IDEATE 2026

Lesley McGilp, Executive Director
Clyde Deletsu, Innovation Coordinator

Date: May 14, 2026
Time: 8:30 am – 4:00 pm
Location: Boffins - Innovation Saskatchewan's Innovation and Technology Research Park

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Land Acknowledgement:

We acknowledge that the land on which we gather is Treaty six territory and the homeland of the Metis people.

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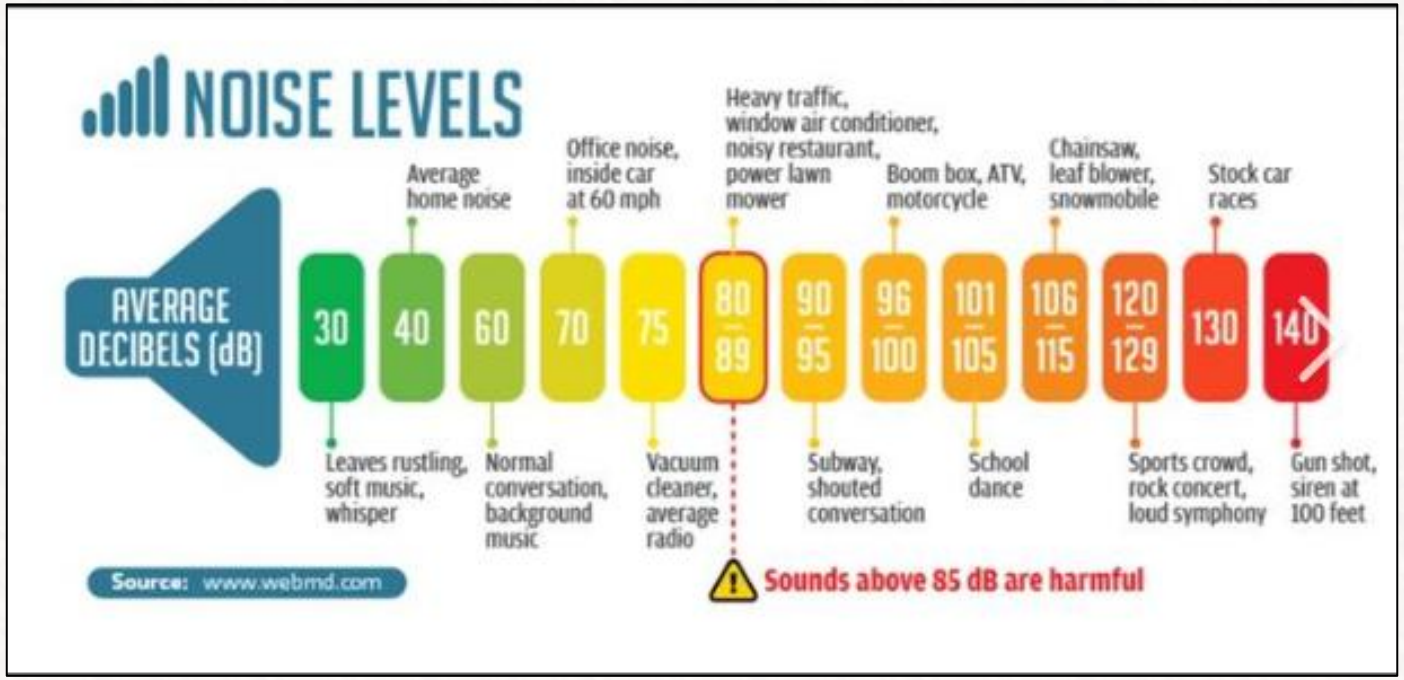
Safety Moment: Noise and Hearing Loss

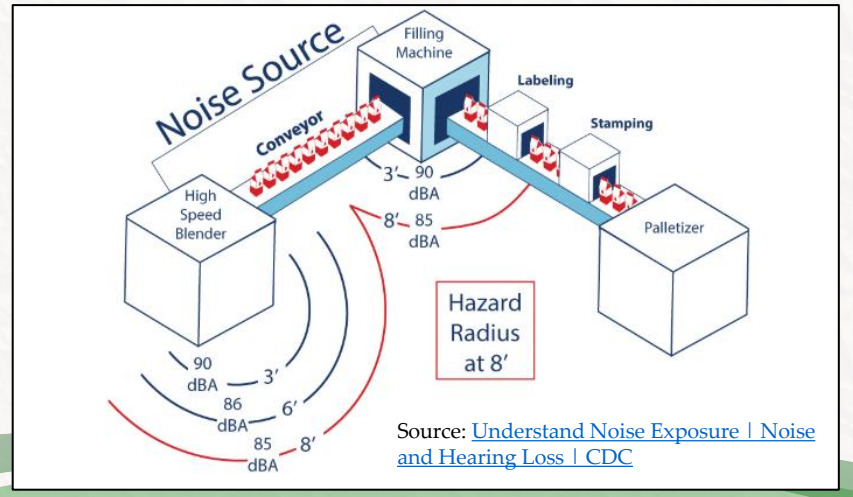
Cause: Prolonged Exposure above 85 decibels:
ex. Noisy Restaurant, Heavy Traffic.



- **Signs:** Frequently Delayed
- **Long-term Impacts:**
  - Reduced situational awareness
  - Permanent Loss, Comms Challenges
  - Reduced QoL, Social withdrawal
  - Increased Dementia Risk
- **Mitigation Strategies:**
  - Noise monitoring and mapping
  - Hearing Protection

Metal Grinding: 95-110 dB

Coffee Grinder (blade type): 88-95 dB



Upcoming IMII Events and Activities:

IMII AGM and Workforce Development Workshop – May 21, 2026, Saskatoon, Boffins

IDEATE 2026 Agenda

8:30 – 9:00 am	**Registration**
9:00 – 9:15 am	Opening Remarks
9:15 – 9:30 am	Format for IDEATE workshop
9:30 – 10:30 am – Workshop #1	
Advanced Materials & Advanced Manufacturing Part 1	Water Use & Tailings
10:30 – 10:45 am	Refreshment Break
10:45 – 11:45 am – Workshop #2	
Advanced Materials & Advanced Manufacturing Part 2	Ground Control
11:45 am – 1:00 pm	Lunch, Guest Speaker & Networking
1:00 – 2:15 pm – Workshop #3	
MSI, Repetitive Strain & Human Factors	Process Sensors & Data
2:15 – 2:30 pm	Refreshment Break
2:30 – 3:30 pm – Workshop #4	Next Generation Mining and Mineral Processing
3:45 – 4:00 pm	Expression of Interest (EOI) Process Overview & Closing Remarks
4:00 PM	Networking

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IMII Mission: IMII is a member-based consortium that brings together industry, post-secondary education, government and solution providers to collaboratively pursue innovation, workforce development and thought leadership to sustain and strengthen the Saskatchewan Minerals Sector.

Vision: **To be a valued leader in building collaborative innovation and workforce development capacity that drives the growth and advancement of Saskatchewan's minerals sector.**

Values:

Collaboration: We are a unique network that accomplishes more by working together.

