SUSTAINABLE SOLUTIONS FOR MINING AND REMEDIATION

NOVEL PROCESS

- HPSA is a mechanical process (i.e. no chemicals) leveraging particle - particle collisions.
- HPSA focuses on liberating minerals along their intergranular boundary lines, creating a much more efficient liberation at particle sizes that are coarser than the industry standard.
- Slurries are transported by high-pressure pumps through opposing nozzles, creating impinging jets contained in a collision housing.

GEN A Deployed at Iron Tailings Site

SELECTIVE LIBERATION

- HPSA uses the difference in Mohs hardness between the base mineral and target mineral for selective liberation, which provides a more energy efficient alternative to conventional grinding mills.
- By liberating target minerals from the gangue, the post-HPSA material can be more efficiently separated by size classification or flotation for increased grade and recovery.
- Due to HPSA's ability to selectively liberate, the target minerals are efficiently concentrated earlier in the processing sequence, which reduces the amount of overall material that needs processing. This creates opportunities to reduce or remove downstream unit operations.

HPSA Skid

CONTINUOUS OPERATION

- HPSA can be used as a stand alone system (typically for remediation and tailings applications) or as a "plug and play" unit in the grinding/regrinding stage of the processing circuit (replacing the need for ball mills, rod mills, and/or attrition scrubbers).
- Throughput scaling options based on processing needs - currently offering units with a range up to 50 TPH.
- Units can be applied to any circuit with minerals that benefit from selective liberation. Successful applications currently include, but are not limited to: Uranium / Vanadium / Phosphate / Potash / Graphite / Copper / Molybdenum / Gold / REEs.

GEN B Full Circuit

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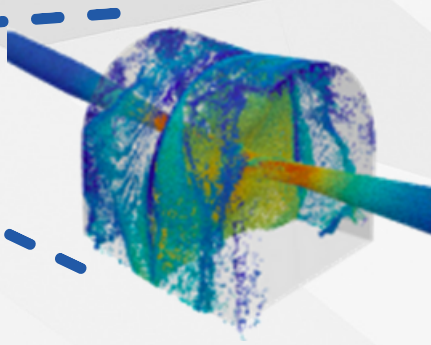
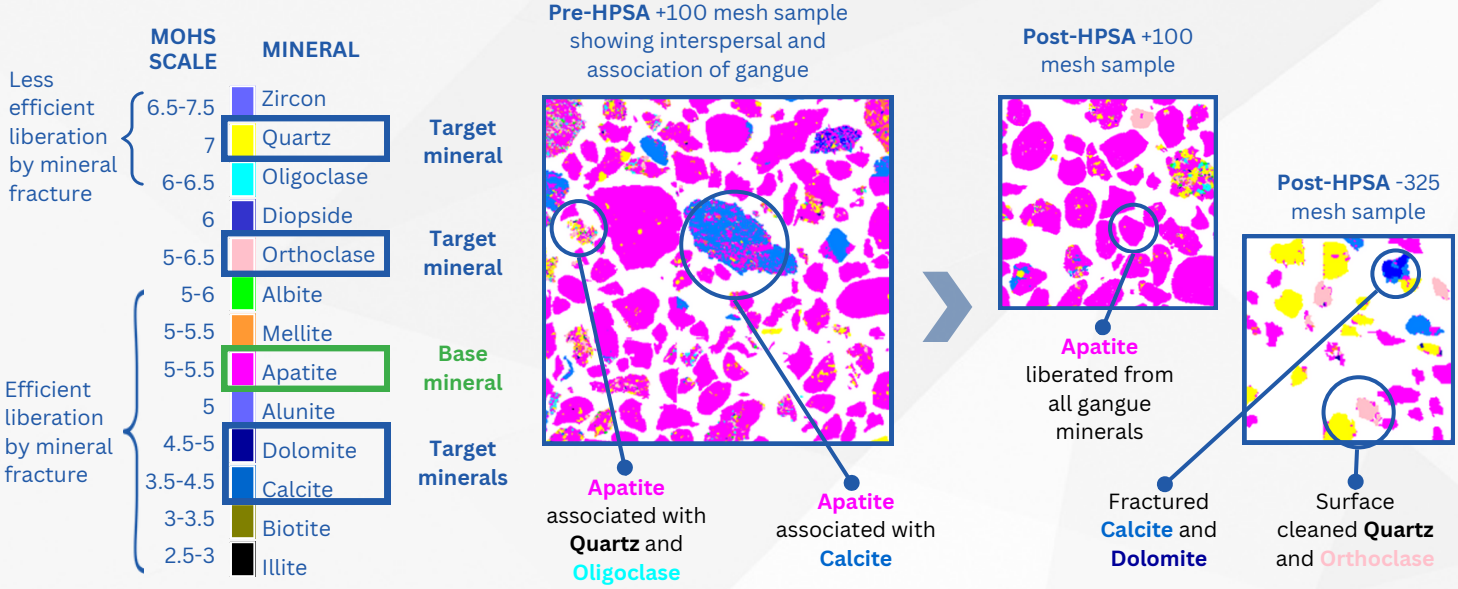
DISA PHOSPHATE



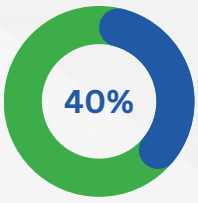
APPLICATION

- In a phosphate application, HPSA uses the base phosphate mineral (hydroxyapatite) to selectively liberate acid consuming minerals and silicate gangue minerals from the phosphate host rock.
- HPSA was evaluated against a rod mill in a secondary grinding circuit. The results demonstrated HPSA outperformed the rod mill for both grade and recovery. This presents the opportunity for HPSA to replace the rod mill completely and create significant OPEX and CAPEX savings.

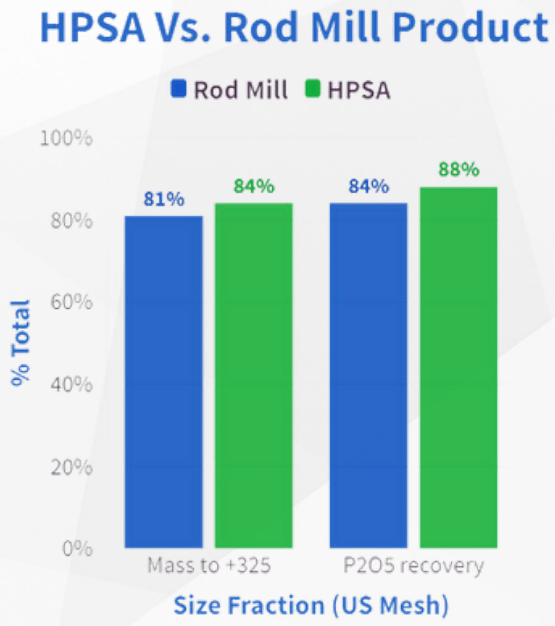
MINERAL LIBERATION ANALYSIS



RECOVERY & MASS DISTRIBUTION



HPSA reduced impurities such as SiO_2 and Al_2O_3 from the product by greater than 40%.



- HPSA improved apatite recovery and grade by an average of 3% and 4%, respectively, at a lower OPEX than the current rod mill.
- A technoeconomic analysis calculated that the implementation of a 5 TPH HPSA unit has an added value of $500,000/year. Furthermore, a 50 TPH has an added value of $10 M/year.