SMI JKMRC
Julius Kruttschnitt Mineral Research Centre

High Voltage Pulse Technology – Its association with Geometallurgy

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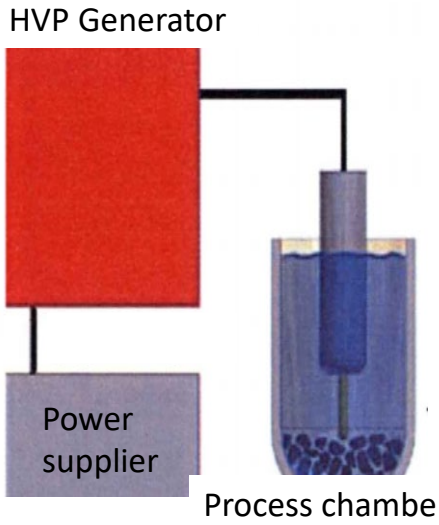
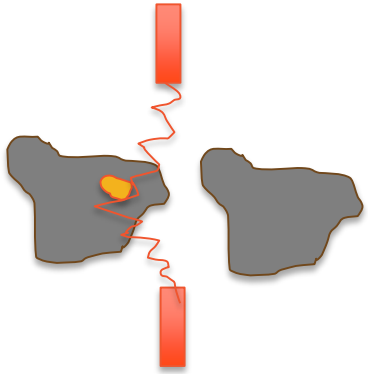
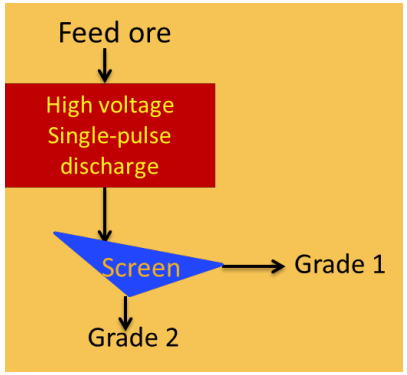
High Voltage Pulse Comminution





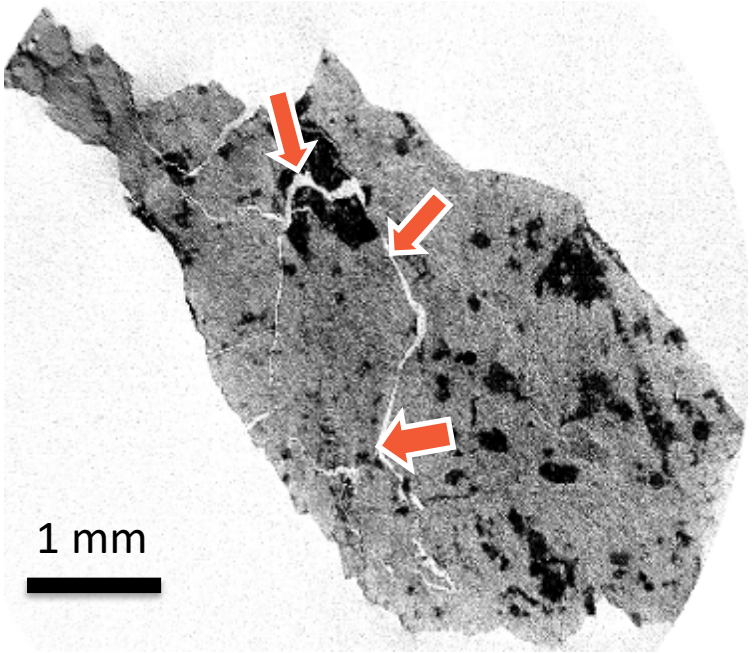


Potential applications identified by JKMRC research:

- Preweakening
- Preferential liberation
- Pre-concentration

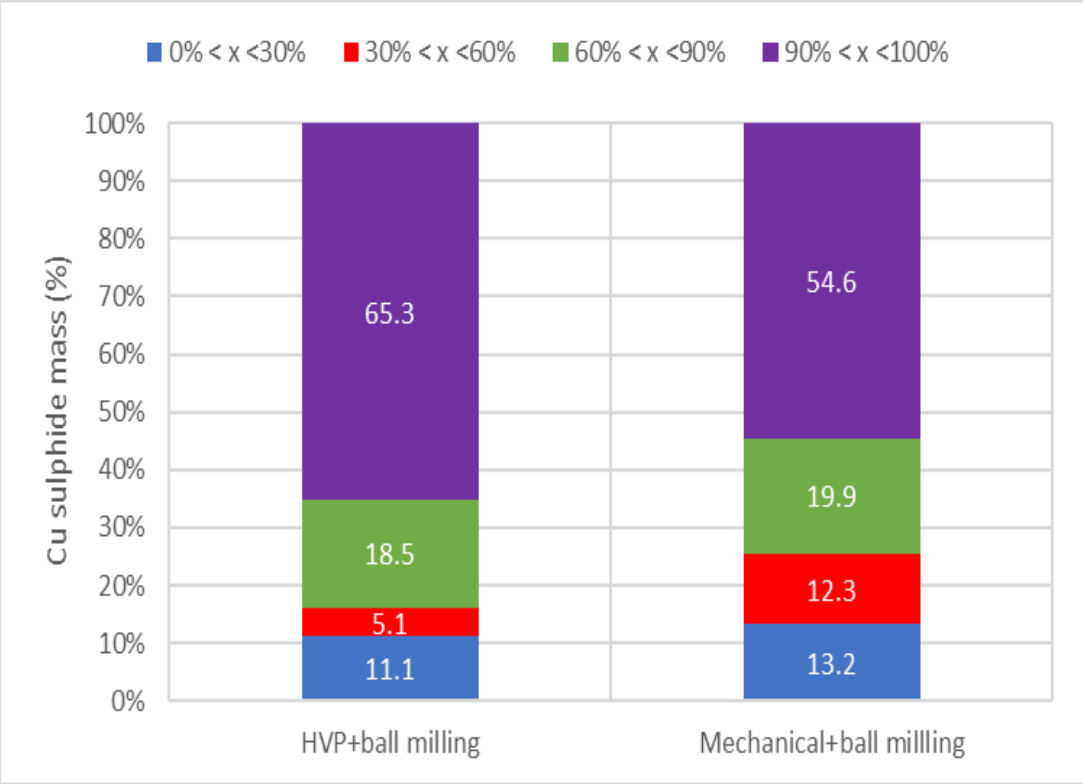
HVP Pre-weakening

- HVP damages the particle structure
  - With 1-2 kWh/t
  - Cracks/microcracks form
  - Detected by X-ray tomography & mercury porosimetry
- Pre-weakened fragments
  - Axb increases from 31 to 84 (easier to break)
  - Bond Work index decreases by 24% (save comminution energy)
  - Simulations indicate 10 to 20% increases in throughput may be possible



HVP Improved Liberation

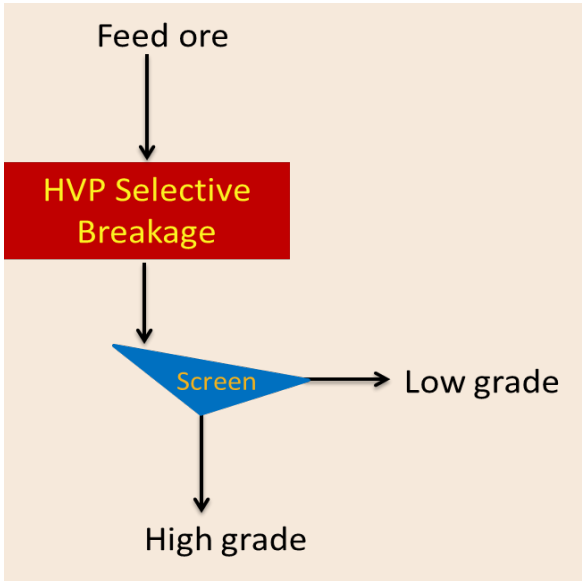
- Improved grades and recoveries in downstream separation at a particular grind size
- Improve viability of coarse particle flotation technologies



