Mining
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Respiratory Protection for the Coal Mining Industry
Respiratory Protection for Coal Mining

Session 1 – Airborne Hazards & Exposures
Session 2 – Respirator Selection
Session 3 – Fit and Wear time
Session 4 – Maintenance
Session 1 - Airborne Hazards

In this session we will cover:

• Dusts, Mists and Fumes
• Diesel Particulate Matter
• Diesel Gaseous contaminants
• Exposure Standards
Dusts, Mists & Fumes

• Dust
  • Crushing, Cutting, Sanding etc
  • *Eg Coal Dust, Crystalline silica*

• Mist
  • Airborne droplets from Spraying etc
  • *Eg Oil mist*

• Fume
  • Fire, Hot Work processes
  • *Eg Welding Fume*
**Dusts - Sizes**

Visible by electron microscope
- Viruses
- Unaggregated Welding fume

Visible by microscope
- Diesel Particulate
- Tobacco smoke
- Coal Dust
- Pollen
- Human hair

Visible by human eye
- Dust
- Fog
- Mists & drizzle
- Rain

Particle diameter, microns (1mm = 1,000 microns)

- Respirable Range
- Total Inhalable Range

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• Coal Dust
  – Coal workers pneumoconiosis

• Crystalline Silica
  • Silicosis

• Welding fume
  • Varies with type of metals in the fume.
  Eg galvanised steel – metal fume fever from Zinc Oxide
Diesel Particulate Matter

- Formed from combustion
  - Elemental carbon (EC) particles with adsorbed chemicals (OC)
  - EC stick together to form chains or clumps
• High concentrations cause irritation

• Due to the size and composition of DP it is easily inhaled and retained in the lungs.

• On the basis of animal studies has been classified by the International Agency for Research on Cancer (IARC) as ‘probably carcinogenic to humans’
Gaseous Diesel Emissions -
Effects

- Carbon Monoxide
  - Chemical asphyxiant
- Sulfur Dioxide
  - irritant, bronchoconstriction (airway narrowing)
- Oxides of Nitrogen (NO NO₂)
  - Respiratory irritants
- Aldehydes
  - Irritants particularly eyes
Exposure Standards

<table>
<thead>
<tr>
<th>Substance</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respirable coal dust</td>
<td>3mg/m³</td>
</tr>
<tr>
<td>Respirable silica</td>
<td>0.10mg/m³</td>
</tr>
<tr>
<td>DP</td>
<td>0.16mg/m³ (MSHA Standard)</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>30ppm</td>
</tr>
<tr>
<td>Nitric Oxide</td>
<td>25ppm</td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>3ppm</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>2ppm</td>
</tr>
<tr>
<td>Acrolein</td>
<td>C 0.1ppm</td>
</tr>
</tbody>
</table>
In this session we will cover:

- Selection factors
- 3M Respirators for the Coal Mining Industry
Respirator Selection

AS/NZS 1715 “Selection, use and maintenance of respiratory protective devices”

Influenced by 3 factors:

• Contaminant
• Task
• Operator
Contaminant Related Factors

- Form – gas, particulate, both?
- Concentration, Exposure standard, Protection Factor
- Need for other PPE to protect
- Warning given by the contaminant
Respirator Selection - Task

Task Related Factors

• Regular or emergency use
• Length of time required to wear respirator
• Activity and mobility of wearer
• Need for vision and communication
• Maintenance facilities
Operator Related Factors

- Physiological Effects
- Facial Fit
- User acceptance
Selected Respirators for the Coal Industry

3M 8710 maintenance free cupped
3M 9913V maintenance free cupped
3M 9300 Series maintenance free flat fold
3M Airstream™ AH6TM Underground Mining Helmet
3M Airstream™ AH6HRM Underground Hardrock Mining Helmet
3M 8710 P1 Maintenance Free

- AS/NZS 1716 Rating: P1
- Galvanised steel nose clip
- Lightweight, Comfortable
- No maintenance
3M 9913V GP1 Maintenance Free

- AS/NZS 1716 Rating: GP1
- Galvanised steel nose clip
- Cool Flow™ valve
- Lightweight, Comfortable
- No maintenance
3M 9300 series flat fold
Maintenance Free

- AS/NZS 1716 Rating: P1 or P2 versions
- Individually wrapped
- Cool Flow™ valve models
- Foldable – easy to store
- Lightweight, comfortable
- No maintenance
3M Airstream™ AH6TM Underground Mining Helmet

- Intrinsically safe
- ASNZS 1716 Rating: PAPR-P1 or P2
- Lightweight 1070g
- Powered by Oldham miners battery
- High impact Face protection, Type 1 Industrial helmet
3M Airstream™ AH6HR
Underground
Hardrock Mining Helmet

