

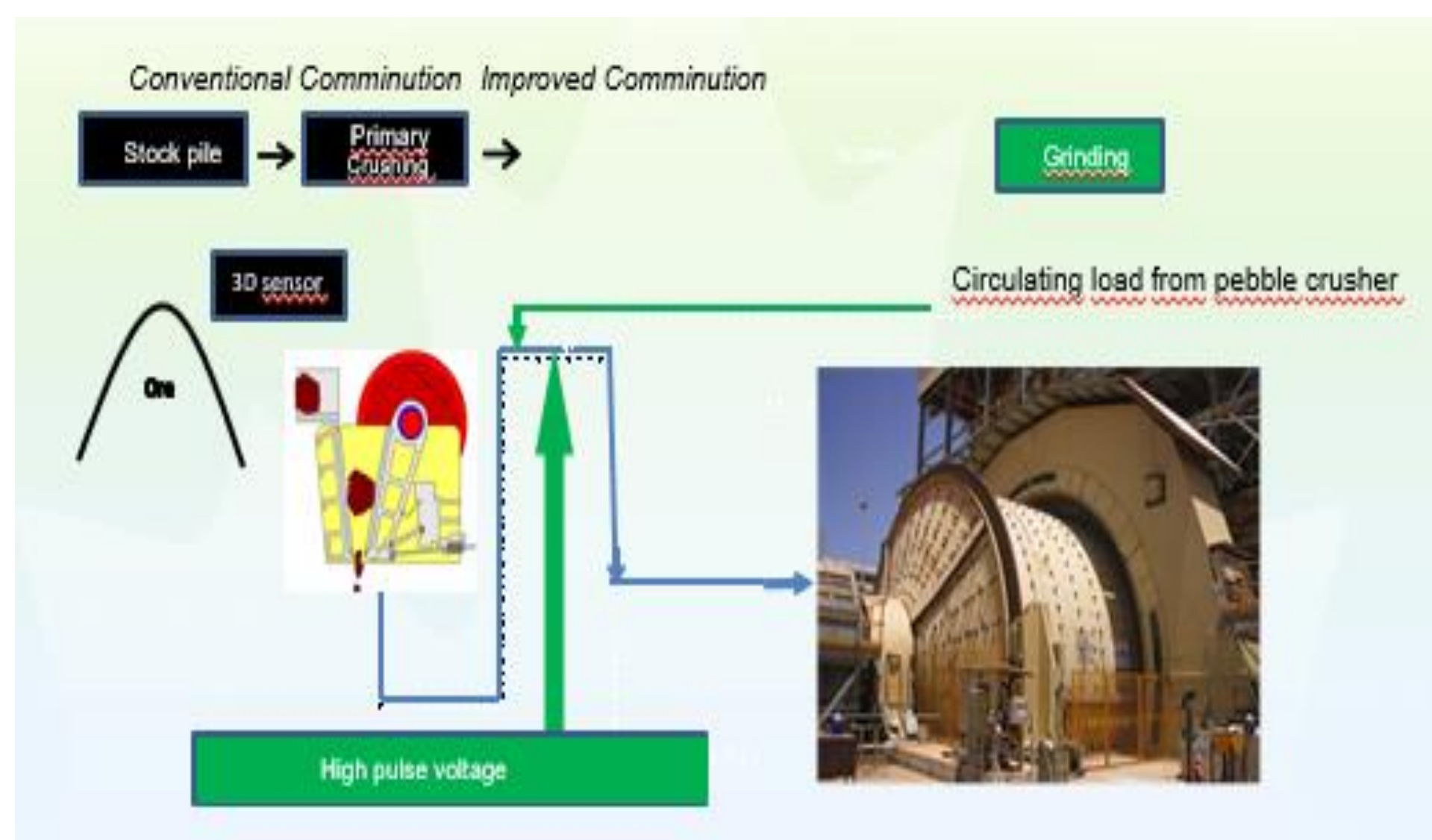
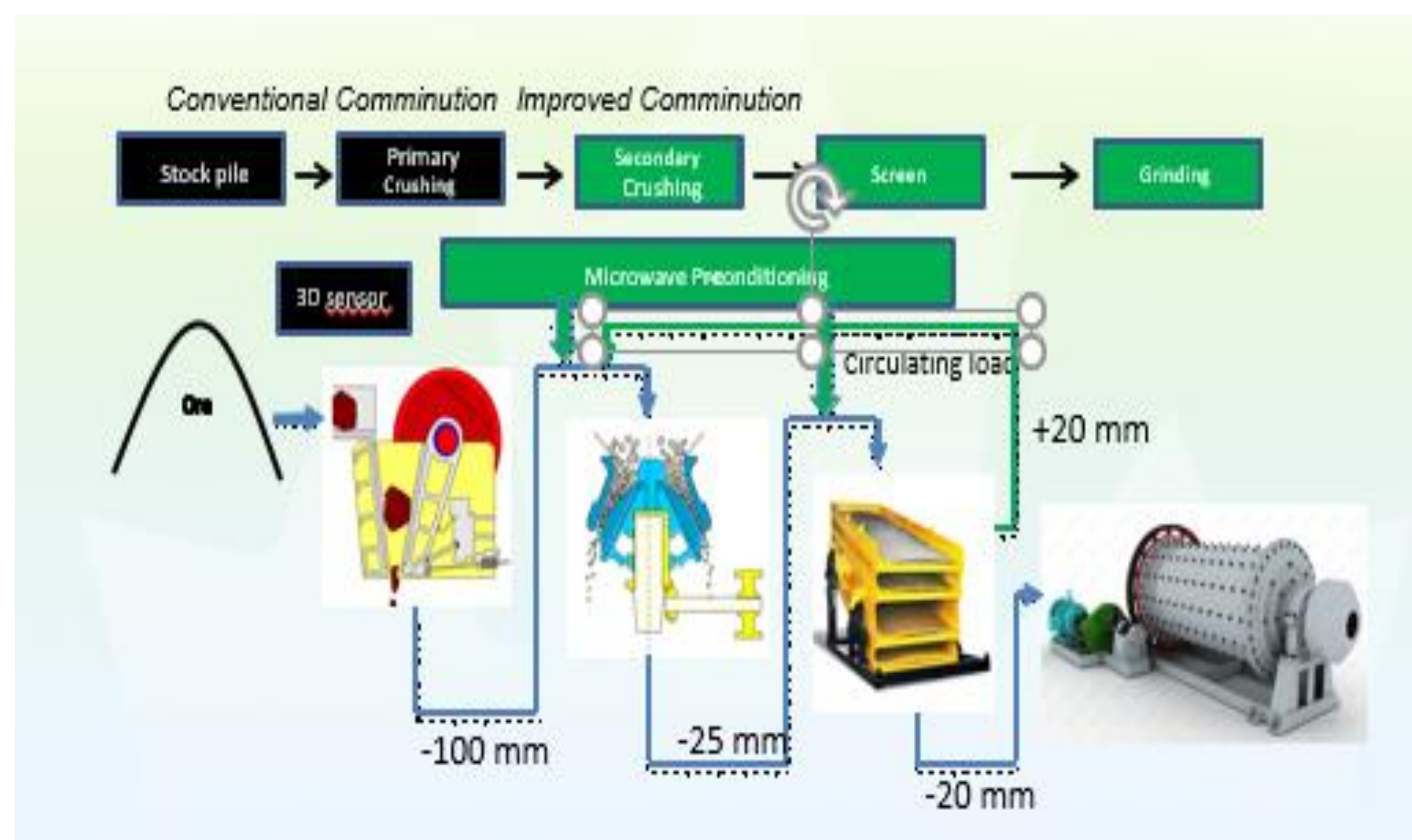
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Comminution/Processing/Traitement