Trust: The network shares non-competitive information openly for the collective success of the minerals industry ecosystem.

Impact: We invest to generate positive outcomes for industry and society.

Sustainability: We acknowledge that all things are connected, and our decisions support a more sustainable world.

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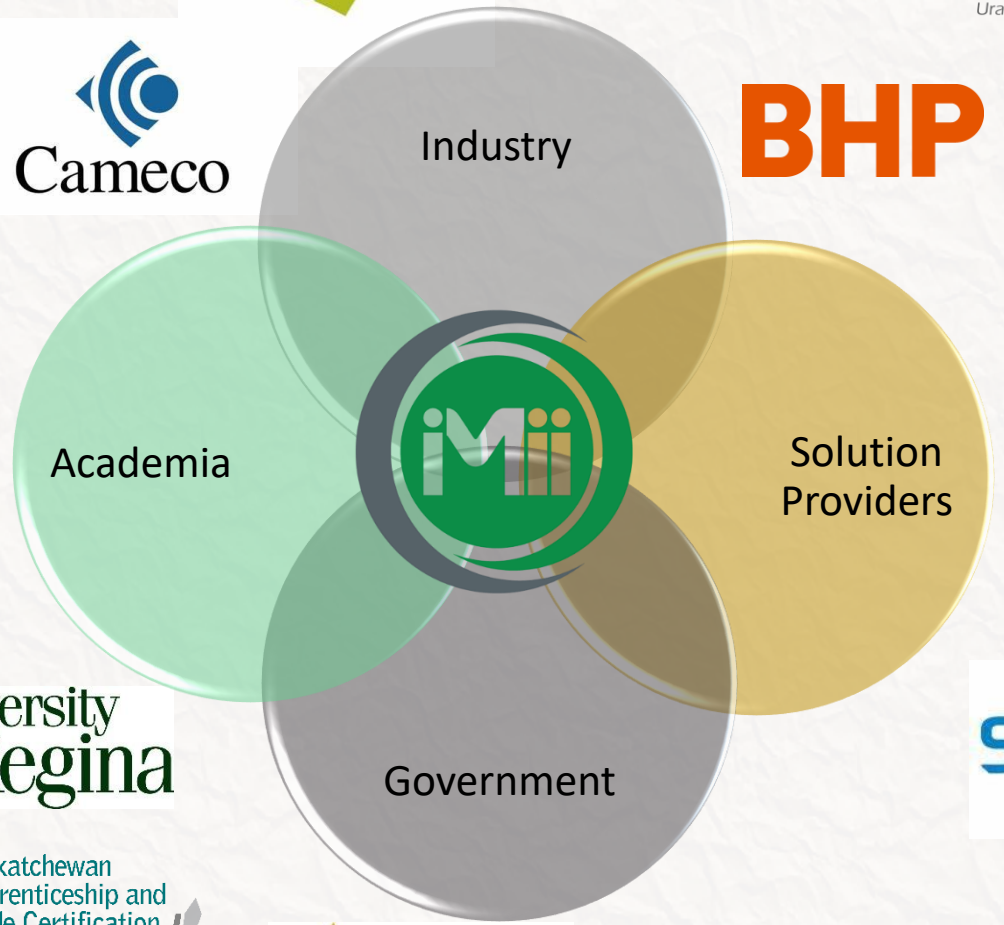
Strategic Imperative: All IMII members receive and perceive value from their IMII Membership.

IMII:

- Facilitate intersections to drive innovation.
- We belong where collaboration matters
- Draw and deliver value for all collaborators.

2026 Members



IMII's strategic plan focuses on achieving meaningful value across 3 pillars that represent our core organization purpose:

Innovation

- Support technology development

People

- Strengthen workforce capacity, diversity and skills.

Knowledge

- Thought leadership and strategic insights to facilitate industry analysis and future thinking.

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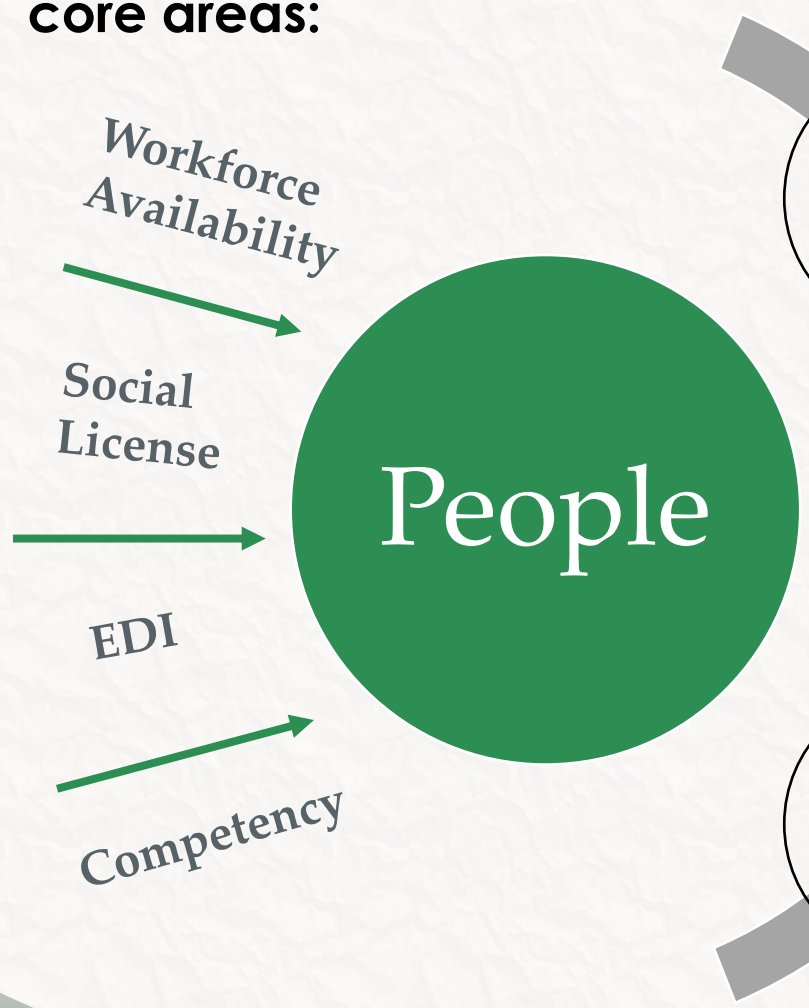
IMII People Strategy

Develop projects to strengthen workforce capacity, diversity and skills across 3 core areas:



Trades

- Formation of Trades Advisory Committee
- Trades-focused Workforce & Training
- Trades related Innovation projects

Pathways to Mining

- Distributed training models
- STEM Education
- EDI, Indigenous Learners

Mining & Innovation Skills

- Student Engagement
- Professional Development
- Building Capacity and Expertise

IMII Student Engagement Activities

- **Mining Hackathon**

- **Scholarships**
  2025 Winners:

- IMII Rockstar Scholarships
- Al Shpyth Scholarship in Environmental Excellence
- Applications due: June 30, 2026

- Graduate Student Research Projects
  - IMII-funded Research projects provide graduate student research opportunities, recent blog series:

Dr. Arthur Situm

From Corrosion Research to Nuclear Innovation: How IMII Funding Sparked a Career in Applied Science

From Student to Research Leader: How IMII Helped Shape a Career in Rock Mechanics and Strengthen Safety Across Saskatchewan Mines

From Campus Lab to Synchrotron Science: How IMII Helped Launch a Career in Corrosion and Potash Research

AI4SafeMines

Student Competition

Compete to develop a tool using AI to impact safety.

