QMIHSC 2026 Submitted Abstracts and Award Entries (Published with Author Consent)

This booklet includes submitted abstracts and award entries that were not accepted into the conference program but have been published with the consent of the authors. Only submissions where publication consent was provided are included.

Mapping the mine by monitoring the mind: Continuous EEG-based fatigue hotspots

Miss Emily Tetzlaff

Biography:
Dr. Emily Tetzlaff is the Principal Scientist, EHS, at Wenco International Mining Systems. Emily has a PhD in Human Kinetics from the Human and Environmental Physiology Research Unit at the University of Ottawa. During her studies, Emily received the Canadian Institute of Health Research Health System Impact Fellowship and a Natural Sciences and Engineering Research Council of Canada postgraduate scholarship for her investigation into heat stress in underground environments. Throughout her doctorate, she served as a Research Affiliate with the Climate Change and Innovation Bureau at Health Canada and worked as a fatigue risk management analyst for Torex Gold Resources Inc. Emily also holds a Master of Human Kinetics, an Honours Bachelor of Physical Education with a specialization in Health Promotion, university certifications in Post-Secondary Teaching and Gerontology, and is a Registered Kinesiologist. Since entering the mining industry in 2015 as a researcher and health and safety specialist, Emily has published over 40 peer-reviewed articles.

Fatigue continues to undermine safe production within the resources industry despite decades of procedural controls. Traditional approaches such as self-assessment, supervisor observation, and hours-of-service rules infer risk indirectly and offer little visibility into the moment-to-moment changes in alertness that precede error. Advances in wearable neurotechnology, including ruggedized electroencephalography (EEG)-based devices, now enable operations to shift from these lagging indicators to continuous, leading measures of human performance in the field. However, a central challenge remains: how do we translate real-time alertness data into system-level changes that measurably reduce exposure to harm?

To address this question, we synthesized millions of hours of anonymized EEG-derived alertness data from surface mining operations worldwide. Records spanned thousands of workers engaged in haulage, loading, drilling, and ancillary equipment operations. Alertness measures were integrated with fleet management data, including location, activity state, altitude, roster design, and shift time.

Through geospatial clustering and temporal modelling, we identified where and when elevated fatigue levels repeatedly occurred and found that repeatable human-factor patterns emerged. For example, high-altitude environments and low-stimulus travel corridors concentrated risk, particularly on extended hauls. Night work produced a greater overall burden, yet roster design determined severity: compressed rotations accelerated late-shift decline, while rotating schedules revealed cumulative misalignment. Critically, operations displayed distinct fatigue signatures as evidenced by mines with similar fleets and schedules producing different outcomes, underscoring the limits of generic rules.

Where hotspot intelligence informed action, sites implemented haul-road improvements, lighting upgrades, targeted break strategies, and roster adjustments aligned with circadian troughs. These interventions reduced high-fatigue events and improved average alertness levels. When leaders can see where cognitive strain accumulates, accountability shifts from worker resilience to work design. Continuous EEG monitoring enables mines to treat human performance with the same rigor applied to geotechnical or mechanical risk. Protecting people begins by identifying where the system makes staying alert most difficult.

Governance of Competence – an evolution of Critical Control Management

Mr Steven Amor

Biography:
Steve is a Mining & Engineering professional with 30 years global experience across mine operations, expansion projects and technology development, including 22 years with Anglo American.
Steve's practical experiences are underpinned by formal qualification – holding Bachelor degrees in Electronics Engineering and Information Technology plus post-grad Master of Business Administration.
Most recently, he is focused on working with mining operations in the areas of Safety & Health compliance – in particular composure of, and competencies needed, by the Mine Management Structure, The Qld Practising Certificate Scheme - and the pathways to competence.

Mining operations are increasingly adopting Critical Control Management (CCM) as a key mechanism for preventing Material Unwanted Events (MUEs). While CCM programs focus on identifying critical controls, defining performance standards, and establishing verification processes, operations still experience control failures.

CCM is a strong model, but it largely assumes that managers and superintendents are competent to design and sustain these systems - and importantly, this is rarely examined or assured.

Preliminary feedback from domain experts (e.g. Pitzer, personal communication, 2026) indicates the most catastrophic failures are not simply operator errors; they stem from (amongst others) inadequate verification processes, or flawed governance decisions.

