October - 2024

innovative environmental solutions

Waste to Value – Thompson, Manitoba

Copper Precipitate Project 2021 - 2026

Agenda

- KBL Overview
- Thompson, Manitoba
 - Project Onset & Objectives
 - Water Treatment
 - Extraction
 - Processing
- Waste to Value
- Questions



KBL Overview





About KBL



- Environmental Ltd. Founded in 2006, in Yellowknife NT.
 - 2013 Logistics Ltd.
 - 2018 Consulting added to Technical Services
 - 2020 Projects Ltd.
 - 2023 Expansion of Projects Services through acquisition of Secure Projects Group.
- Privately Owned.
- Liability Management Focus.
- Core Safety Certification.

Our goal is to assist forward-thinking companies in developing, maintaining, and executing successful environmental management programs.



KBL Locations and Partnerships



Offices

Soil Bioremediation Facilities

Hazardous Waste Transfer Facilities

Paint Recycling Facilities

PARTNERING FOR PROGRESS

CREATING ECONOMIC OPPORTUNITIES

ENHANCING PROJECT EFFICIENCIES

DFOSTERING PROGRESS





Thompson Manitoba





Project Onset

- In August of 2018, the client ceased operations of its Thompson Smelter and Refinery. As part of the decommissioning plan for the Smelter and Refinery, the plan also outlined that the Refinery's Copper Arsenic Residue holding ponds needed to be decommissioned as well.
- During the operating life of the Refinery, a copper by product was produced and sent to outside storage areas known as the Copper Arsenic Ponds.
- Three (3) Copper Arsenic Ponds required decommissioning: #4, #5, and #6.
- As part of the decommissioning planning, the client was seeking for a contractor who could produce an intermediate copper product from the solids in the holding ponds. This would require reclamation work that entailed:
 - Safe removal of filtrate.
 - Safe removal of solids from the holding ponds.
 - Production of a marketable and shippable intermediate copper product from the solids.
 - Preparation plan for shipment of processed solids.



Primary Objectives







Treat acidic raw wastewater and reclaim Ni Reclaim Cu from waste tailings holding ponds Remove operating liabilities and reclaim land for future use



Project Challenges

- No incidents or accidents
- No harm spills to the environment
- Implementation of Geotechnical Monitoring Plan
- Raw filtrate low PH
- Corrosive environment
- Weather
- Magnitude of the project site
- Create a marketable and shippable intermediate copper product.
- Produce Ni Precip by-product







Water Treatment





Water Treatment - 2022 to 2024

- Neutralization of pH for discharge to the tailings management area & extraction of precipitate.
- Projects also extracting and bagging sediment from pond(s).
- Water treated by adding Magnesium Oxide to raw water to raise the pH from initial range of 0.6
 - 2.8 up to pH 9.
- Extraction of the resulting precipitate through filter press operations.
- Discharging the resultant clear water to the existing tailings management area (TMA).





Water Treatment - Challenges

- Raw water sampling for bench-top study analysis to confirm initial design intent.
- Raw water quality changed constantly during pumping operations:
 - pH flucutations
 - Metals concentrations
 - Difficult to standardize the process
 - MgO
- Clarifier:
 - Clarifier didn't work as anticipated
 - Precipitate was too heavy and created a very dense block at the bottom that couldn't be pumped to the filter presses







Water Treatment – Lessons Learner

- Bench-top testing is critical to the success of a treatment project.
- Equipment maintenance prior to mobilization to remote sites is critical.
- Addition of Weir Tank to remove any loose suspended solids, not previously captured by the filter press operations, prior to releasing treated water in the Tailings Management area.





Water Treatment - Results

- Successful operations throughout 2022, 2023, and now into 2024.
- Average change in pH: raw water ~1.67 batched & treated to ~8.94
- Raw water treated & discharged:
 - 2022 2024: 36,582 m3
- Ni Precip filter cake: 3,543 mt
- Assays:
 - Nickel ~14%
 - ► ~500 mt



Extraction





Extraction – 2021 to Present

- Extraction and decommissioning of Copper Pond # 4
 - ► 2021: 6,500 mt
- Extraction of Copper Pond # 6
 - 2022 & 2023: 32,000 mt
- Extraction of Copper Pond # 5
 - 2023: 7,300 mt current
 - 2024: 28,037 mt
 - ~9,000 mt remaining





Extraction - Challenges

- Corrosiveness of Copper Precipitate & Lime
 - Damages / corrosion to excavators
 - Buckets, pins, seals, rads
 - Damages / corrosion to steel sludge bins and bin trucks
 - Bins, hydraulic lines, air bags
- Extreme northern climate
- Hydrated lime







Extraction – Lessons Learned

- Adaptation to the project hazards & working environment:
 - Procure custom stainless-steel bins
 - Revamped decontamination procedures
 - Modifications to equipment
- Design, erect and install 2nd coverall building
- Standardized process for hydrated lime





Extraction – Results

- Successful operations throughout 2021, 2022, 2023, and now into 2024.
 - Annual operational efficiencies, year over year.
 - Neutralization of Cu Precip through ~9,800 mt of lime.
 - Reduction in corrosive repairs & associated damages.
- Successful decommissioning of Copper Pond # 4.
- Complete extraction in Copper Pond # 6.
- Cu Precip to date: 67,403 mt
- Assays:
 - Copper ~21%
 - ► ~14,150 mt





Processing





Processing – 2022 to Present





Processing – Challenges

- Copper content & vision thereof
- Tracking of bags
- Extreme northern climate
- Hazardous environment
- Offsite coordination
- Ergonomics





Processing – Lessons Learned

- Sampling procedures revamped
- Manual tracking of bags transitioned to ID print out per bag – full functionality with scanners
- Design, erect and install 2nd coverall building
- Health and safety procedures
- Movement of bags logistical coordination
- The micro break





Processing – Results

- Successful operations throughout 2022, 2023, and now into 2024.
 - Annual operational efficiencies, year over year.
 - During the 2023 season, over ~70,000 man-hours with no work-related injuries.
 - Thus far during the 2024 season, over ~49,000 manhours with no work-related injuries.
- Marketable products processed to date:
 - ~81,300 mt (Cu Precip, Ni Precip, SAS)
 - ~56,721 bags relocated offsite
 - ~61,300 mt relocated offsite





Waste to Value



Marketable Products - Conclusion

- Nickel:
 - Nickel ~14%, ~500 mt
 - \$18,000 USD per ton = ~\$9 MM USD
- Copper:
 - Copper ~21%, ~14,150 mt
 - \$9,500 USD per ton = ~\$134 MM USD





Thank you!... Any questions?