- **EOIs due Feb. 26, 2026**

- **Prelim Pitches Mar. 31, 2026**
  - **Pitch Coaching from Dr. Sean Wise with** KPMG
  - **10 Teams, 6 Schools, Strong diversity**
    - **3 teams from U of R**
  - **Multi-disciplinary teams**

- **Finalists: Advance to Final Pitch at ISSA Mine Safety Conference**
  - **Mentor supported development**
  - **Seed Funding**
  - **Pitch on Sept. 24th, 2026 - Scholarship Prize**

Mine Safety Themes:

- Environmental Hazard Awareness
- Human Health and Well-being
- Equipment and safety
- Training and Performance

WHY IT MATTERS

- Transforms students from learners to innovators
- Accelerates AI adoption in mining safety
- Builds a future-ready talent pipeline for industry
- Creates solutions with real-world impact

More Info:
https://www.imii.ca/ai4safemines/

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issa | INTERNATIONAL SOCIAL SECURITY ASSOCIATION
Section on Prevention in the Mining Industry

Fondation canadienne pour la recherche en chiropratique | Canadian Chiropractic Research Foundation

IMII School of Mining 2026

An Immersive Introduction to Mining

June 23–25, 2026 | The Willows, Saskatoon, SK

WHO IT'S FOR

- Early-career professionals (up to 5 years of experience)
- Engineers, technologists, and students
- Individuals transitioning into mining
- IMII member organizations and industry partners

WHAT PARTICIPANTS GAIN

- End-to-end mining understanding (geology → mining → processing → business)
- Exposure to potash, uranium & critical minerals
- Insights into safety, ESG, and regulations
- Direct access to industry experts & peer network

WHY IT MATTERS

- Strengthens IMII's talent pipeline
- Bridges academic knowledge and industry practice
- Builds industry-ready professionals—faster

COURSE CONTENT

- Saskatchewan geology fundamentals
- Underground mining & in situ techniques
- Potash, uranium & emerging processing
- Infrastructure & remote operations
- Environment, closure & footprint
- Regulatory frameworks, permitting & safety
- Innovation & emerging technologies
- The business of mining

PROGRAM HIGHLIGHTS

- Comprehensive curriculum spanning geology, mining methods, processing, infrastructure, business & more
- Delivered by industry professionals from IMII member companies, academic experts & specialists
- Networking reception + peer cohort experience
- CPD certificate of completion (3 days of continuing professional development)

TO REGISTER

Visit the link or scan the QR code:

IMII School of Mining Registration

REGISTRATION DEADLINE

May 31, 2026

Contact Admin@imii.ca to arrange alternate payment method

REGISTRATION FEE

IMII Members: $1,000 CAD + taxes

Non-Members: $2,750 CAD + taxes

IMII Knowledge Strategy

Thought Leadership and Strategic Insights to facilitate industry analysis and future thinking

Knowledge

Engage senior leaders in IMII activities to guide identification of key interest areas.

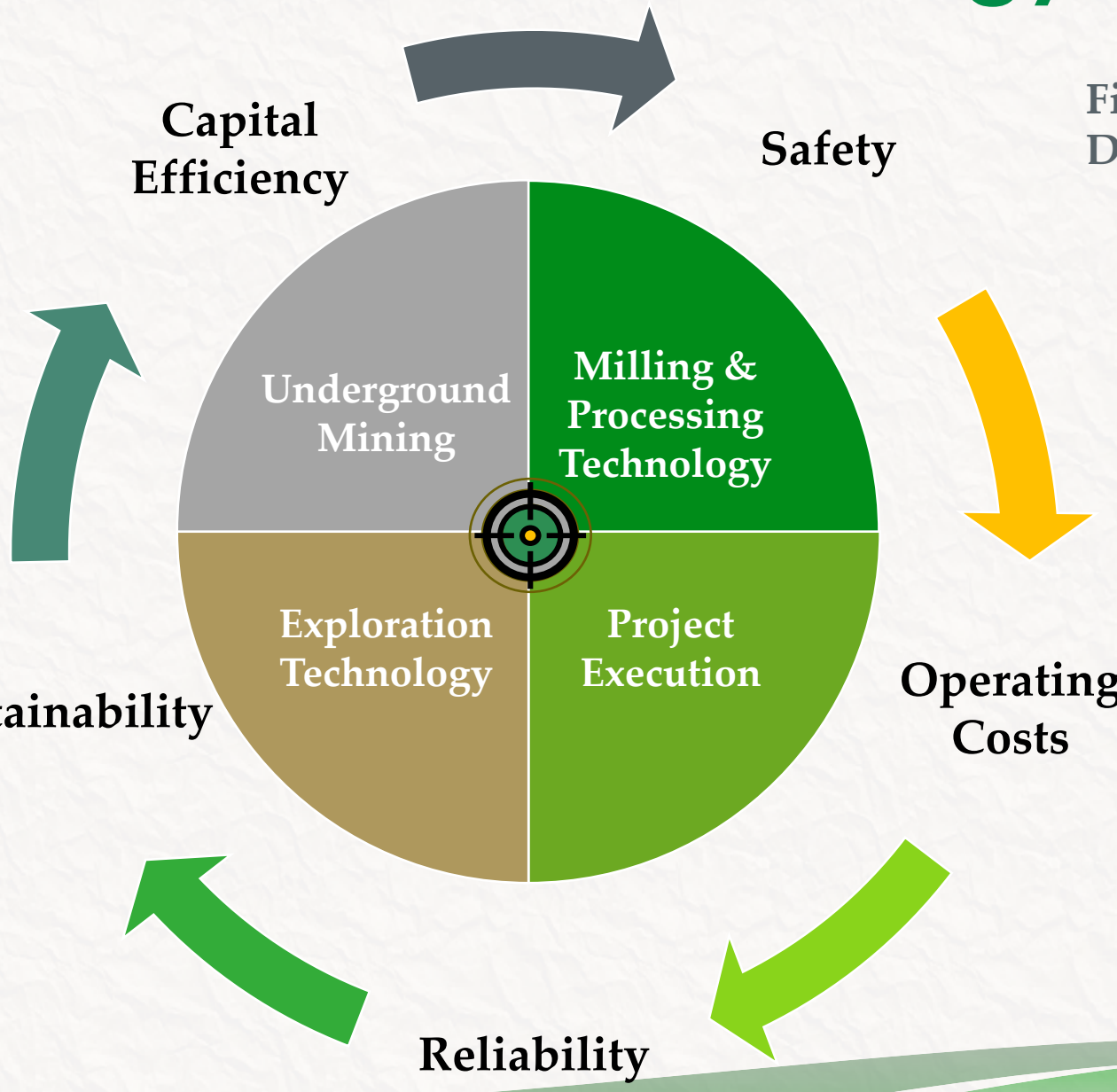
Execute studies, publish and present outcomes on identified topics.

