Projects in the Pipeline...

Trevor Kelly and Gillian Holcroft
CMIC Project pipeline: 2020

**Concept**
- Small Modular Reactors
- Fully Autonomous - Surface
- Fully Electric - Surface
- Predictive Analytics - Surface
- Rock face pre-treatment
- Continuous Surface mining
- Surface / UG road map combined
- Renewable energy and mine operations
- Robbins / Master Drilling Bergteamet / Vale collaboration
- CMIC / COSIA projects and workshops

**Development**
- Mech Cutting demo - Hecla
- Mech Cutting demo – Vale
- Mech Cutting – Continued Learning
- Alternative Haulage Surface (phase 2a & b)
- Sensor Based Ore Sorting
- UG Mining Safe Deep Development
- Continuous UG -Discovery
- Data Mining for Value
- Global Water Curves

**Execution**
- CAHM
- MonoRoll
- CanMicro

**Completed**
- Defragmenting the Mining Innovation Ecosystem (NRCan)
- Predictive Analytics - Syncrude
- Alternative Haulage surface - Phase 1

Towards Zero Waste Mining

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**Keywords:** Energy, Water, Environment, Footprint.
# Portfolio Overview - TZWM

<table>
<thead>
<tr>
<th>Portfolio</th>
<th>Project</th>
<th>Towards Zero Waste Mining</th>
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</thead>
<tbody>
<tr>
<td>MINING</td>
<td>Mechanical Cutting- Demonstration</td>
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<td>Alternative Haulage</td>
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<td>Underground Mining Safe Deep Development</td>
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<td>INTEGRATION</td>
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<td>Global Water Curves</td>
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*Projects in Development Pipeline*
Underground Safe Deep Development (SDD)

- **Project Scope**
  - Remove operators from the active mining face.
  - Multi-phase approach
    - Initial proof of concept are face prep & load, wire, fire
    - All activities 5m from the face.
    - Remote
    - Automated

- CMIC recommended level setting process to unite industry voice & focus project streams
- Project has been socialized with multiple mining companies resulting in extensive expression of interest.
Mechanical Cutting – Continued Learning

Project scope

- Continue to identify and investigate low cost cutting collaborations for members.
- Develop and maintain relationships with OEM’s and disruptive organizations.
- Arrange site visits for members to view cutting technologies.
- Perform workshops to focus underground consortium on specific projects.
- Initiate confidentiality and sharing agreements to enable open sharing of information.
Sensor Based Ore Sorting Overview

- **Industry Driven:** Identified by CMIC members as a technology that could disrupt mining industry. CMIC was asked to develop a proposal to create a multi-commodity mining company led consortium. Proposal was sent out on May 30th. Goal is to have 5 to 10 Mining Companies sign up by mid-June.

- **Purpose:** Share experiences, identify gaps & ultimately align sensor and sorter vendors to accelerate implementation of ore sorting solutions (within 2-3 years)
  - 1st Phase → 6 Months
  - 2nd Phase → 18 to 24 months
Scope of Work

PHASE 1 LEVEL SETTING PROCESS

Workshop 1
Experience Share

ACTIVITIES
- Explore latest advances in Sensing, Sorting

EXAMPLE TOPICS
- Bulk Sorting
- Particle sorting
- Sensors
- Ore body knowledge (eg. heterogeneity)
- Other consortiums
- Business case
- Case studies

Workshop 2
Review & Gap Identification

ACTIVITIES
- Draft proposals for sub-project scope

Workshop 3
Scoping & Project Plans

ACTIVITIES
- Sub-project planning

PHASE 2 EXECUTION

- Tech Eval.
- Piloting
- Demo
- Value Prop.
- Other?

EXAMPLE TOPICS
- Business case
- Case studies

6 months
## Sensor Based Ore Sorting - 6 month- Fast-paced schedule

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Deliverable</th>
<th>Completion Schedule</th>
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<tbody>
<tr>
<td><strong>Project Launch</strong></td>
<td>Project Charter and Role Description approved; Consortium membership finalised. Funding secured</td>
<td>June 30, 2020</td>
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<tr>
<td><strong>Pre-Workshop 1 Preparation</strong></td>
<td>Workshop preparation material distributed to participants</td>
<td>July 15, 2020</td>
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<td><strong>Pre-Workshop 2 Preparation</strong></td>
<td>Workshop preparation material distributed to participants including finding from Bridging of gaps</td>
<td>Sept. 30, 2020</td>
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<td><strong>Pre-Workshop 3 Preparation</strong></td>
<td>Initial “straw-man” sub-project charters</td>
<td>Nov. 15, 2020</td>
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<td><strong>Workshop 1</strong></td>
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<td>July 31, 2020</td>
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<tr>
<td><strong>Workshop 1 Outcome</strong></td>
<td>Workshop outcome report: Priorities &amp; Gaps identified</td>
<td>Aug. 7, 2020</td>
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<tr>
<td><strong>Pre-Workshop 2 Preparation</strong></td>
<td>Workshop preparation material distributed to participants including finding from Bridging of gaps</td>
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<td><strong>Workshop 2</strong></td>
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<td>Oct 15, 2020</td>
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<tr>
<td><strong>Workshop 2 Outcome</strong></td>
<td>Workshop 2 Outcome Report: Initial sub-project identification</td>
<td>Oct 31, 2020</td>
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<td>Nov 30, 2020</td>
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<tr>
<td><strong>Workshop 3 Outcome</strong></td>
<td>Workshop 3 Outcome Report and sub-project charters:</td>
<td>Dec 15, 2020</td>
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Data Mining for Value- Kick off 2020?

XPS Glencore → Project Champion, CMIC Project Management support

Project Charter
Nov. 2019

Phase 1
Level Set
4 months

- Survey & Benchmark Partner Operations (Systems, software, algorithms...)
- Baseline questionnaire completed
- Outcome- Sharing of best practices & gaps (confidential sources)

Phase 2
Data Collection & Analysis
4 months

- Select clean “partner” datasets & use multiple data analytics tools to evaluate outputs (project is software agnostic)
- Outcomes → which tools / datasets work well and generate realistic/robust results and which tools / datasets are problematic and why?

Project needs at least 5 and ideally 10 mining company participants to commit
Goal: Deliver a new industry tool “Global Water Curves Database” to drive industry knowledge sharing & accelerate more water efficient technology uptake & innovation.

Phase 1: Level Set 6 months
Phase 2: Data Collection & Analysis 8 months
Phase 3: Initial Data Base Development 8 months
Phase 4: Beta Roll-out 6 months

Workshop: Based on Success of Energy Curves

Project needs at least 5 and ideally 10 mining company participants to commit
Let us know if you want to learn more and get involved!

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&
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