- ASNZS 1716 Rating: PAPR-P1 or P2
- Lightweight 1070g
- Powered by Oldham miners battery
- High impact Face protection, Type 1 Industrial helmet
Session 3- Fit and Wear Time

In this session we will cover:

• The correct fitting of 3M Respirators
• Fit testing
• Fit Checks
• The importance of wear time
Fitting 3M Maintenance Free Cupped Respirators
Fitting 3M Maintenance Free Cupped Respirators
Fitting 3M Maintenance Free Flat Fold Respirators
Fitting 3M Maintenance Free Flat Fold Respirators
Fit Testing 3M Maintenance Free Respirators

- AS/NZS 1715 – fit testing requirements
- Qualitative
  - Saccharin (3M FT-10)
  - Bitrex (3M FT-30)
- Quantitative
  - Portacount
- Annual testing – ongoing monitoring of control measures
Fit Checks

Gross determination of fit

- Each time a respirator is fitted
- Cover facepiece and inhale sharply
- No air channelling around the face seal
The Importance of Wear Time
Session 4 – 3M Airstream™ Mining Helmets

In this session we will cover:

• Checks prior to use

• Care & Maintenance of Airstream Mining Helmets
Before Use

What to Check:

- Filters
- Motor & Cap Lamp Circuits
- Adaptor & Cap Lamp Fitting
- Helmet Shell
- Adjustments
- AirFlow Testing
• Main filter is fitted around motor housing

• Pre Filter fitted and grille closed
• Connect cap lamp into Adaptor unit.

• When fully located, motor should be running.
Adaptor & Cap Lamp Fitting

• Connect adaptor into bracket on visor.

• Fit cap lamp

• Cables retained by clips on side and rear or helmet.
Helmet Shell

• Examine the helmet for signs of damage.

• Check the harness, seals and visor for damage.
Adjustments

- Adjust the headband and if necessary helmet head height
Airflow testing

• Check airflow using Airflow indicator over the circular grille on the motor housing
• All cleaning must be done in a safe area

• Avoid inhaling dusts or contaminants retained by the helmet

• DO NOT use petrol, degreasing fluids, solvents or abrasive cleaners on any part of the unit
• Helmet, Visor, Head/Face Seal, Comfort band and Head band can be cleaned with mild detergent and water

• Motor Housing can be vacuumed to remove loose dust.
<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased Airflow</td>
<td>Filters Damaged</td>
<td>Replace filters</td>
</tr>
<tr>
<td></td>
<td>Filters incorrectly fitted</td>
<td>Refit Filters</td>
</tr>
<tr>
<td></td>
<td>Head, Temple or Face Seals damaged or incorrectly fitted</td>
<td>Refit or replace seals</td>
</tr>
<tr>
<td>Reduced Airflow</td>
<td>Filters clogged</td>
<td>Replace filters</td>
</tr>
<tr>
<td></td>
<td>Motor housing clogged</td>
<td>Clean housing</td>
</tr>
<tr>
<td></td>
<td>Discharged battery</td>
<td>Fit fully charged battery</td>
</tr>
<tr>
<td>No airflow</td>
<td>Battery disconnected</td>
<td>Reconnect battery</td>
</tr>
<tr>
<td></td>
<td>Adaptor sub assembly fuse blown</td>
<td>Replace fuse</td>
</tr>
<tr>
<td></td>
<td>Flat battery</td>
<td>Fit fully charged battery</td>
</tr>
<tr>
<td></td>
<td>Motor failure</td>
<td>Replace motor</td>
</tr>
</tbody>
</table>
WARNING!

ANY ATTEMPT TO MODIFY THE AIRSTREAM HELMET, OR THE FITTING OF REPLACEMENT PARTS OR ACCESSORIES NOT APPROVED BY 3M AUSTRALIA PTY LIMITED, MAY SERIOUSLY REDUCE THE PROTECTION AFFORDED TO THE USER AND CAN INVALIDATE THE WARRANTY GIVEN BY 3M AUSTRALIA PTY LIMITED

Any questions or enquiries should be sought from your Airstream supplier or 3M Australia
3M delivers

- Global expertise – world leader in respiratory
- National trained sales force
- Specialist respiratory knowledge
- Significant R&D Investment ($AUD2b)
- Technical Centre of Excellence
- 3 Full Time Qualified Hygienists
- Respiratory laboratory
- Site surveys at your request
- TechAssist Help Line: 1800 024 464
- Service Life software (Internet)
- Sales force enhancement tools eg. Electronic selectors (CD)
- Customised training programs
- Respirator Service Centre
- Representation on Australian Standards
- Quality assured
  - ISO 9001 – design/produce/install/service
  - ISO 9002 – excludes design
  - QS 9000 – Automotive industry AIC
  - ISO 14001 – Environmental management
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THANK YOU