Generate discussion that elevates knowledge and understanding of key issues.

IMII Innovation Strategy

Four Innovation Focus Areas

Five Innovation Drivers



Advancing Ideas toward Development and Demonstration.

Driving growth for the Saskatchewan minerals sector.

Working with the IMII Target

Fundamentals Skills, Ideas
Innovative Concepts
Innovative Inventions
Demonstrations, Core Skills, Core Goals

Bullseye: Core goals that are strategically meaningful

IMII Collaborative Innovation Projects: Drive toward core goal, focus on the Grey & Green zones.

Leveraging the Tool Box:

Innovation Tool Box:

- Automation/AI/Digital Tech
- Sensors
- Machines
- Bio-Tech
- Process Chemistry
- Foundational or Strategic Knowledge

Innovation Strategic Priorities:

IDEATE 2026 submissions should align with these priorities.

Safety

- Eliminate serious injuries from human-equipment interactions
- Mitigate/eliminate human-environment interaction hazards
- Reduce Repetitive/Routine Task Injuries
- Mitigate human factor risks

Reliability

- Reduce maintenance downtime
- Explore advanced materials to enhance equipment reliability.
- Enhance predictive maintenance
- Improve sustainable production and operations

Sustainability

- Impactful energy use reduction
- Reduce water use or enhance water reuse
- Tailings Deposition & dewatering

Efficiency

- Data integration and intelligent workflow optimization
- Enhance process measurement & analytics
- Optimize modular & remote construction
- Deliver next generation step-change improvements

Innovation Strategic Priorities: Safety

1. **Eliminate serious injuries from human-equipment interactions**
   - Reduce human exposure to hazards during maintenance
   - Predictive or inspection tools to anticipate equipment failures
   - Lock out/tag out enhancements

2. **Mitigate/eliminate human-environment interaction hazards**
   - Proactive hazard management "tech on your shoulder"

3. **Reduce Repetitive/Routine Task Injuries**
   - Reduce human exposure to accumulative hazards (vibration, noise, heavy lifting)
   - Eliminate poor ergonomics in repetitive tasks (ex. awkward positioning)

4. **Mitigate human factor risks**
   - "Tech on your shoulder" to enhance situational awareness, fit for duty awareness
   - Training technology (ex. VR)

Opportunities to reduce 'dull, dirty or dangerous' activities.

Safety Priority Area Specific Items:

Underground

- Sensors to anticipate collisions
- Geologic hazard sensors
- Emergency alert systems: radiation, fire, excessive dust
- Dust collection & mitigation ‘smart chute’
- Stoper operation (vibration hazard)

Mill/ Processing

- Load-out (rail car loading)
- Sensing technologies for reducing collisions
- Equipment inspection/health monitoring tools.

Exploration

- Remote Emergency Response (connectivity)

Project Execution

- Contractor Training & management
- Situational awareness during construction/maintenance

Innovation Strategic Priorities: Sustainability

1. **Impactful energy use reduction**
   - Potash drying retro-fit
   - Energy storage technologies
   - Northern mines: Off-grid Energy efficiency
2. **Reduce water use or enhance water reuse**
   - Technologies to reduce water use
   - Tech to improve circularity of water use:
     - Desalination
     - Contaminant removal
3. **Tailings Deposition & dewatering**
   - Increased density of tailings output
   - Supernatant treatment after dewatering (ex. sulphate)

Innovation Strategic Priorities: Reliability

1. **Reduce maintenance downtime**
   - Dust Reduction
   - Innovations to allow maintenance w/o shut-down
   - Efficient downtime:
     - Enhanced lock-out/tag-out methods
     - Effective planning tools: Easily accessible updated drawings

2. **Enhance Equipment Integrity**
   - Improved hoisting reliability, belt and miner equipment reliability
   - Advanced materials & manufacturing methods to enhance equipment integrity
   - New (novel) measurement methods for health monitoring of mechanical components
     - Looking for novel concepts only.

3. **Enhance Sustainable Production and Operations**
   - Predictive process control
   - Advanced process analytics and measurement
     - New measurement tools: online moisture to dryers, radiation monitoring equipment

Innovation Strategic Priorities: Efficiency

1. **Data integration and intelligent workflow optimization**
   - Improved data integrity, data integration and decision-making
   - Automated and intelligent reporting, planning and logistics
   - Worker-friendly and field-enabled reporting, training and task prioritization

2. **Enhance process measurement & analytics**
   - Enable faster visibility into key process variables such as mineral composition and particle size
   - Reduce process variability through integration of advanced process control systems
   - Faster troubleshooting and response to process upsets

3. **Optimize modular & remote construction**
   - Improve modular projects to enhance installation/constructability
   - Improved construction management & progress reporting
   - Enhance logistics for remote and seasonal access construction

4. **Deliver next generation step-change improvements**
   - Reimagined processing technologies that enable step change improvements in efficiency
   - Physical-chemical processing approaches that improve liberation, separation efficiency or reagent utilization
   - Improve overall system reliability through simpler, more robust process designs

2026 IDEATE Research Needs – May 14, 2026

Safety Topics
- Human Factors, Fatigue, and Cognitive Safety Technologies for the Mining Sector
- Eliminating or Redesigning Repetitive, Routine & High Strain Tasks in Mining
- Advancing Ground Control Through Forward Visibility in Potash Mining

Sustainability Topics
- Water use and reuse technologies
- Understanding and Mitigating Potash Fines/Slimes Migration in Tailings Facilities

Efficiency Topic
- Processing Sensors and Advanced Data Analytics for Mining Applications

Over-arching Mining Topic
- Next Generation Mining and Mineral Processing Technologies for Step Change Efficiency Gains

Reliability Topics
- Wear-Resistant & Corrosion-Resistant Materials for Harsh Mining Environments
- Advanced Functional Coatings and Surface-Engineered Systems for Predictive Reliability in Mining Equipment

IDEATE 2026
Research Needs

IDEATE 2026 Overview:

Application Requirements

- Length: 4-5 pages
- Contact information
- Research Category
  - Research Need
  - (Focus areas and Drivers)
- Preliminary Budget
- Project Details
  - Project Team/Collaborators
  - Project concept & Methodology
  - Statement of Need

IDEATE 2026

IDEATE 2026 Overview: Timeline

Activity	Date
IDEATE 2026 Event	**14-May**
Applications Open	14-May
Applications Close	**22-June**
Pre-meetings before proposal development for selected EOIs	10-Aug to 4-September
Proposals due	**2-October**
Response to Academics	16-November
Start of new projects	January 1, 2027

P2INACLE Sprints

Advanced Manufacturing and Advanced Materials Innovation Sprint - Sponsored by P2INACLE and IMII

Purpose of the Innovation Sprint

Led by Red Deer Polytechnic & Red River College, partnering with Saskatchewan Polytechnic

It explores how advanced manufacturing techniques—such as cold spray, additive manufacturing, near-net-shape processes, and advanced welding—could be applied in the mining sector to improve efficiency, quality, and creating complex geometry components. It also examines advanced materials suited for the harsh, corrosive, and erosive conditions common in mining.