The CCM framework recognises this human dimension but is vague:

- Emphasises the importance of organisational readiness, stating an organisation undertaking CCM should have the right skills, experience, and resources to implement at a whole-of-program level.
- Acknowledges that many controls are people-based and therefore rely on the skills, knowledge, and experience of individuals or groups - a recognition that human capability materially affects control reliability.
- Explicitly advises practitioners to exclude "competent operator" or "training" controls from bowties because almost every control relies on competent people to operate, inspect, or maintain it - adding that such requirements would overwhelm bowties and are assumed to be managed through existing organisational systems.

These points create a paradoxical situation where competence is essential and universally assumed - yet structurally unmanaged within the framework: in particular, there is no weight placed on the competence of those who design, approve, verify, and govern critical controls.

By reframing human capability and competence as a core element of CCM, distinct from and complementary to, performance standards and verification activities, this approach would address a common blind spot in critical control programs. Integrating capability with verification closes the human-performance gap, enhances the reliability of critical controls, and improves operational risk.

In summary, competence can be thought of as the reliability multiplier that determines whether controls are designed and function as needed. Is competence governance the next evolution of CCM?

Fitness for work - an ergonomic approach

Mr John Schneider

Biography:
Occupational Physician with an evidence based approach. Clinical practice limited to OHS Education, Occupational and Workplace Rehabilitation Management. Special interests: Corporate occupational health risk management consulting, Occupational rehabilitation using a biopsychosocial model, Ergonomics, Work in hot environments, OHS in rural and remote environments, Work overseas, Fitness for work assessment, Occupational health training, International post graduate education and assessment in occupational medicine. Advocate, "It Pays to Care". Retired OHS educator: Faculty of Community Medicine UAE University, Faculty of Medicine James Cook University, Faculty of Health Science Central Queensland University. University

Start of shift screening for drugs including alcohol, identifies workers who have been exposed to those substances only. It does not exclude incapacity to work safely nor productively, because of cognitive impairment. It does not fulfil a duty of care as it does not identify exposure to most causes of cognitive impairment.

Ergonomics is a scientific discipline that studies and evaluates, task designs, jobs, products, environments and systems and how they interact with humans in their environment. Effective ergonomics improves worker performance, productivity and decreases discomfort, fatigue, and injury-related absenteeism.
It encompasses three key domains: -
Organizational: Optimizing sociotechnical systems, including policies and teamwork.
Physical: Focus on anatomical, anthropometric, and biomechanical characteristics.
Cognitive: Focus on mental processes. (Perception, data processing and decision making).

Unlike physical ergonomics, which addresses musculoskeletal health, cognitive ergonomics aims to manage mental workload, reduce errors, and prevent burnout. It focuses on enhancing the interaction between human mental processes (eg. perception, memory, reasoning, and motor response) and the work environment to optimize performance, safety, and well-being.

A worksite cognitive impairment identification test is a proactive safety tool used by employers; particularly in safety-sensitive industries like mining, transportation, construction, and manufacturing, to evaluate a worker’s current fitness for duty. Unlike drug tests that detect past usage, these cognitive tests identify impairment in real-time caused by hazardous exposures including fatigue, emotional stress, illness, or alcohol/drug impairment.

Identification of cognitive impairment particularly where information perception, identification, interpretation, processing and decision making is required due to mental health capacity and function should be considered in assessment of fitness for work.

A failed trial of an Australian developed computerized cognitive test occurred approximately 25 years ago probably due to poor implementation, investigation and management of workers identified with impaired cognitive function remaining at work if they passed an alcohol and limited drug screen. An Organizational Ergonomic Failure.

Psychosocial issues have been widely accepted in the management of occupational rehabilitation and return to work; perhaps it is time for cognitive impairment to be again considered a factor in managing health and safety in the workplace.

Why is the Mining Industry not Sharing Safety Information

Mr Ray Parkin

Biography:
Ray Parkin is a senior professional with an extensive background in the mining industry both in the United Kingdom and Australia. In 2006 he was awarded the OAM for services to Mine Safety and Rescue. He has served in the following positions;
12 years as Chairman of the Board of Directors of Queensland Mines Rescue Service.
4 years - General Manager Health Safety and Environment Shell Coal/ Anglo Coal
5 years - General Manager and Director of German Creek Mines (Shell Coal /Anglo Coal)
6 years - Director of Dalrymple Bay Coal Terminal Chairman 1996-1997
1994 - Panel Member of the Wardens Court into the Moura Mine accident.
5 years - External Member of the Australian Nuclear Science and Technology Organisation HSE Committee (Deputy Chairman) 2001-2005
4 years – Member of the MCA, QRC and NSWMC Health, Safety and Environmental Committees.

