Critical control management (CCM)

Mark Holmes, Manager
GOSHnet
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Genk, Belgium
Presentation overview

• ICMM introduction
• Safety performance
• Critical control management & implementation
ICMM at a glance

CEO led
23
Company members

35
Association members

Over 950 sites
in 58 countries
Leading to unprecedented industry collaboration across five continents accounting for 30% of global production

Canada
- Barrick
- Goldcorp
- Teck

USA
- Freeport – McMoRan
- Newmont

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- Barrick
- Goldcorp
- Teck

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USA
- Freeport – McMoRan
- Newmont

South Africa
- African Rainbow Minerals
- AngloGold Ashanti
- Gold Fields
- Lonmin

South Africa
- African Rainbow Minerals
- AngloGold Ashanti
- Gold Fields
- Lonmin

Russia
- Polyus

Russia
- Polyus

Australia
- BHP Billiton
- South32

Australia
- BHP Billiton
- South32

China
- MMG

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- MMG

Japan
- JX Nippon
- Mining and Metals
- Mitsubishi Materials
- Sumitomo
- Metal Mining

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- Mitsubishi Materials
- Sumitomo
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UK
- Anglo American
- Rio Tinto

UK
- Anglo American
- Rio Tinto

Norway
- Hydro

Norway
- Hydro

Switzerland
- Glencore

Switzerland
- Glencore

France
- Areva

France
- Areva

UK
- Anglo American
- Rio Tinto

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Member admission, commitments and reporting

- Robust entry criteria and process
- Clear performance expectations
- Enhanced reporting commitments
- Sustainable Development reports assured independently

10 principles
6 position statements

Member commitments progressively strengthened through position statements

www.icmm.com
Safety performance
ICMM total fatalities 2012 - 2015

![Bar chart showing fatalities and fatality frequency rate over years 2012 to 2015. The chart indicates a decrease in fatalities from 2012 to 2014 followed by an increase in 2015. The fatality frequency rate shows a similar trend with a peak in 2013.](image-url)
2015 member company fatality frequency rate

Fatalities per 1 million hours worked for various companies:

- AngloGold Ashanti
- South32
- BHP Billiton
- Anglo American
- Freeport McMoRan
- Codelco
- JX Nippon
- Mitsubishi Materials
- Sumitomo
- Teck

The graph shows a bar chart where the X-axis represents the company names and the Y-axis represents the fatality frequency rate (per 1 million hours worked). The companies are listed from the highest to the lowest fatality rate.
Where were the fatalities in 2015?

66% underground
What hazards are linked to the fatalities in 2015?
Critical control management & implementation
2012: Collective realisation

Limited correlation between reduction in LTI and fatality rate
2013: Shift focus on learning from HPI given the correlation between fatal and HPI incidents.
Incident investigations of HPI’s highlighted control adequacy and control performance weaknesses
Critical control management is an integral part of risk management with a focus on the critical few risks and associated critical few controls.

The process requires the active participation across organisational levels in the establishment of adequate controls given the materiality of the risk, allocation of accountability for implementation, maintenance and performance monitoring of critical controls, to prevent the realisation of material risk.
2015: implementation guidance

1. A brief overview on the critical control management approach, history, common pitfalls etc

2. A step-by-step guide that uses health and safety case studies to demonstrate the approach. The document provides actions to achieve the target outcomes within each step.
Step 1: Planning - Risk Management maturity

- CCM part of business process
- Critical control performance
- Control adequacy
- Control Focus
- Risk Rank Focus
Develop plan

- Organizational context (maturity and adoption capability)
- Sponsor support obtained and communicated
- Project objectives set
- Responsibilities allocated
- Business sections involved
- Resources required
- Skills, tools and techniques required
- Methodologies and decision trees defined
- Human resource development needs established
- Priorities set
Step 2: Identify Material Unwanted Events (MUE)

Where the potential consequence exceeds a threshold defined by the company warranting the highest level of attention and resources.

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>A (Very Likely)</th>
<th>Has occurred several times in the past</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
<th>Extreme</th>
<th>Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>B (Likely)</td>
<td>Has occurred at some time in the past</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>High</td>
<td>Extreme</td>
<td></td>
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<tr>
<td>C (Possible)</td>
<td>Could occur multiple times on this site</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate</td>
<td>High</td>
<td>Extreme</td>
<td></td>
</tr>
<tr>
<td>D (Unlikely)</td>
<td>Could occur once during the life of the facility</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td>Moderate</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>E (Rare)</td>
<td>Unlikely during the life of the facility</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Moderate</td>
<td></td>
</tr>
</tbody>
</table>

Consequences

LOW | MINOR | MODERATE | MAJOR | CRITICAL

MUE focus
Step 3 – Identify controls
Risk analysis (e.g. BOWTIE)

Cause → MUE → Consequence
Cause → MUE → Consequence
Cause → MUE → Consequence

Prevention Controls
Mitigation Controls
Risk is determined by the controls and their effectiveness.
Controls are:

**Acts** – a description of what a person should do

**Objects** – a device that works when needed without a person's act(s), or

**Technological Systems** – combination of act(s) and object(s)
What are not controls?

Example of elements that are not controls:

- Training
- Permits / paper work
- Check sheets
- Maintenance plans

These are determinants of control effectiveness, or a supporting framework in which controls need to operate.