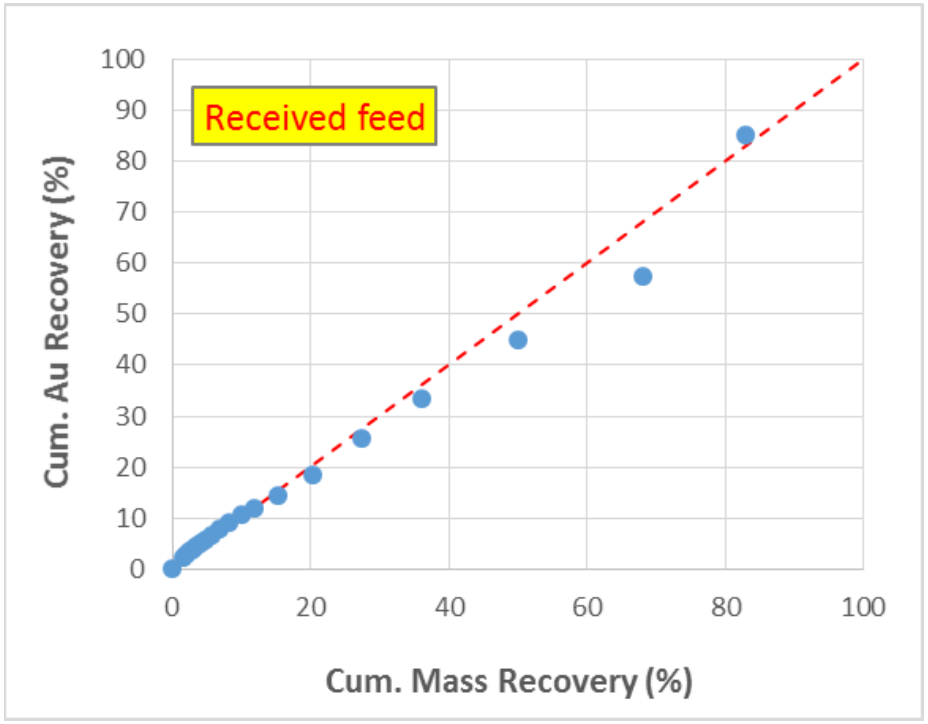
HVP Pre-concentration

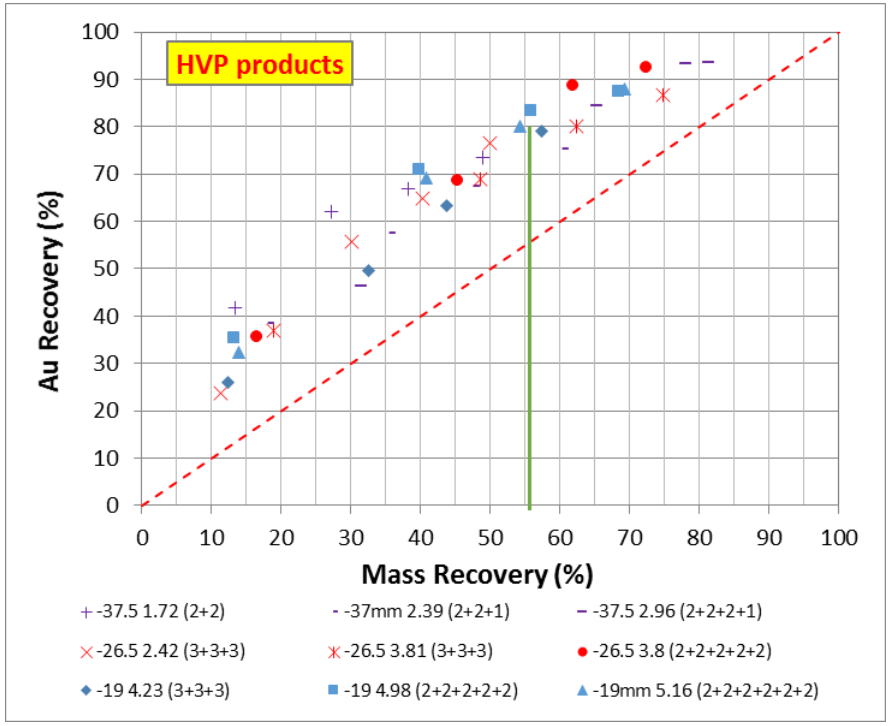


Product	Ecs (kWh/t)	Yield (wt%)	Grade (Cu%)	Distr. (Cu%)
Broken	2.5	73.1	0.28	91.5
Unbroken		26.9	0.07	8.5
Total		100.0	0.22	100.0