In 1996 disaster struck Gretley colliery which is located near Newcastle in NSW, when a water inrush claimed the lives of four miners.
The mining industry has not shared safety information due to investigations being conducted under legal privilege following the outcome of the Gretley Inquiry in 1998, over 20 years ago, when for the first time in any material way individual managers were prosecuted and faced terms of imprisonment. Subsequent legislation which has introduced even greater penalties (up to 20 years imprisonment) continues to stifle transparency, meaning businesses are not willing to share their learnings from incidents, by publicly releasing the outcomes of their investigation into the cause and circumstances of the incident. Managers should only be prosecuted in the event of acting wilfully and recklessly.

The current legislative position has resulted in the reliance on legal professional privilege, which inhibits open and transparent safety investigations and causes a defensive rather than a proactive safety culture. The existing system impedes the timely sharing of information to help prevent recurrence of incidents.

This paper will demonstrate how safety information can be shared by Government, Management, Unions and any other stakeholders getting together to rectify this injustice that has been in place for over 20 years.

Most people in the industry want to see information being shared which will change the investigation culture in the industry for a positive safety outcome. All it needs is goodwill from all parties concerned.

Safety Communication in the Attention Economy: From Safety Messages to Safety Influence

Mrs Melanie Laas

Biography:
Melanie Laas is a Australian-based communications and marketing strategist specialising in communication systems, stakeholder engagement, behavioural audience insight, and leadership visibility across operational and high-accountability environments.
With over 15 years of experience spanning infrastructure, telecommunications, resources, government, and corporate communications, Melanie's work focuses on how communication influences engagement, interpretation, retention, and behavioural response in modern operational environments. Her background includes executive communication, public consultation, organisational positioning, brand strategy, and digital communication systems across regional and corporate sectors.
As Founder of EMME Influence and through consulting work as a Marketing and Communications Manager, Melanie supports businesses and leadership teams to strengthen communication capability, audience engagement, and market positioning through practical, commercially grounded communication and marketing strategies. Outcomes delivered through her work include 2,000%+ LinkedIn engagement growth for a regional industry organisation, 80,000+ organic campaign reach, and over $500,000 in annual advertising cost savings through strategic in-house communications restructuring and in-house capability development.
Melanie regularly delivers executive workshops, conference presentations, provoking speaking engagements, and communication training across healthcare, mining, professional services, and regional industry sectors. Her presentations explore how modern communication environments, audience psychology, leadership communication, and behavioural patterns influence engagement, communication retention, and organisational culture.

Modern media environments are reshaping how people consume, filter, and retain information. Safety communication now competes against constant exposure to inductions, toolbox talks, signage, emails, notifications, meetings, mobile devices, internal platforms, and repetitive digital communication systems.

Over time, high-frequency messaging can contribute to communication fatigue, reduced attention, and lower message retention. Message delivery alone does not guarantee engagement or recall.

Drawing from communication strategy, audience psychology, stakeholder engagement, content systems, and modern media dynamics, this presentation explores how communication style, relevance, structure, and delivery influence whether operational messaging is genuinely interpreted, remembered, and acted upon in practice.

The session examines how smartphone behaviour, fragmented digital consumption, message saturation, and repetitive compliance communication are reshaping engagement across operational environments. It also explores how principles used in marketing, content creation, audience engagement, and communication strategy can strengthen communication effectiveness without increasing communication volume.

This presentation aligns strongly with engagement, communication and consultation, competency and capability, organisational culture, human factors, and leadership communication across resource environments.

