Mechanical Rock Excavation: Opportunities for non-competitive collaboration

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The hard-rock industry is still some way behind its soft-rock counterpart when it comes to adopting these innovations, with very few commercial references available. These factors are **driving a renewed push by the industry** to develop a mechanized excavation system.
Business Gain

Safety & Quality…

- Improved safety through increase of mechanization
  - Moving people away from the face
  - Reduce in GHG and explosives

- Reduce damage to rock mass around excavation
  - Reduce ground support & maintenance

- Improved excavation profile
  - Improved air flow

Increased NPV…

- Consider future projects
  - Potential higher advance rates
  - Bring production ahead
  - Significant increase in NPV
Garson Mine McConnell Orebody Access

Outcomes of Trial Program

- Demonstrate ability to cut rock in excess of 250 MPa
- Demonstrate ability to cut rock at a commercial rate > 3.5 m\shift
- Quantify cost per meter compared to Drill and Blast
- Assess HSE suitability of MRE process
- Insight into the optimized MRE process
Stage Gate and KPIs for the Trial

- **Sep 2020**
  - Initial pre-trial in soft rock
  - Speed: 0.8m/hr
  - 6.3 Hours Cutting/Shift

- **Oct 2020**
  - Pre-trial in hard rock
  - 50 meters/3 months
  - Speed: 0.36m/hr
  - 6.3 Hours Cutting/Shift

- **Apr – Jul 2021**
  - Pre-trial in hard rock
  - 70 meters/3 months
  - Speed: 0.24m/hr
  - Cutting: 1.5m/shift
  - 6.3 Hours Cutting/Shift

- **Aug – Nov 2021**
  - Canadian Footprint
  - 140 meters/3 months
  - Speed: 0.44 m/hr
  - Cutting: 3.2 m/shift
  - 7.2 Hours Cutting/Shift

- **Dec 2021 – Mar 2022**
  - 190 meters/3 months
  - Speed: 0.44 m/hr
  - Cutting: 3.7 m/shift
  - 8.4 Hours Cutting/Shift
Project Program Phases

Considering three phases;

1. Preparation
   • Pre-execution documents, studies and collaborative feedback

2. Trial
   • Physical demonstration of hard rock mechanical cutting and field follow

3. Future Planning
   • Future State Mining System evaluation
Proposed Collaboration Framework

- Within the project phases there will be opportunities to collaborate in the areas of Technical, R&D, Operational, Maintenance, Health, Safety, Environment, Etc…
- Joint work sessions and work plan development with Vale/Komatsu/CMIC
- Regular collaboration meetings, participation alignments, information sharing, mutual learning, peer review, reporting and site visit scheduling
Collaborative initiatives models will depend on clarity of challenge, commitment and willingness to share.
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Keeps for success:
- Addressing single issues
- Deliver innovative responses
- Absolute trust
- Open and transparent
- Commitment
- Peer accountability
- Various ways to contribute
- Address anti-trust concerns

Diagram:
- Clarity & Commitment
  - Sharing information & standards
  - Conversation communities
  - Brainstorming ideas
  - Joint pilots
- Keep IP: Isolated & solution centered
- No IP: Collaboration & problem centered
Why CMIC?

- CMIC Provides a broad exposure to leading organizations in the Global Mining Industry, including Mining Companies, Contractors and Consultants and other Collaboration Groups
- Existing positive relationship with CMIC
- Can leverage off existing information sharing processes, procedures & agreements
- Positioned to potentially support via other consortiums and groups if necessary
- Aligned with vision of a mechanical cutting future
The only way we will get to where we need to be is with collaboration.
In Summary

• Vale is committed to collaborate with the mechanical rock excavator (MRE)
• We will direct this collaboration via CMIC
• The success of mechanical cutting is beneficial for the industry and we must support each other as we trial the latest MRE technology
• If the cutting mechanism is effective and reliable, this opens numerous opportunities for the underground mining industry
• The success of this trial is only the beginning
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1. How much will this open up deeper mine fronts like Creighton due to cleaner drifts and shift mineral resources into mineral reserves...how will this be tracked as a benefit?

The key to enabling deeper reserves is ensuring that there is value to extract that ore at an acceptable risk. Mechanical cutting is an enabler of this, but it is important to look at the entire ecosystem which the cutter can be part of. We are starting at the start to understand whether the oscillating disc can extract the ore effectively and efficiently with consideration of the application of mining (today and in the future). In other words we need to understand the cost (now and future) and productivity (now and future) to extract waste/ore; and if this can compete with conventional methods, we plan to implement this technology in the base plans. So, tracking will come later once we understand better the potential and validate our simulations / modelling.