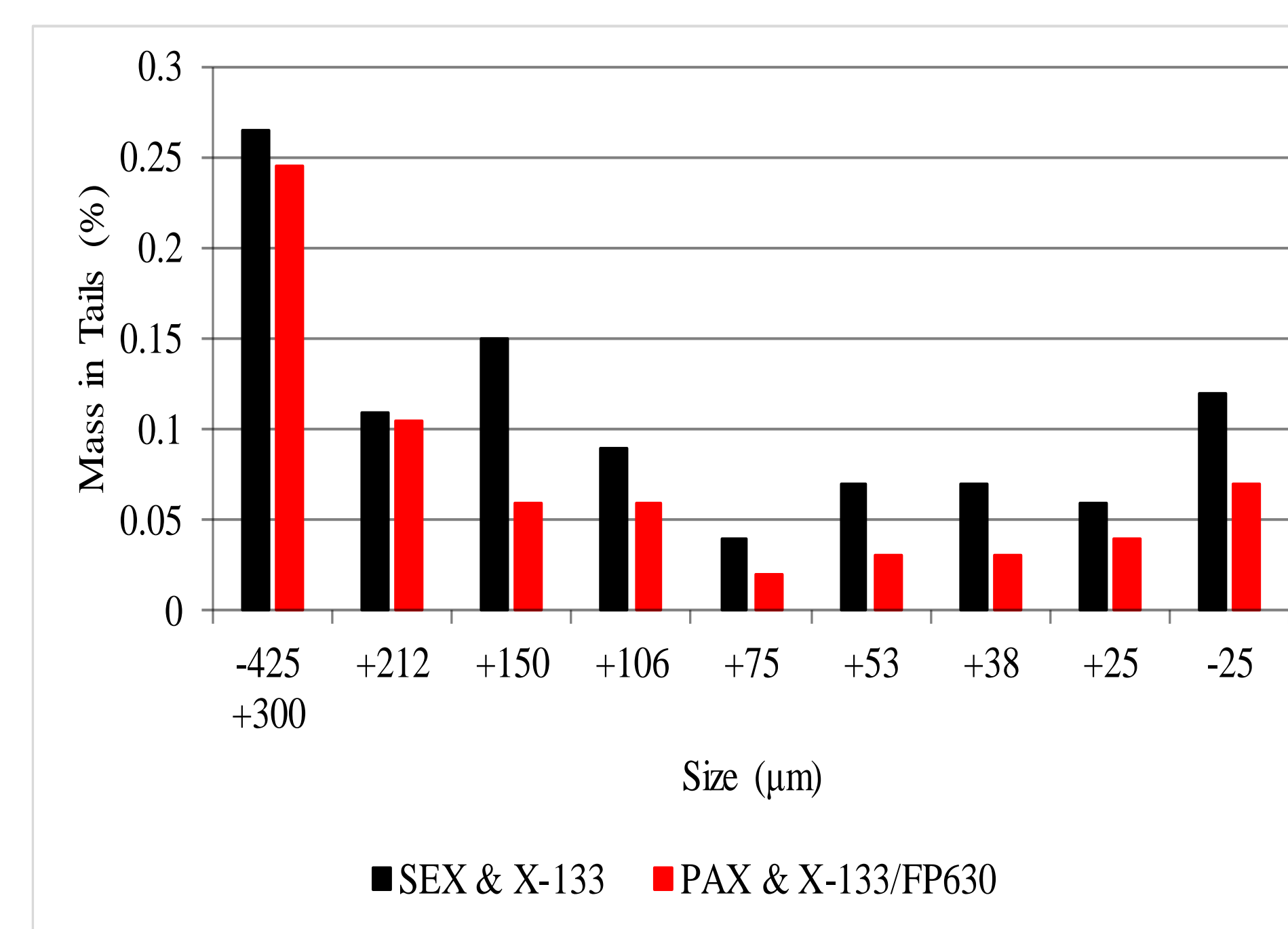
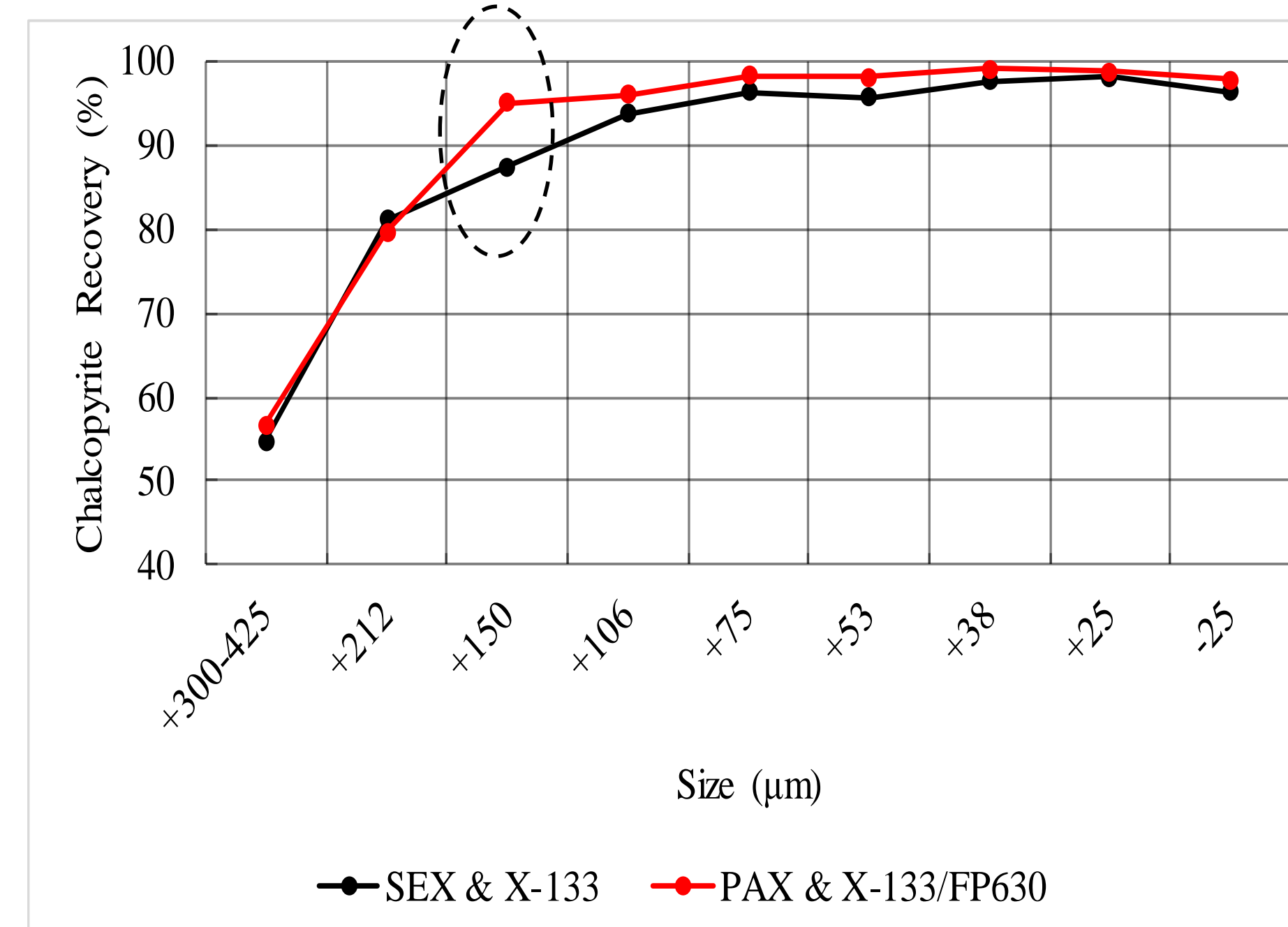
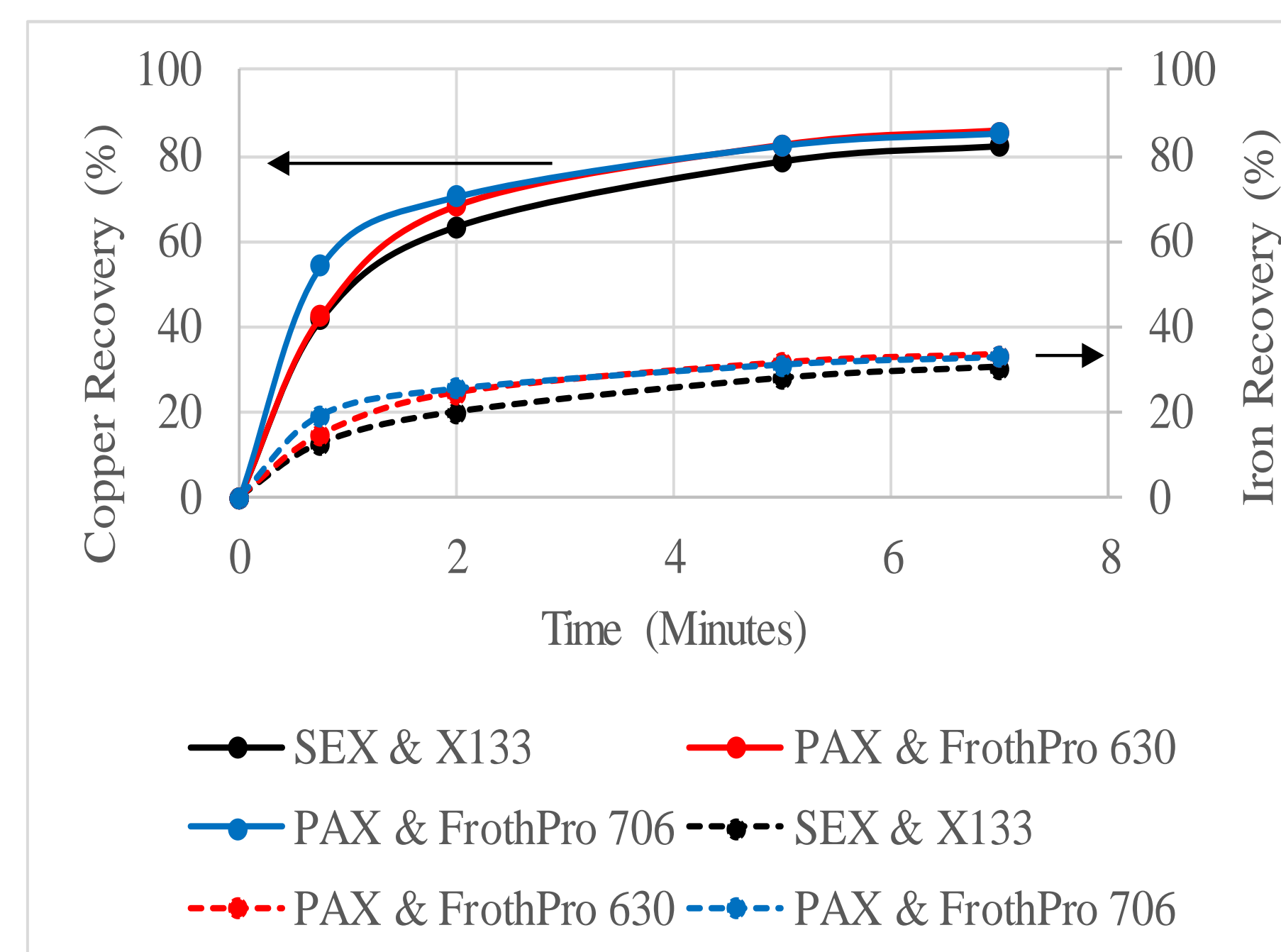
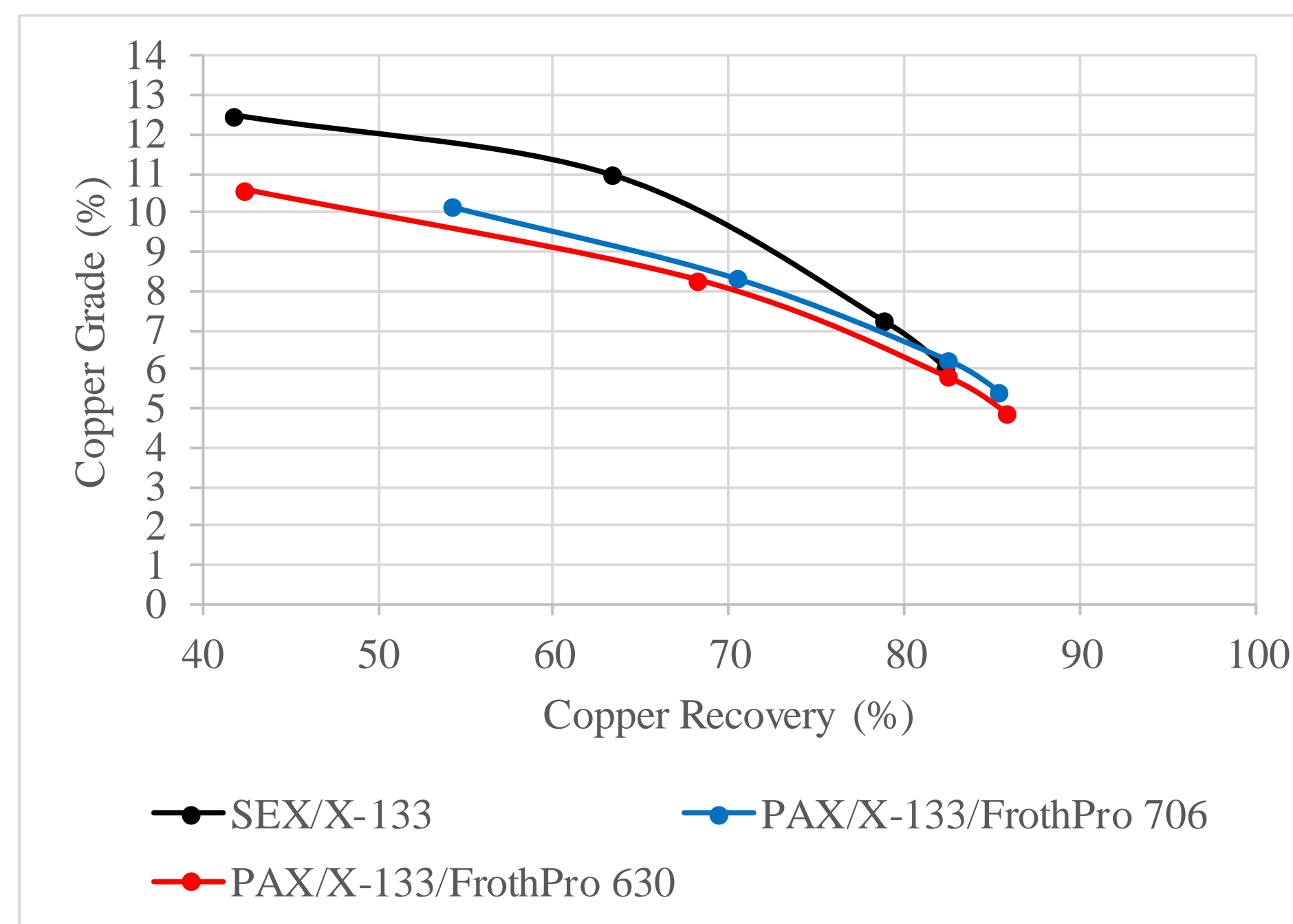
- Les concasseurs et les broyeurs consomment environ 40% de l'énergie approvisionnée à l'usine.
- Crushers and grinders consume almost 40% of the energy delivered to the mineral processing plant
 - Potential savings/économies potentielles ~24% (ore dependent/ dépend du minerai)
- 3 areas/domaines
 - 3D sensor/capteur 3D
 - Weaken rocks/affaiblir les roches
 - Microwaves and/or high pulse voltage/Micro-ondes et/ou la pulsation à haut voltage
 - Coarse grinding and coarse particle flotation/Broyage et flottation de particules grossières
- Focused on innovation - generation of new technologies/ Focalisé sur l'innovation - génération de nouvelles technologies
- Aims for improved energy efficiency in comminution/Vise à améliorer l'efficacité dans la comminution.



