo flares
Trainees were asked the following question -

The items in the team bag; e.g. light sticks, strobes, etc. are useful for mine rescue teams

The bar chart shows the distribution of responses. The majority of trainees (around 70%) strongly agree, while a smaller number (around 20%) agree. A very small percentage (around 10%) neither strongly agree nor strongly disagree. A few (around 5%) strongly disagree with the statement.
Commercial Laser Pointers

- Compact, lightweight, affordable
- Laser Diode Technology
- Class IIIa (Green, Red, Blue)
- Wavelength - 532 nm & 645 nm
- Output Power - 3-5 mW
- Beam Diameter - 1 mm
- Range - up to 2,400 ft
- Hilti looking at a permissible version of a green hand-held laser

Mine rescue team captains wearing lasers
Trainees were asked the following question -

*The blue laser worked better than the green in the smoke.*
Communication systems

**Con-Space**

Photo: CON-SPACE Communications

**Rescom**

Photo: Rescom Sales Inc.
Con-Space Communication System

Foundation Coal has bought sets

Consol Energy bought 12 sets

PA BMS buying 4 sets
Con-Space System

• Modes of communication
  – Team members among themselves
  – Team to fresh air base
• Features
  – All members hear
  – All can speak (if desired)
  – Constant communication – not voice activated
• MSHA Approved
• Teams seem to prefer one person with mic and headset
Rescom Communication System

Photo: Rescom Sales Inc.

Cable reel

Head set and mic @ FAB

Team connections
Rescom Communication System

- Modes of communication
  - Team members among themselves
  - Team to fresh air base
- Features
  - All members can hear
  - All can speak (if desired)
  - Constant communication – not voice activated
- Not MSHA approved
Rescom System in use

Ear piece w/throat mic and control
Rescom Communication System

- Improvements made based on mine rescue teams used and evaluation (06)
- Additional evaluation conducted in April 2007
- More rescue team friendly, teams liked new design
- Teams still want ability to slide along link line which the present configuration prevents
- Pursuing MSHA permissibility testing
- Will be testing wireless version next
Thermal Imaging Cameras

- PA BMS buying multiple units
- Various companies looking at this technology

MSA Evolution® 5200

Belt fire viewed through MSA Evolution® 5200

Cairns IRIS – c. 1996
Camera Images

- Mine rescue team exploring
- Power cable w/splice
- Miner behind barricade
- Underground belt line

- Everyday mine maintenance
- Hot rollers
- Rubbing belt
Other technologies

- Retractors for gas meters
- Lifeline pulleys
- Retractable stretcher
- Lightsticks
Technologies, such as lifeline pulleys, chemical lightsticks, handheld lasers, lighted link lines, and thermal imaging cameras enhance the safety and operational effectiveness of emergency responders.

Not all devices have been submitted for MSHA approval

- Will not be available in the “near term”

Hilti does have permissible LED lighting and is pursuing permissible green hand-held laser.
For more information ...

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