Project Team & Roles

- Tonya Wolfe – Advanced manufacturing processes & integration.
- Kyle Nicholson – Advanced materials & coatings.
- Debjyoti Sen – Computer vision & adjacent-sector technology review.
- Moein Imani Foumani & Baltej Singh Rupal – Digital technologies in mining

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P2INACLE Prairie Polytechnics Supporting Industry

P2INACLE Sprints

Advanced Manufacturing and Advanced Materials Innovation Sprint - Sponsored by P2INACLE and IMII

Cross-Cutting Themes: The mining sector's challenge is not a lack of technology but the need for ruggedized, validated solutions. The focus should be on applied trials, shared metrics, and integration strategies that de-risk adoption. Emphasis should be placed on "making it last" (durable materials), "seeing it early" (automated inspection), and "fixing it fast" (advanced repair), all underpinned by digital tools and reliability engineering.

Focus Areas

Coatings and Overlays: Advanced materials such as nanocomposites, high-entropy alloys, and laser-clad overlays. However, these technologies require mining specific validation and careful integration into existing maintenance workflows

QA/QC inspection of parts prior to installation: Drone based imaging, 3D laser scanning. Challenge lies in automating data interpretation and integrating inspection outputs into decision making processes.

Online Wear Detection: Sensor-based monitoring systems (e.g., fiber optics, acoustic and ultrasonic sensors, sacrificial wire sensors), However, sensor reliability in harsh environments and integration into operational workflows remain key barriers to adoption.

Repair Technologies: Techniques such as directed energy deposition (DED), laser cladding, cold spray, and robotic welding can restore high-value components and reduce downtime

P2INACLE
Prairie Polytechnics Supporting Industry

P2INACLE Sprints

Water Use and Reuse Technology Innovation Sprint - Sponsored by P2INACLE and IMII

Purpose of the Innovation Sprint

Led by Northern Alberta Institute of Technology, partnering with Saskatchewan Polytechnic

It evaluates water treatment and reuse technologies relevant to the potash and uranium sectors. Key areas of interest include desalination and chloride removal for potash and uranium mine water

Project Team

- Muhammad Burhan, Ph.D., P.Eng.
- Jordan Kolb, M.Sc.
- Quamrul Huda, Ph.D., P.Eng.

P2INACLE Sprints

Water Use and Reuse Technology Innovation Sprint - Sponsored by P2INACLE and IMII

The technological scan of desalination systems began with membrane-based technologies, which require electricity as an energy input for their operation. Reverse osmosis (RO), nanofiltration (NF), and membrane distillation (MD) were evaluated.

Due to the high salinity of the discharge stream (270,000-315,000 PPM), conventional desalination technologies were not deemed suitable for this application.

Found Crystallization more suitable for potash brine desalination and coupling crystallization with current RO systems used in Uranium.

Table 3: Comparison and Suitability of Discussed Desalination Methods

Technology	Energy Source	Waste Heat Recovery	Salinity limit, ppm	Application	Suitability for Potash Industry	Suitability for Uranium Industry
RO	Electric	No	45,000	Water Reuse	✗ High Salinity	☑ Already in use
NF	Electric	No	5,000 to 10,000	Pre-treatment	✗ High Salinity	⚠ No Application
MD	Electric/ Thermal	Yes	340,000 (Theoretically)	Water Reuse	✗ High Salinity	⚠ Low TRL
EDI	Electric	No	3000 (Commercial)	Ions Removal	✗ High Salinity	⚠ Specific Heavy Metal
CDI	Electric	No	10,000	Ions Removal	✗ High Salinity	⚠ Specific Heavy Metal
MSF	Thermal	Yes	70,000 (Operational)	Water Reuse	✗ High Salinity	✗ No Heat Recovery
MED	Thermal	Yes	70,000 (Operational)	Water Reuse	✗ High Salinity	✗ No Heat Recovery
Brine Concentrator, MVC, TVC	Electric/ Thermal	Yes (TVC only)	250,000	Water Reuse, Volume Reduction	✗ High Salinity	☑ Water Reuse, Volume Reduction
Crystallizer MVC, TVC	Electric/ Thermal	Yes (TVC only)	300,000 to 350,000	ZLD, Solid Disposal	☑ ZLD, 99% water recovery, Solid Reuse	☑ ZLD, 99% water recovery, Solid Reuse
Dual Stage Crystallizer	Electric/ Thermal	Yes	300,000 to 350,000	ZLD, Salt Recovery	☑, ZLD, Water Recovery, Direct Potash Recovery	⚠ For Solubility Specific Salt Recovery

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P2INACLE Sprints

Industrial Safety and the Trades Innovation Sprint - Sponsored by P2INACLE and IMII

Purpose of the Innovation Sprint

Led by Northwestern Polytechnic, partnering with Saskatchewan Polytechnic
Analyzes serious incident and injury trends across mining, utilities, and oil & gas. It also investigates innovative safety solutions used outside the mining sector and/or Saskatchewan and assesses their potential application within Saskatchewan's mining industry to mitigate comparable incidents within Saskatchewan.

Project Team

- Lorelle Warr - Principle Investigator
- Dr. Brye McMorran - Co-Investigator
- Emily MacDonald - Student Research Assistant

P2INACLE
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P2INACLE Sprints

Industrial Safety and the Trades Innovation Sprint - Sponsored by P2INACLE and IMII

Strong associations were observed between contact with objects and equipment and hand/finger injuries, and between bodily reaction and exertion events and trunk, upper extremity (excluding hand/finger) and lower extremity injuries.

Although industry standard occupational health and safety policies and procedures are in place, they have not been sufficient to reduce injuries related to equipment interaction and physical workload. The results highlight the importance of targeted, event specific interventions and support for a shift towards a bottom-up safety innovation approach that incorporates worker input and task level realities.

Exoskeletons for augmenting body strength, endurance and body mobility

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P2INACLE Sprints

Impactful Innovations Scan for Underground Mining: Sensing, Automation, and AI-Driven Technologies

Purpose of the Innovation Sprint

Led by Northern Alberta Institute of Technology (NAIT), partnering with Saskatchewan Polytechnic

This initiative identifies the most impactful industrial innovations from the last five years across global mining and major industrial sectors. It evaluates their potential applicability to Saskatchewan mining. Focus areas include digital tools, sensing technologies, water and process solutions, tailings innovation, and advanced durable materials.

