Combined Microwave-Assisted Comminution and Sorting: Project Update

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June 9, 2020
## Project Overview

<table>
<thead>
<tr>
<th>19th Century</th>
<th>20th Century</th>
<th>Today</th>
<th>Future</th>
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<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
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### Benefits:
- Multi-mode scalability to >1000 tph
- Seamless technology integration with bolt-on option
- Up to 70% energy reduction for various ores
- Compelling value proposition, impact on downstream processing & tailings
CanMicro Process

Mining → Crushing

Microwave Treatment
(F₈₀ = 150mm)

Heating of value minerals
Cracking

Conventional Grinding Circuit
F₈₀ = 150mm

Microwave Sorting

Result:
✓ Weakened ore particles
✓ > 20% mass rejection
✓ Better liberated and higher grade mill feed
✓ Coarser product
✓ Significantly ↓ grinding energy
✓ Downstream benefits

CanMicro
CanMicro Team

Steering Committee

E. Bobicki
UNIVERSITY OF TORONTO

A. Gillis
sepro mineral systems

G. Holcroft
CMIC

D. Fragomeni
GLENCORE Canada

Members

XPS EXPERT PROCESS SOLUTIONS
Ausenco
Queens UNIVERSITY
KPM Kingston Process Metallurgy Inc
Corem
SRC
Project Timeline

- Rapid development towards TRL 6 – Prototype Demonstration

<table>
<thead>
<tr>
<th>Months 0-4</th>
<th>Months 4-8</th>
<th>Months 8-14</th>
<th>Months 12-18</th>
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<tr>
<td><strong>Phase 1</strong></td>
<td><strong>Phase 2</strong></td>
<td><strong>Phase 3</strong></td>
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<tr>
<td>Bench Scale Assessment of Ores</td>
<td>High Power Microwave Testing</td>
<td>Process Integration</td>
<td>Downstream Effects</td>
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<tr>
<td>Equipment Engineering</td>
<td>Sorter Fabrication</td>
<td>Sorting Grinding</td>
<td>Flotation Leaching</td>
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</tbody>
</table>

- **TRL 2**
- **TRL 3**
- **TRL 4-5**
- **TRL 6**
Phase 1: Bench-Scale Assessment

- 50 kg minimum sample:
  - Fundamental Characterization
  - Microwave Heating Tests
  - Comminution Tests
  - Evaluation of Ore Sortability
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Phase 1: Permittivity & Heating Tests

• Over 30 ores tested at the bench-scale to date
• Sample permittivity and heating curves (3 kW system) shown
Phase 1: Grindability Tests

• A number of ores show significant potential for grinding energy reduction
Phase 1: Sorting Tests

- Sorting algorithms developed for each ore based on heating patterns
- Significant mass rejection obtained based on mid-IR sorting alone
Phase 2: Microwave Testing
Future Work

Phase 3: Sorter Integration

Phase 4: Downstream Testing

- Automated sorting
- Multi-sensor
- Flotation
- Leaching
- Gravity Separation
- Tailings
CanMicro is the **ONLY** technology to combine microwave-assisted comminution & sorting → Potential energy savings of **up to 70%**:  
1. Reduced ore competency  
2. Increased product size  
3. Removal of waste before grinding  

✓ Phase 1: Ore Screening → Complete!  
✓ Phase 2: High-power microwave testing → Underway  
✓ Promising results in improved grindability & sortability  
✓ Crush It! Challenge deadline: November 30\(^{\text{Th}}\)

**CanMicro intends to Crush it!**
Thank-you!