Ruth Fuller

Optimising the use of an incident management system in coal mining emergencies
Introduction

Why underground coal mining is different

Mandatory annual emergency response practice

Mining Emergency Management System (MEMS)

Non-technical skills

Crew Resource Management (CRM) training
Coal mining – constant hazards

Workers are underground

Workers can be many kms from mine exit

Coal reacts with oxygen

Gas analysis is complex and depends on accurate readings

Limited communications
Pike River Coal Mine, NZ

First of 4 explosions 19 November 2010

29 killed

Royal Commission 2011/12
Raspadskaya, 2010 – 19 rescuers killed

Crandall Canyon, 2007 – 3 rescuers killed

However.....

SAGO, 2006 – 11 of 12 trapped men die waiting for rescue
## Time between explosions

<table>
<thead>
<tr>
<th>Time</th>
<th>Mines and Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5 mins</td>
<td>Castle Gate No. 2 Mine, Willow Creek</td>
</tr>
<tr>
<td>5 - 10 mins</td>
<td>Willow Creek</td>
</tr>
<tr>
<td>10 - 20 mins</td>
<td>Castle Gate No. 2 Mine, Robena No. 3, Eccles Nos 5 and 6</td>
</tr>
<tr>
<td>20 - 30 mins</td>
<td>Willow Creek</td>
</tr>
<tr>
<td>30 - 60 mins</td>
<td>Jim Walter Resources No 5 Mine</td>
</tr>
<tr>
<td>1 - 3 hrs</td>
<td>Consol No. 9 Mine, Consol No. 9 Mine, Sayreton No. 2 Mine</td>
</tr>
<tr>
<td>3 - 6 hrs</td>
<td>Bilsthorpe Colliery, Raspanskaya Mine</td>
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<tr>
<td>6 - 12 hrs</td>
<td>Pond Creek No. 1 Mine</td>
</tr>
<tr>
<td>12 - 24 hrs</td>
<td>Consol No. 9 Mine</td>
</tr>
<tr>
<td>1 - 2 days</td>
<td>Consol No. 9 Mine</td>
</tr>
<tr>
<td>2 - 3 days</td>
<td>Scotia Mine, Moura No. 2</td>
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<tr>
<td>3+ days</td>
<td>Consol No. 9 Mine</td>
</tr>
</tbody>
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Brady & Cliff, 2012
MOURA No.2, Queensland Australia - 1994

11 men killed – Warden’s Inquiry

Annual practice requirements

Recognised Standard 08: Conduct of mine emergency exercises
Level 1 Organising Committee
On the day underground

A passage was shored-up prior
On the day aboveground
On the day aboveground
THE ICT
MEMS Structure (Mining Emergency Management System)

**Incident Controller**
Responsible for overall incident management

- **Planning**
  Collate information.
  Risk assessment.
  Predict development.

- **Operations**
  Manage resources and activities

- **Logistics**
  Procures facilities, services, materials and finance

Ref: M.Farrag QMRS
MEMS training

psychology (0.5 days)

MEMS structure/roles & responsibilities (1.0 days)

emergency simulations (2.5 days)
Incident Controller
Responsible for overall incident management

Planning
Collate information.
Risk assessment.
Predict development.

Operations
Manage resources and activities

Logistics
Procures facilities, services, materials and finance

THE ICT
Mine Emergency Response: support & training

MEMS structure - Incident control system
Mandatory Mine Practice - Level 1s and 2s
MEMS training
Mine Re-entry Decision Support Software

Human factors
ICS – wildfire fighters 1970s

CIMS (New Zealand)

MEMS (Qld mines)
Can’t just push a button....

humans are unpredictable

mine managers are not expert emergency managers

what happens in other high reliability industries?
The Cullen Report (1990)

The Offshore Installation Manager severely criticised
Performing under stress
Recommended looking at other industries

Piper Alpha (1988)
Crew Resource Management (CRM)

Early 1980s

Use all resources in cockpit

Training adopted by aviation
Non-technical skills – what are they?

cognitive and social skills that enhance technical skills

- Situational awareness
- Communication
- Leadership
- Assertiveness
- Decision making
- Teamwork
- Personal limitations
- Fatigue Management
- Trust
- Stress Management

Personal limitations
PhD research

- Identify critical non-technical skills
- Develop CRM training
- Implement CRM training
- Evaluate effectiveness of CRM training
  - behaviours & attitudes
CONCLUSION

- Annual emergency response practice is mandatory for mines in Qld.
- 14 years of data available on Level 1 Mine Emergency Exercises.
- The Qld mining industry has its own Mine Emergency Management System (MEMS) based on the ICS.
- It is proposed that decision making and ICT performance could be enhanced by including a CRM program in the MEMS training to address the identified critical non-technical skills.
THANK YOU

Level 1 reports are available at:

Any comments gratefully received.
Contact details: r.fuller@mishc.uq.edu.au