Results/Réalisations

Coarse Particle Flotation/Flottation de particules grossières

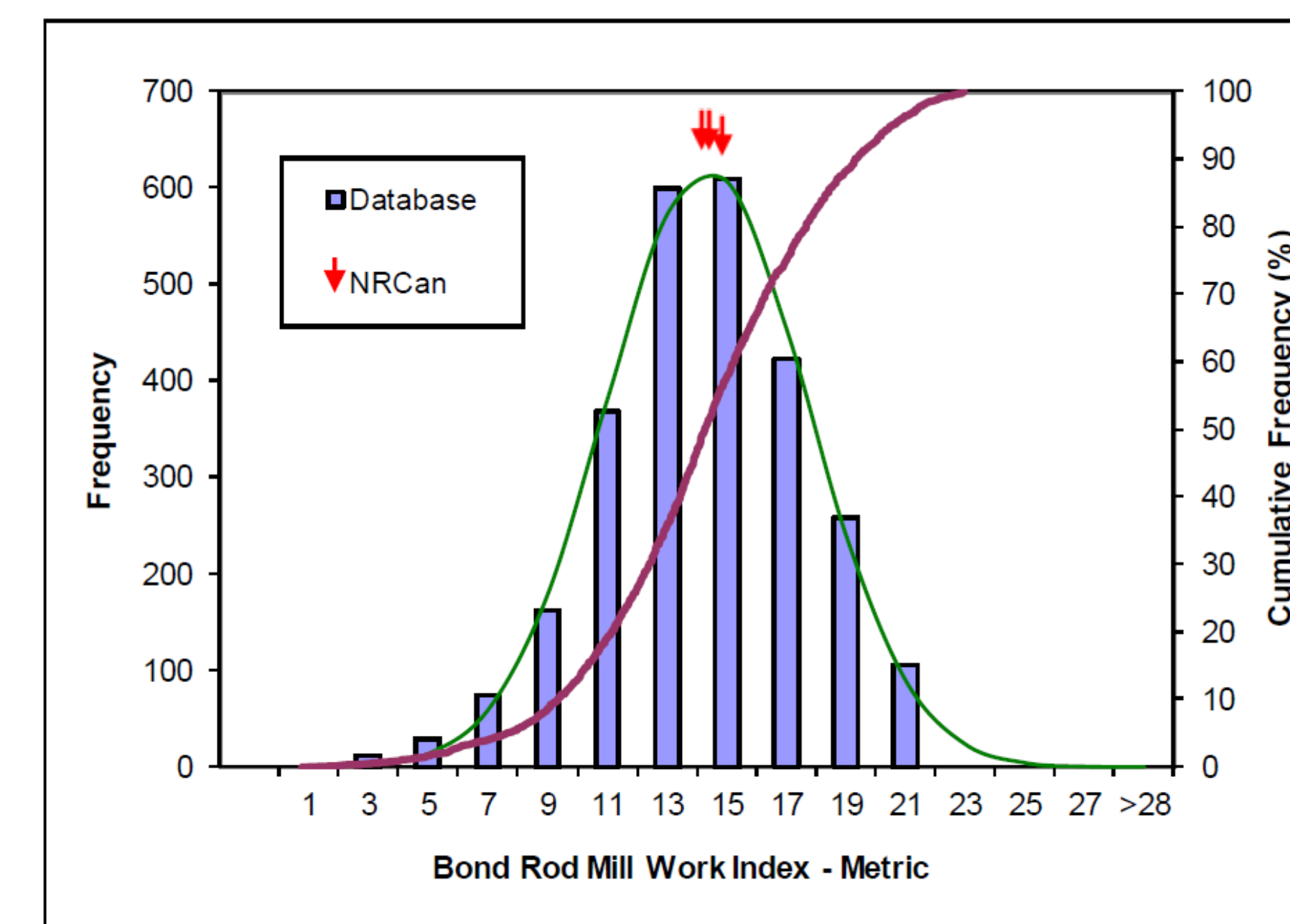
- 3% increase in copper recovery/ 3% de récupération de cuivre
 - Grind size of 80% passing 265 micrometers/Granulométrie de 80% passant 265 micromètres
 - At 85% confidence using Analysis of Variance (ANOVA)/Confiance de 85% en utilisant Analysis of Variance (ANOVA)
- \$12,500,000 (US)/year in increased revenue/\$12,500,000 (US)/annuel en augmentation de revenus.