Project Team

- Lei Yang, PhD - Principle Investigator
- Yong Hyun Kim- Co-Investigator
- Emily MacDonald - Student Research Assistant

P2INACLE
Prairie Polytechnics Supporting Industry

P2INACLE Sprints

Impactful Innovations Scan for Underground Mining: Sensing, Automation, and AI-Driven Technologies

The scan evaluated five advanced sensing, automation, and AI- driven technology platforms with transformative potential for the mining industry, namely:

LiDAR + SLAM Spatiotemporal Convergence Monitoring
Ultra-Wideband (UWB) Personnel and Asset Tracking
Bio-Sentry Predictive Wearable Biometrics
Edge Anomaly Detection in Underground Mining
Real-Time Hazard Detection

Autonomous robot-mounted Hovermap – navigating a hazardous potash mine drift, hands-free

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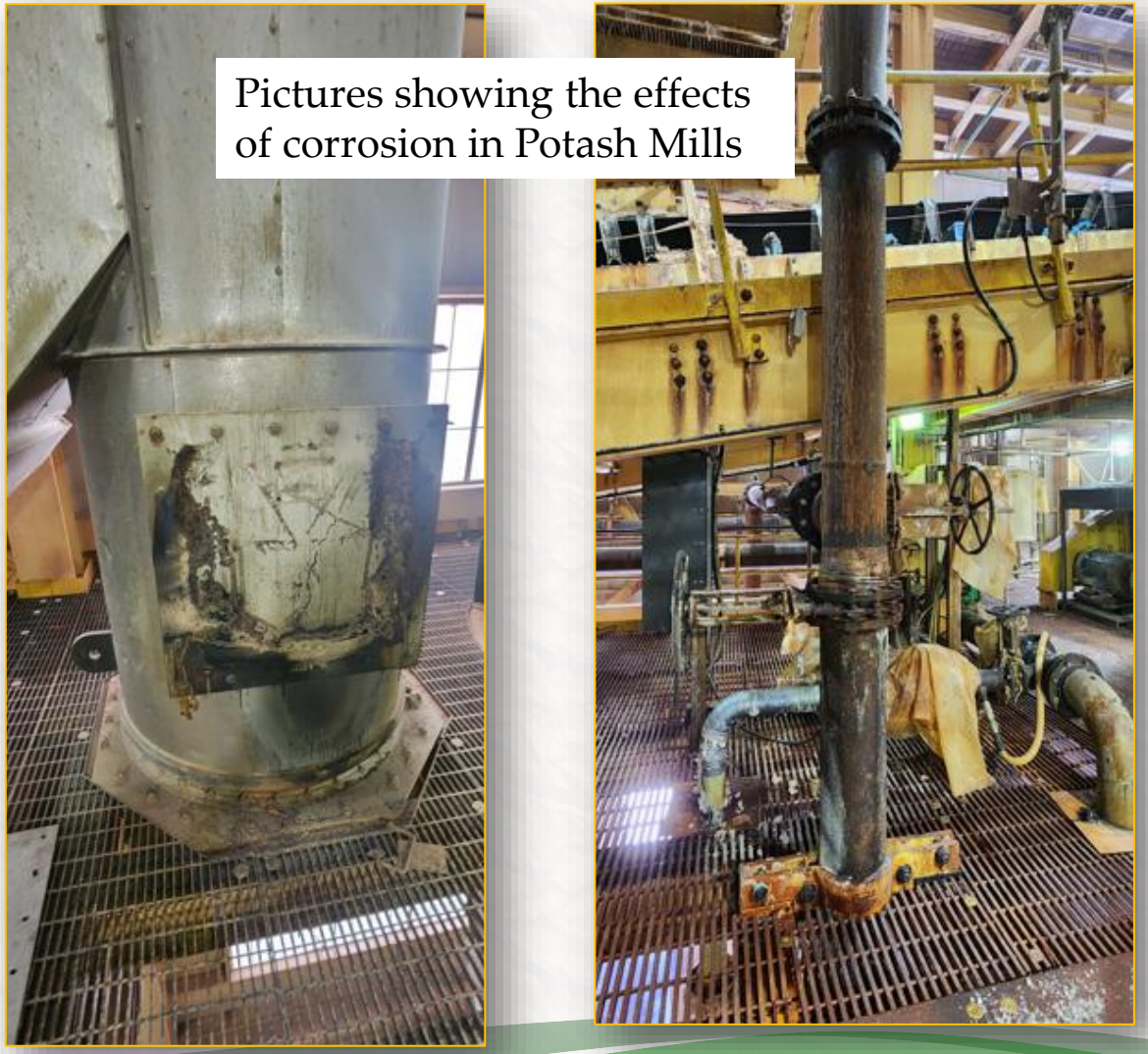
Reliability Challenges - Examples

Corrosion Challenges

- Corrosion in the potash industry is a significant challenge due to the corrosive nature of the material itself
- What advanced materials and manufacturing processes can be explored to mitigate these issues?
- What advanced materials can be used to easily perform temporary patches to extend life of failed pipes and ducts in the field – allowing time to plan for proper replacement



Pictures showing the effects of corrosion in Potash Mills

IDEATE Workshop #1

Wear-Resistant & Corrosion-Resistant Materials for Harsh Mining Environments

- Mining operations—particularly in potash, uranium, and other mineral sectors—expose equipment and infrastructure to **high abrasion, corrosive brines, scaling, erosion, and cyclic fatigue.**

- These conditions contribute to **premature equipment wear, unplanned downtime, costly maintenance, and elevated safety risks.** As mines become deeper, more remote, and more production intensive, the industry requires **next generation materials that can deliver longer service life and improved performance** under extreme conditions.

Picture showing pipe internal corrosion in a Potash Mill

IDEATE Workshop #1

Wear-Resistant & Corrosion-Resistant Materials for Harsh Mining Environments

- Advances in materials science and advanced manufacturing technologies are creating **new possibilities for highly durable alloys, ceramic reinforced composites and surface treatments** that could dramatically improve equipment longevity and reliability across the mining value chain