Still important. Just not controls.
Example: A control for mitigating child pedestrian fatalities outside schools

The control is drivers driving vehicles at a speed that is specified as 40km/hr or less which is measureable via speed cameras and pass the adequacy test.

Specified

Measureable

Adequate
Step 4: Select critical controls

a process for selecting ‘critical controls’
Step 5: Define control performance, monitoring and information expectations

<table>
<thead>
<tr>
<th>Accountability</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Who is the MUE owner?</td>
</tr>
<tr>
<td>• Who is the critical control owner?</td>
</tr>
<tr>
<td>• Worker knowledge requirements?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control design</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Name of the critical control?</td>
</tr>
<tr>
<td>• What is the purpose of the control?</td>
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<tr>
<td>• What is the target performance of the control?</td>
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<tr>
<td>• What is the control performance trigger for action?</td>
</tr>
<tr>
<td>• What can we monitor to determine if the control meets its purpose?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control performance parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Functionality specifications</td>
</tr>
<tr>
<td>➢ Availability expectations</td>
</tr>
<tr>
<td>➢ Reliability target</td>
</tr>
<tr>
<td>➢ Performance dependencies</td>
</tr>
<tr>
<td>➢ Compatibility</td>
</tr>
<tr>
<td>➢ Survivability</td>
</tr>
<tr>
<td>➢ Risk reduction limits</td>
</tr>
<tr>
<td>➢ Anticipated control performance variability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Control performance monitoring information</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Performance status</td>
</tr>
<tr>
<td>• Below target performance</td>
</tr>
<tr>
<td>• Deviations from critical assumptions</td>
</tr>
</tbody>
</table>
Step 6: Assign accountability

MUE Owner Accountability

CC 1 Owner Accountability
- CC 1 verification activity 1
- CC 1 verification activity 2

CC 1 Owner Accountability
- CC 2 verification activity 1
- CC 2 verification activity 2
- CC 2 verification activity 3

CCMP for Vehicle Collisions

Critical Control

Critical Control
Step 7: Site specific implementation

- Assess the risk maturity and progress of the operation
- Develop and implement a change management plan and the allocation of resources
- Review and update list of MUE’s, risk analysis, control strategy, control performance information, verification plans and action trigger points based on site specifics
- Identify employee knowledge requirements across the different levels and associated capacity building needs
- Communicate key information to the various role players
- Develop and implement performance verification plans
- Entrench CCM knowledge in business processes
- Take one small bite at a time
Step 8: Performance verification, reporting and action

• Execute verification plans (developed in step 5)
• Report results to critical control and MUE owners
• Initiate action when performance drop below trigger points
• Review verification plans based on experience
Step 9: Response to inadequate performance

• Investigate and address sub standard control performance
• Identify, assess and action deviations from critical assumptions
• Investigate and action program compliance deviations
• Learn from incidents (potential and actual)
• Conduct independent program compliance and effectiveness reviews (Step1 to 9)
Case study: Reduced fatality rate within two years of implementation

Great response and implementation from ICMM member companies

80% of members in October
What’s next for CCM at ICMM

• Supporting implementation
  • encouraging uptake
  • workshops

• Internal - members developing generic CCM strategies
  • Tailings dam failure
  • Diesel particulate matter exposure
For further information:

www.icmm.com

@icmm_com

info@icmm.com
LESSONS LEARNED

• **Change in focus** – legal compliance & compliance to Standards remains important, but occupational hygiene programmes need to focus much more on business value, people and sustainability.

• **Change in role players** – In the past and current occ hygiene programmes are driven, very often in isolation, by the occupational health and hygiene practitioners and very often these responsibilities and the management of occupational hygiene are outsourced. Going forward we foresee more collaboration and cross-functional role-players in occupational health & hygiene

• **Change in health risk management approach & focus point** - it is about identifying the sources of health risks. Current occupational hygiene programmes are still focussed predominately on personal exposure measurements. The focus need to be on understanding the source, intervention & critical control management.

• **Critical health control performance monitoring** - The hygienist must monitor control performance (i.e. that controls work according to design specifications) and ensure control availability

• **Sampling** - must be directed to provide information about the availability and efficacy of controls and enable management decisions

• **The worker** – must be involved in the process, he is at the centre of our control efforts, and he must be shown how to use control measures properly, and how to check that they are working and how to report control failures