Cranes on mine sites – key safety issues learned over 30 years

Dr Charlotte Nash-Stewart

Biography:
Charlotte Nash-Stewart is a Senior Engineer at FIELD Engineers and a forensic engineer specialising in crane and lifting system safety. Her work spans incident investigation, design verification, regulatory engagement and technical analysis following serious crane and lifting failures across construction, mining and heavy industry. Drawing on detailed forensic examinations of failed components, log data, load paths, operating conditions and human factors, Charlotte focuses on the mechanisms of failure in real-world operations, and how they can be prevented. Her work bridges engineering theory and site reality and she regularly contributes to safety reviews and engineering assurance processes aimed at improving crane safety outcomes across high-risk environments.

Cranes perform vital work across mine sites, supporting lifts for routine maintenance activities, new constructions and shutdowns. Despite this widespread use, cranes remain a specialised area of inspection and engineering practice. As a result, site supervisors and other personnel may find themselves responsible for supervising crane operations, signing off on lift plans or dealing with equipment compliance without the necessary technical background. In addition, mining environments such as shutdowns add specific risks that may be poorly understood by non-specialists. Patterns of incidents have received relatively little attention in the literature compared to those in the construction industry. These knowledge gaps can contribute to serious incidents, including fatalities.

This paper draws on the collective experience of senior and principal engineers across three decades of lifting studies, crane safety inspections and forensic incident investigations to highlight key learnings for crane non-specialists. Incident data from the literature is briefly reviewed for context, before focussing on three practical safety issue patterns illustrated with relevant case study examples:

- unmanaged risks in lifting – failing to recognise a “complex lift”
- misunderstanding crane capacity – failing to identify planning errors
- overestimating the capabilities of crane safety systems.

Through this exploration, the paper highlights practical red flags and the underlying risks they signal, equipping non-specialist leaders and workers to ask important questions about crane operations for safer outcomes.

49 (Safety Innovation Award submission)

Remote tyre deflation system for hot or overpressure tyres

Mr Steven Amor[1]
[1]Zen Meerkat, North Lakes, Australia, [2]Disruptive Mining Technologies, Brisbane, Australia

Biography:

Mining & Project Engineer with 25+ years experience across many mining operations, engineering projects and software / tech startups throughout Australia, UK, South Africa, Canada, USA and China. Passionate about helping people introduce disruptive technologies that will do good and breaking down the barriers of entry into the glacial-speed of the mining Corporate World!

Currently busy assisting local startup Dengus Group to commercialise their Remote Tyre Deflator technology.

The problem:

For decades, heavy mining equipment (HME) tyres on haul trucks, loaders and water carts have posed a significant risk when they become overheated or over-pressurised. Standard practice requires parking the machine, establishing an exclusion zone (often up to 300 metres), and waiting up to 48 hours for the tyre to cool before a tyre fitter can safely enter the zone to manually deflate it. In extreme cases, tyres have been deflated by shooting them with a rifle – and the end result is the tyre fitter still has to enter the exclusion zone and position themselves directly in the line of fire to manually deflate the tyre anyway.

This process exposes tyre fitters and other personnel to the risk of catastrophic tyre explosions or air-blasts, which have caused fatal and serious injuries in Australian mining operations. Recent Resources Safety and Health Queensland (RSHQ) safety alerts have highlighted tyre explosions following lightning strikes, with fragments projected significant distances. Historical incidents, including fatalities at Queensland coal mines, underscore the ongoing danger. Beyond the human cost, these events cause major operational downtime, with single incidents reportedly costing millions in lost production.

As a truck driver, loader and shovel operator for 30 years James witnessed first-hand the problem, and set about finding a solution.

The solution:

The Dengus Remote Tyre Deflation System is a world-first remote-controlled solution that allows operators to safely and rapidly deflate one or all tyres on HME from a safe distance, eliminating the need for personnel to enter the exclusion zone while the tyre remains pressurised.

Internal/external resources used in the process:

The inventor, James, left his 30-year mining career at age 45 to develop the system as a one-person startup. All initial design, prototyping and early testing occurred in his double garage workshop in New South Wales, with no external funding, sponsorship or mine-site access for testing. He collaborated with a Brisbane-based electronics engineer and a mechanical engineer for manufacturing and certification support.

Methods used in trialling and testing:

Development began in May 2019 with a simple idea to connect a remote receiver to the existing tyre valve stem. Multiple iterations were tested in the garage using basic electronic components, a compressor, and rudimentary methods such as duct-taping prototypes to the family car wheels for durability trials, waterproof testing in the dog's water bowl, and initial activation of a haul truck tyre using two wires and a 9-volt battery. Distance testing, environmental resilience and functionality were refined through months of trial and error.