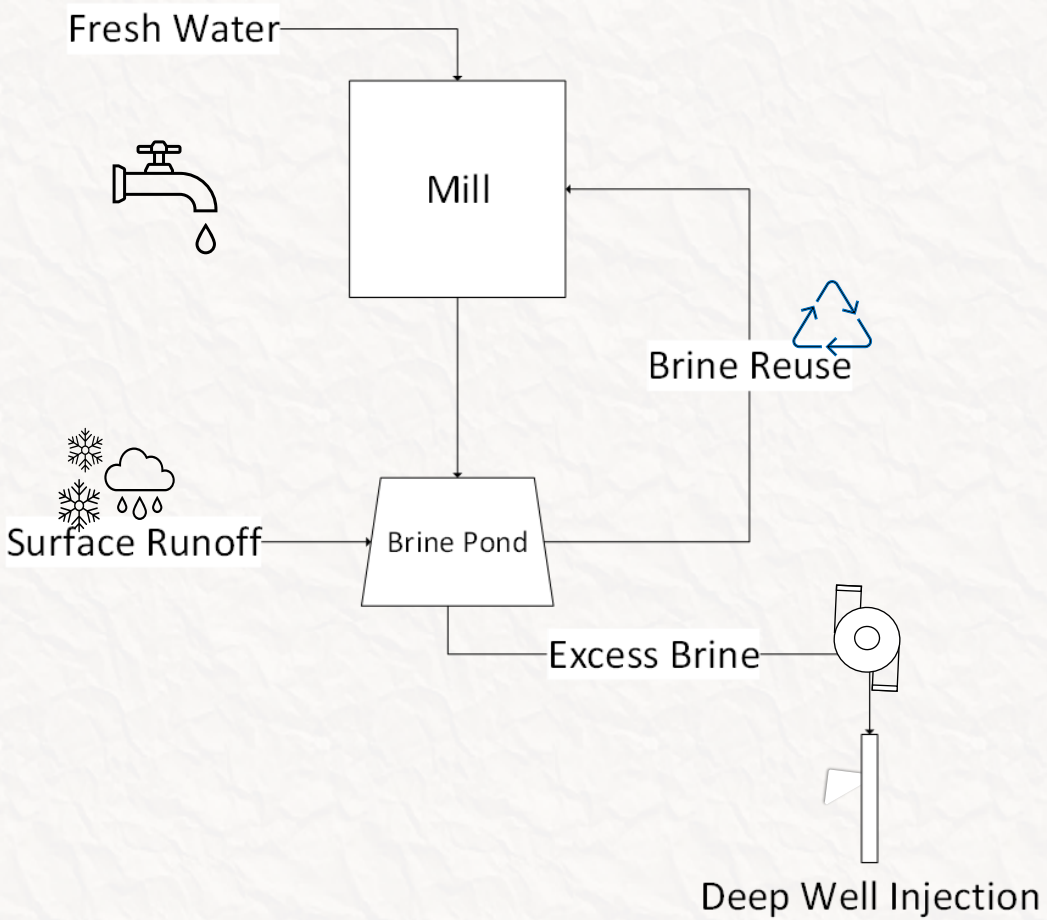
Picture showing pipe wear in a Potash Mill

IDEATE Workshop #1
Sustainability Challenges - Examples
Potash Water Challenges

Potash mines in SK follow a zero liquid-discharge policy.

- All excess water, from precipitation (rain & snow) collected on-site or additional fresh water pumped in, is deep-well injected to maintain relatively consistent brine containment levels.
- Result: Large volumes of co-saturated brine are injected.
- Economic brine desalination and KCl recovery represents a major environmental opportunity.

- Fresh water is used in the mill for: grade control (in flotation or crystallization), cleaning, and scrubbers.
  - Mitigating water use in any of these areas will also help decrease consumption.



IDEATE Workshop #1
Sustainability Challenges - Examples

Understanding and Mitigating Potash Fines/Slimes Migration in Tailings Facilities

- Potash tailings facilities are critical to safe and sustainable production in Saskatchewan
- Unexpected migration of potash fines and slimes observed within tailings piles
- Fine material deposited near the surface may refloat, remain suspended, or migrate downward, ultimately settling near the base

Potash Tailings Management area

Operational Impacts

- Reduction in effective brine storage capacity
- Changes to tailings consolidation behavior and stability
- Potential implications for long-term tailings facility performance

Need for Improved Understanding

- Limited understanding of the mechanisms driving fines movement
- Influencing factors may include:
  - Salinity and density gradients
  - Hydrodynamic and fluidization effects
  - Mineralogical and chemical interactions
  - Deposition methods and operating conditions

IDEATE Workshop #2

Advanced Functional Coatings and Surface-Engineered Systems for Predictive Reliability in Mining Equipment

- Mining equipment in potash, uranium, and related sectors operates under **combined mechanical, chemical, and thermal stressors** that **drive degradation at material surfaces** long before bulk material failure occurs.
- While advances in alloys and composites address intrinsic material performance, **surface engineered coatings** offer an underleveraged opportunity to both **extend component life and enable condition-based maintenance.**

Picture showing a worn pipe wrapped as an interim repair

IDEATE Workshop #2

Advanced Functional Coatings and Surface-Engineered Systems for Predictive Reliability in Mining Equipment

- **Next generation coatings**—such as multi-layer ceramics, nanostructured metallic coatings, amorphous alloys, and functionally graded surfaces—can be **tailored to simultaneously resist abrasion, corrosion, erosion, thermal cycling and fouling**.
- When combined with **embedded sensing or self reporting capabilities**, these coatings could also provide **early indicators of degradation**, enabling predictive maintenance and improved asset reliability.

IDEATE Workshop #2
Safety Challenges – Examples
Ground Control – Proactive Detection

- Lack of forward visibility:
  - Creates uncertainty in detecting geological anomalies, voids or stress conditions ahead of mining,
  - Increases risk of sudden roof failures, unplanned ground falls and associated safety hazards.