High Pulse Voltage Pre-Treatment/Pré-traitement de pulsation à haut voltage

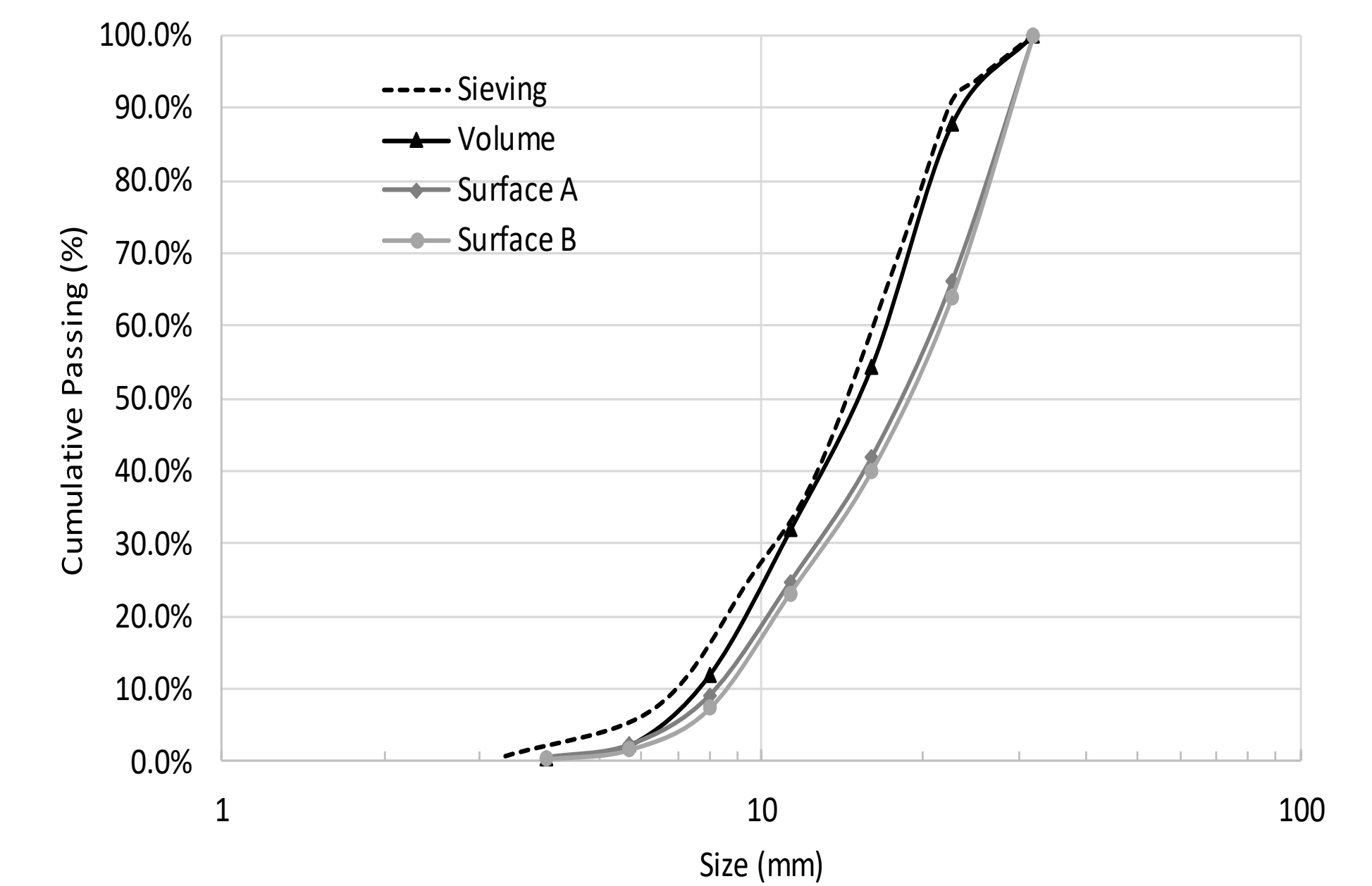
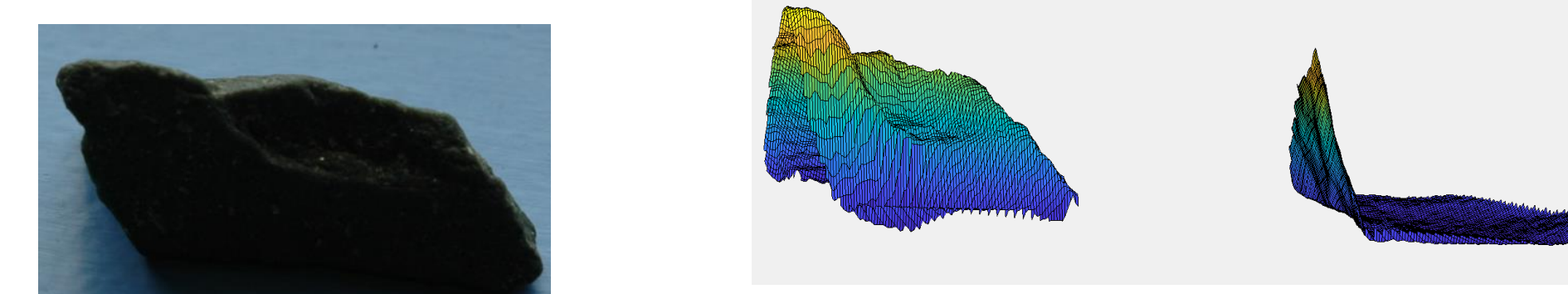
- Bond Rod Work Index on Goldex ore without high pulse voltage pre-treatment/sans pré-traitement de pulsation à haut voltage

