Best Practice Guidance for Effective Methane Drainage and Use at Coal Mines

Activities of the Ad Hoc Group of Experts on CMM with respect to mine safety

Item 6 of the Agenda

Geneva, 12-13 October 2009
Principal findings

Report outline

Finalisation
Reduce underground explosion risk
Explosions

- Devastating explosion events killing 100 – 200 miners and more have occurred in 21st Century
- All coal mining countries affected but scale and frequency differs
- Fatalities/Mt: 1.25 China, 0.037 USA, 0.0 NSW Australia
- Explosions are preventable – gas dilution, layer prevention, gas capture, gas transport, ignition sources
Explosive mixtures are unavoidable

Coal seam  >95% CH4

Open goaf  15% - 5% CH4

Airway  <2% CH4
Regulatory and risk control

• Technology alone not enough
• Site specific treatment - risk assessment
• Involve stakeholder most at risk – workers
• Non prescriptive rules except where physical constraint eg explosive limits
• Strong enforcement essential
Climate change

• 2020: 793Mt CO2 released; 95% from underground
• 70-80% VAM; remainder drained gas and coal product emissions
• Cost to economy not yet borne by mining
• Technology exists which can virtually eliminate methane emissions
• High opportunity cost barrier: but utilisation attractive with high gas/power price plus high carbon price or high emission penalty
CMM projects are “additional”

![Graph showing revenue and specific emission relationship for Power, CERs, and Total. The graph indicates that as specific emission increases, revenue also increases. Revenue for Power is US$50/t, for CERs is US$30/t, and the total revenue combines these two, showing a linear increase with specific emissions.]](image-url)
Gas drainage

- Many technologies but principles common
- Drainage reduces accident risk and hence mining cost
- Reduces ventilation costs (double airflow, x8 more power)
- Allows increased coal production
- Post drainage – capture gas before excessive dilution so can use
- Captured gas can be used or flared to reduce emissions at low cost
- Drainage of gas at low concentration is dangerous, inefficient and can be avoided
De-stressing zone from which gas released above a longwall
Effective post drainage captures gas where released
<table>
<thead>
<tr>
<th>Gas drainage options – high permeability coal</th>
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<tbody>
<tr>
<td>Many coal seams in roof and floor (+150;−40m)</td>
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<td>• Pre-drainage of worked seam effective</td>
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<tr>
<td>• Post-drainage also needed if gassy</td>
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<td>No coal seams in roof and floor (+150;−40m)</td>
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Gas drainage options – low permeability coal

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<tr>
<td>• Pre-drainage of worked seam ineffective alone</td>
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<td>• Post-drainage essential if gassy – may include floor boreholes</td>
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<td>• Ventilation solutions only, coal production rate limited</td>
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Main conclusions

• Global application of the accumulated knowledge on methane occurrence, prediction, control and management could virtually eliminate explosion risks in coal mines.

• There is a strong business case for installing and operating high efficiency gas drainage systems

• Methane emissions from underground coal mines can virtually be eliminated using existing technology
Report outline

1. Executive Summary
2. Introduction
3. Fundamentals of gas control
4. Occurrence, release & prediction of gas emissions
5. Mine ventilation
6. Methane drainage
7. Methane utilisation and abatement
8. Cost & economic Issues
9. Conclusions
10. Case studies (5 studies)
Report conclusions

• The global economy, will continue to be dependent on energy from coal for the foreseeable future.
• Coal extraction will become increasingly challenging as shallow reserves are exhausted and deeper and more gassy seams are mined.
• Climate change impacts will lead to greater restrictions on coal mining activities and societies will increasingly demand and expect safer working conditions.
• This guidance is considered a starting point for devising strategy and evolving programs to support the necessary safety and practice improvements from which all mining countries can benefit.
• Technologies now exist that will allow coal mines to maximize gas capture for utilization.
• There is a strong business case for installing and operating high efficiency gas drainage systems.
• Elimination of virtually all mine-mouth emissions through oxidation of the un-captured methane that escapes into the ventilation air is now feasible.
• This high level of emission control only becomes financially viable when supported by a market that assigns a value through carbon credits to environmental protection.
Case Studies

- VAM Case Studies (Megtec or Biothermica)
- Upgrading Technology (Molecular Gate)
- High performance longwall operations in areas with high gas emissions – Germany
- Achieving planned coal production from a gassy, retreat longwall with severe strata stress and a spontaneous combustion prone coal seam – UK
- High performance longwall operations in areas with high gas emissions – Australia
- Development of a CMM power co-generation and emission abatement scheme – China
Molecular Gate Unit for 2.5 MM SCFD
Case Studies: Longwall with Y-shaped, ventilation design and drainage boreholes in the roof and the floor behind the longwall.
Finalising draft

- Omissions – contractor safety, use of gas storage tanks, environmental regulations on utilisation and destruction?
- Standardising terms – differences between Australian, US, UK and European usage
- Corrections – factual errors, differences of opinion
- Illustrations – simple, clear, relevant – illustrator needed
- Photos – invite submissions, fully attributed and no copyright issues