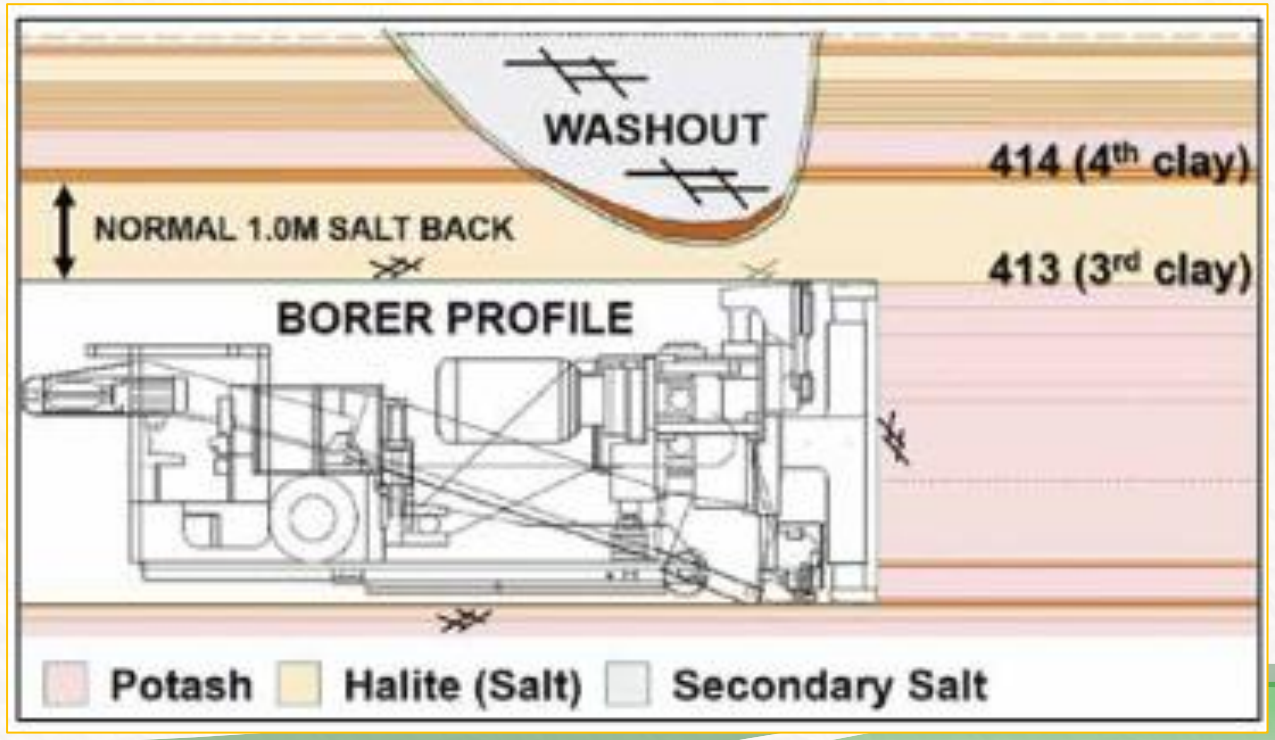


Illustration of potential fall-of-ground hazards in potash Mines (from PotashWorks 2026)

IDEATE Workshop #2
Safety Challenges – Examples
Ground Control – Proactive Detection

- Current ground control practices in potash mining rely on reactive measures such as sounding, scaling and established procedures, supplemented by ground penetrating radar (GPR) for limited subsurface imaging.
- Does not provide a direct or continuous way to "see" beyond the active cutting face.
- **Proactive solutions that enable real-time, reliable imaging or predictive modeling** beyond the mining face is essential to **improve hazard anticipation, enhance worker safety and optimize mine planning.**

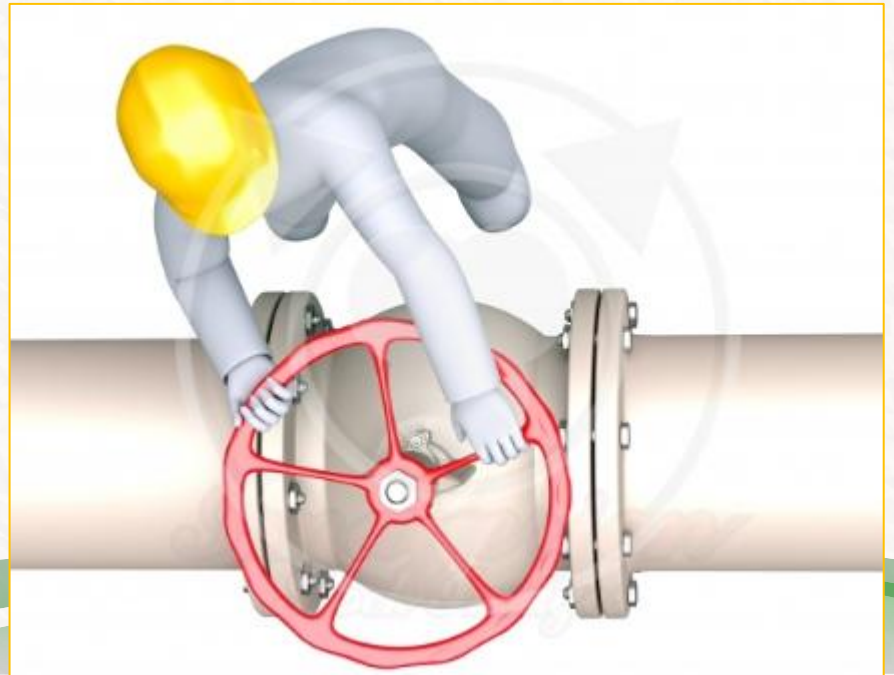
Current sounding techniques using scaling bar are unreliable and inconsistent from worker to worker

IDEATE Workshop #3
Safety Challenges – Examples

MSI, Repetitive Strain & Human Factors

- Innovations that mitigate **challenges with tasks in hard-to-reach areas.**
- Innovations to **avoid putting workers in Line of Fire** of an accidental energy release.

- Innovations to **reduce awkward and strenuous tasks**, such as operating large gate valves.



IDEATE Workshop #3
Safety Challenges – Examples

MSI, Repetitive Strain & Human Factors

Human Factors, Fatigue & Cognitive Safety Technologies in Mining

- Mining environments place high cognitive, physical, and psychological demands on workers
- Long shifts, repetitive tasks, and high-risk operations can degrade alertness, decision-making, and situational awareness
- Human factors and fatigue remain significant contributors to safety incidents and injuries

Need for Improved Understanding

- Limited visibility into how fatigue, cognitive load, and situational awareness evolve during mining operations
- Gaps in linking human performance data to safety events in real operating conditions
- Need to better understand interactions between workers, automation, and complex systems
- Improved insight required to support effective deployment, acceptance, and use of cognitive safety technologies

IDEATE Workshop #3
Process Sensors & Data

Current Challenges

- Mineral processing plants generate large volumes of data, yet many decisions rely on delayed or indirect measurements
- Harsh operating conditions—dust, vibration, high temperatures, corrosive reagents, radiation, and slurries, limit:
  - Sensor reliability and accuracy
  - Measurement resolution and response time

- **Critical variables remain difficult to measure robustly:**
  - Mineral grade and composition
  - Particle size distribution
  - Product moisture, density, mass flow, and weight
- Existing sensors often require frequent cleaning, recalibration, and maintenance before data can be trusted

Need for Improved Understanding

- Limited understanding of how sensor performance degrades under real plant conditions
- Which variables can be reliably inferred using soft sensors
- How advanced analytics integrate with existing control systems
- Trade-offs between measurement accuracy, robustness, and cost Lifecycle considerations are critical

IDEATE Workshop #4
Next Generation Mining and Mineral Processing

Current Challenges

- Surface and underground operations face growing pressure to:
  - Increase productivity
  - Reduce energy and water intensity
  - Lower operating costs while maintaining safety and reliability
- Core mining and processing steps (cutting, crushing, material handling, separation, dewatering):
  - Remain highly energy-intensive
  - Are often constrained by legacy, mechanically complex equipment
- Incremental optimization alone is insufficient to meet future performance expectations

Need for Improved Understanding

- Limited understanding of how novel technologies scale under real mining conditions
- Need to better quantify:
  - Energy savings versus operational complexity
  - Impacts on downstream processing and recovery
  - Reliability and maintainability over full lifecycle
- Gaps in understanding trade-offs between:
  - Process simplification and system flexibility
- Improved insight required to guide technology selection, integration, and deployment

The World needs more IMII

- Pooling Resources
- Driving Change
- Connecting People
- Facilitating Learning
- Growing Impacts

IDEATE 2026 Research Needs

INTERNATIONAL MINERALS INNOVATION INSTITUTE

Questions?

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