Sample #	Bond Rod Work Index (kWh/t)
1	14.2
2	14.8
3	14.4
Average	14.5



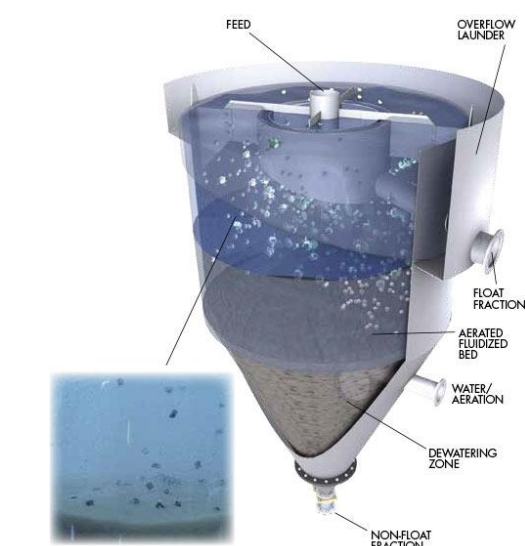
3D Rock Size Sensor/Granulomètre 3D

- Volumetric rock size distribution are unbiased and coherent to size distribution measured by sieving, which is the reference
- La granulométrie volumétrique de la roche est cohérente avec la granulométrie mesurée par tamisage qui se veut la référence



Next Steps/Prochaines étapes

- HydroFloat to recover particles >250 micrometers.
 - SEX/X-133 - P₈₀ 265 µm
 - PAX/X-133/FrothPro 630 - P₈₀ 265 µm
 - Size/Grosueur > P₈₀ 265 micrometers
- Training/Formation April/avril 2019



- Seek more funding for high pulse voltage testwork/À la recherche de fonds pour les travaux de pulsation à haut voltage

Conclusions

- 3% increase in copper recovery/ 3% de récupération du cuivre
 - Grind size of 80% passing 265 micrometers/Granulométrie de 80% passant 265 micromètres
- \$12,500,000 (US)/year in increased revenue/\$12,500,000 (US)/annuel en augmentation de revenus.
- 3D sensor/capteur 3D – Able to measure particle size distribution accurately/Mesure plus précise de la granulométrie

Key Highlights/Points à retenir

- Two progress reports for coarse particle flotation/Deux rapports de mise à jour sur la flottation des particules grossières
- Paper accepted/revue scientifique acceptée - Journal of Minerals and Materials Characterization and Engineering.
- Paper submitted/revue soumise - Minerals Engineering

Team/Équipe

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