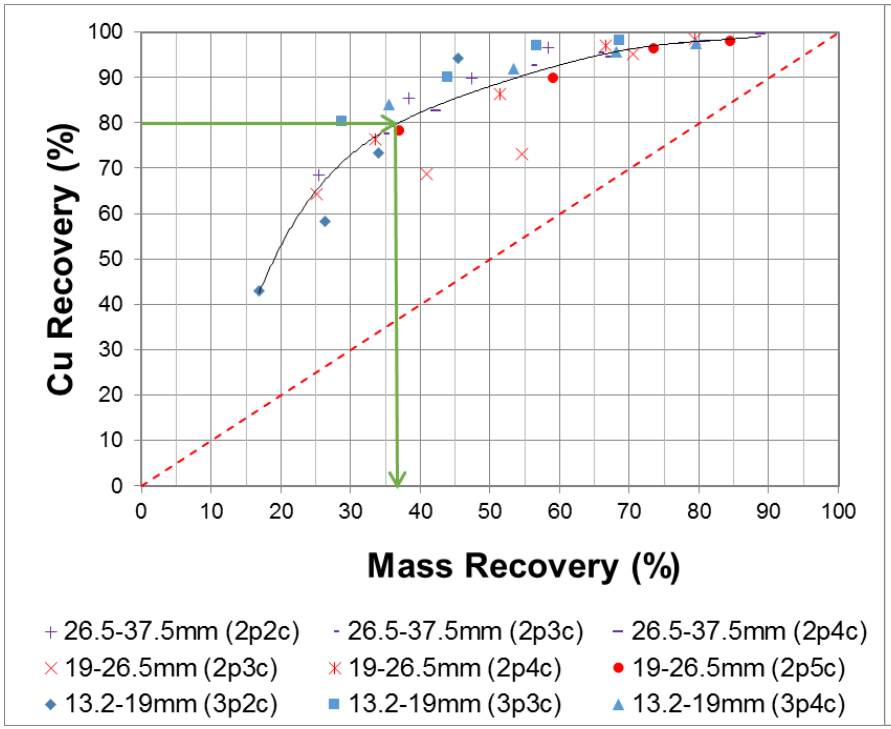
Gold pre-concentration example

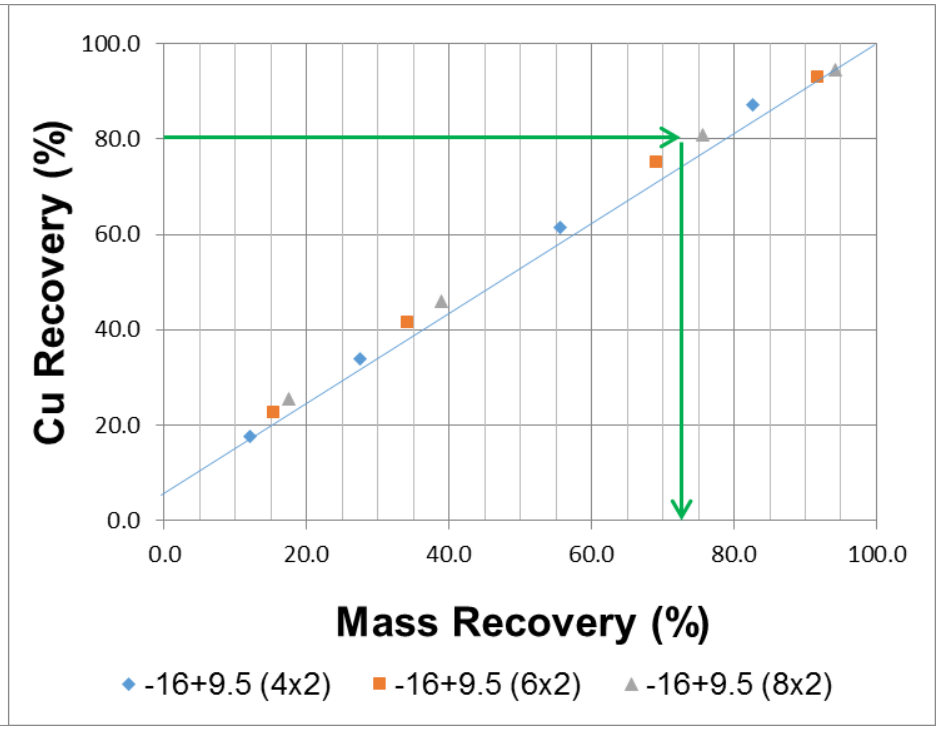




- Ore from an Australian major gold/copper producer
- The received ore shows no preferential deportment of gold
- Can recover 80% of gold whilst rejecting 45% of mass

Variable Amenability to HVP Processing





- Variation in grade, texture, mineralogy and geology affects HVP amenability
- Research ongoing to develop tests to determine ore amenability to HVP and to understand mechanisms involved

Potential implications for GEOMET

- HVP has the potential to
  - upgrade an ore to improve cut off grade and improve the size of a resource
  - enable alternative low and high grade processing routes
  - Decrease grinding costs by preweakening and improve separation efficiencies by improving liberation
- Need to establish what makes an ore amenable to HVP processing and develop low cost tests to map ore amenability across an orebody
- Predict over the life of mine the effects of ore variation if HVP technology was adopted
  - What would be the optimum mining sequence
  - What is the optimal mineral processing circuit design

Proposed Research Pathway

Stage 1: Ore Amenability Testing

Database of Ore Amenability Results with associated geological information

Stage 2: Building Flexible Testing Facility

Enable development of continuous fast testing protocols

Stage 3: Collaborative HVP Research (PhDs)

HPV Application

Develop and test ways of applying HVP at full scale
Determine optimum operating regime

Next Gen HVP

Scale up of the generator system

Ore Amenability

Effect of grade, mineralogy and texture on ore amenability using real ores and synthetic material

Flowsheet Options

Experimental and economic assessment of flowsheet options

Understand drivers for HVP and expected variability in an orebody

Stage 4: Pilot Plant

10 TPH Pilot Plant Demonstration

Summary

- HVP has the potential to improve the economics of mining operations but results will be ore specific

- GeoMet style assessments will become important in determining the mining sequence and mineral processing flowsheet which will optimise the overall economics of an operation when using HVP pretreatment.

- To perform these assessments
  - We are planning to develop fast testing protocols to enable mapping of ore amenability
  - Develop an understanding of the properties of the ore that affect ore amenability
  - Develop models to predict HVP performance in the context of a flowsheet