The early prototypes evolved to incorporate superior long-range wireless technology, lithium batteries and hand-held controllers. Field validation on operating mine sites tested compatibility with super-large-bore valves, tyre chains, liquid tyre additives, air/nitrogen fills, and major tyre pressure monitoring systems. Full-system testing confirmed rapid response times, deflation rates comparable to manual methods, reliable operation, and no interference with site Wi-Fi or autonomous haulage fleets.

Implementation process – where/how on site: Implementation began when Roy Hill iron ore mine in Western Australia's Pilbara region called with a hot tyre issue. James travelled to site and conducted his first real field trials. Roy Hill became the first customer and continues to use the system across its loader fleet.
Adoption accelerated after a second trial at a Western Australian gold mine. A Caterpillar 994 loader with tyre chains suffered a severe overpressure event while positioned in front of the primary feed point. The resulting 48-hour exclusion zone also blocked the secondary feeder, shutting down the entire plant and incurring an internally reported $3.2 million AUD lost opportunity cost. This incident highlighted the dual safety and production benefits, accelerating site approval for trials.
From these initial deployments, the system has expanded across other Western Australian mines and internationally to surface mines in South America (Peru, Chile, Brazil), the United States and Canada. On-site installation takes approximately two hours per machine using existing tyre valve points. The system has been successfully deployed on Caterpillar 785- and 994-class haul trucks, loaders and water carts.

Demonstrate how the hierarchy of control has been applied:
The Dengus system applies the hierarchy of control at the highest level — elimination. It completely removes the need for personnel to enter the tyre-pressure exclusion zone until the hazard (over-pressurisation) has been safely neutralised. This is a true engineering control that eliminates exposure rather than relying on administrative controls (exclusion zones and waiting periods) or personal protective equipment.

Benefits/Effects:
The primary safety benefit is the elimination of human exposure to the risk of tyre explosions or air-blasts during hot tyre or overpressure events, tyre fires, rocks lodged in dual assemblies, or lightning/powerline strikes. This directly addresses a known cause of fatal, serious injuries and near misses in the Australian mining industry.
Operationally, the system enables immediate pressure relief, significantly reducing downtime from up to 48 hours to a matter of minutes. In the documented gold mine incident, similar rapid deflation could have prevented, or at least substantially reduced, the $3.2 million loss. The system introduces no new risks — if the unit fails, the tyre valve hardware behaves exactly as before.
Deployment has grown from initial trials at Roy Hill to multiple sites across Western Australia and international operations. Queensland mines are now in early trial stages.

Transferability:
The innovation has strong potential for adoption, modification and transfer across the entire Australian and global resources industry, including minerals, coal, quarries, and other heavy mobile equipment applications. It is compatible with all common off-the-road (OTR) tyre hardware on haul trucks, loaders and water carts (Caterpillar 785/994 class and above). Installation is straightforward and non-invasive.
As a global issue with no previous safe, non-destructive solution, the system is already deployed or undergoing trials in Western Australia, South America, the United States and Canada. Wider transfer can be achieved through standard procurement channels, with minimal site-specific modification required.

Innovation:
The Dengus Remote Tyre Deflation System is the world's first true remote, controlled and reversible tyre deflation solution for large mining tyres. Its originality lies in the integration of proven long-range wireless technology with a purpose-engineered, battery-powered valve actuator. The design maintains the full original bore deflation rate while enabling individual or simultaneous activation of multiple tyres from up to 500 metres away.
No other commercially available product allows safe, non-destructive deflation without personnel entering the exclusion zone or causing permanent tyre or rim damage. Destructive alternatives such as shooting tyres or crude robotic piercing systems are one-use and introduce additional hazards. Makeshift cage solutions still require personnel to approach the hazard.
Developed in Australia from personal mining operational experience; the system's core simplicity - a remote-controlled deflation valve with one moving part and a hose - is its greatest strength. It introduces no new risks and delivers both safety elimination and substantial productivity gains. It is fully compatible with existing tyre hardware, monitoring systems and autonomous fleets. The question remains: why had no one developed this before?

Approximate cost:
Approximate cost is $8,500–$10,000 AUD per machine (depending on configuration and optional rock guards).