

In recent years, lithium has been one of the fastest growing “tech metals”, with demand from the lithium-ion battery sector driving the need for new supplies, higher-purity products and lower cost processing methods. In addition to steadily increasing demand for rechargeable batteries in personal electronic devices, the increasing popularity of electric vehicles and emerging industrial applications for lithium-ion batteries continues to expand the global market for lithium compounds.

Lithium is produced commercially from two primary sources – mixed alkali/alkaline earth brines (solution mining) and pegmatite (hard rock mining) deposits containing minerals such as spodumene (LiAlSi₂O₆) and petalite (LiAlSi₄O₁₀). The majority of lithium brine reserves are located in South America, where the arid climate helps support low-cost upgrading of the lithium content using solar evaporation. Recovery of high-purity lithium compounds from brine sources is generally economically favorable over extraction from hard rock deposits due to lower mining costs, fewer impurities and less-intensive processing requirements. In order to produce high-value lithium compounds at a competitive cost, developers of hard rock or clay-type lithium deposits face challenges such as:

- Conventional processing routes for extracting lithium from aluminosilicate-type ores are energy and reagent intensive and generate significant solid, liquid and gas-phase emissions to the environment, and;
- High capital costs for vertical integration of mining and concentrating operations with pyro/hydrometallurgical facilities for production of battery grade Li₂CO₃ or LiOH·H₂O.



Figure 1: Rechargeable Lithium-Ion Battery Pack for Personal Electronic Devices

Thibault & Associates Inc. provides our clients with innovative processing solutions to meet the challenges of lithium processing by:

- ☑ Capitalizing on individual resource characteristics to optimize on grade-recovery relationships in primary beneficiation flowsheets such as:
 - Full assessment of low-cost preconcentration options including ore sorting, dense media, magnetic separation, hydraulic sizing and classification of fine particles.
 - Applying an in-depth knowledge of surface chemistry principles to the development of customized and highly selective reagent schemes and operating conditions for direct or reverse flotation of lithium and gangue minerals.

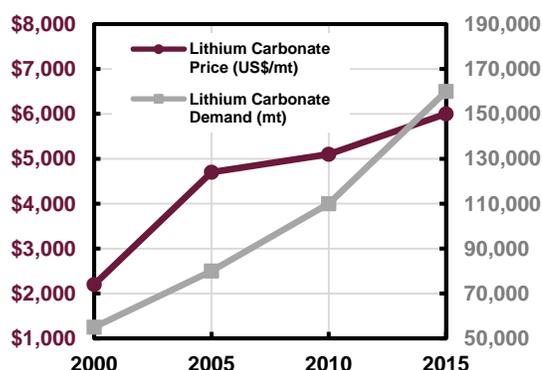


Figure 2: Market Pricing and Demand Trends for Lithium Carbonate Over the Past 15 Years

- ☑ Incorporating modern advances in solvent extraction, ion-exchange and selective crystallization technology to replace more reagent intensive precipitation techniques for impurity removal and lithium purification;
- ☑ Maximizing opportunities for in-situ generation and/or regeneration of reagents from waste streams using modern technologies such as bipolar membranes, electrochemical salt-splitting and diffusion dialysis, and;
- ☑ Utilizing Process Simulation and Economic Evaluation (ProSEE™) models to evaluate and optimize on the economic viability of the proposed flowsheet at each stage of the development process.

Your Vision - Our Innovation™

For over 28 years, **Thibault & Associates Inc.** has applied process technology innovations to comply with our client's project development strategies, transforming natural resources to high value concentrates, ultra-pure metals, speciality chemicals, transportation fuels or power generation.

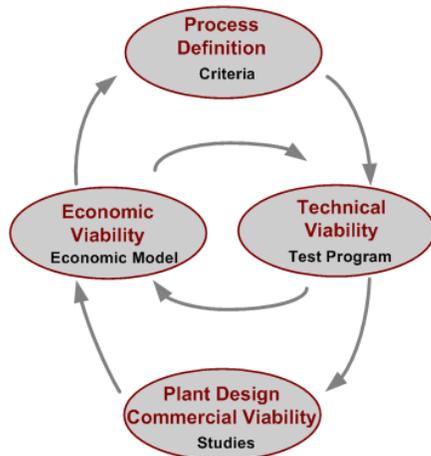
Services

Our firm defines process technology based on the project's earning potential and compliance with product market specifications, environmental protocol and social factors.

We tailor develop process systems to support our client's business plans and our test programs are managed to quantify technical – process design parameters.

As an integral part of process development, we prepare economic models to assess the impact of technical parameters on the project's earning potential.

Our integrated technical and economic studies are based on fully defined process chemistry, equipment selection and plant layout for life of project, heavy industrial process control measures, cost assessment standards, construction and operating practices.



- ✓ Feed characterization and development of process chemistry.
- ✓ Bench scale and pilot test programs.
- ✓ Process simulation and dynamic economic modelling.
- ✓ Independent NI 43-101 technical / economic assessments and feasibility studies.
- ✓ Detailed engineering / multi-discipline plant design, commissioning and aftercare programs.

Speciality

Our clients range from investment firms to heavy industrial producers of base metals, industrial minerals, speciality metals, inorganic chemicals, power, transportation fuels and petrochemicals.

Our project experience covers a wide range of commodities, including:

- ✓ Base metals (Cu, Pb, Zn)
- ✓ Precious metals (Au, Ag)
- ✓ Platinum group metals (Pt, Pd, Rh, Ru, Ir, Os)
- ✓ Oxide metals (W, Sn, Fe, Ti, Al, Cr, Sc)
- ✓ Metals for electronics (In, Y, REO's, Te, Ga, Ge)
- ✓ Specialty chemicals (Sb, V, Mg, K, Si)
- ✓ Battery-grade elements (Graphite, Li, Co, Mn)

In addition to our technical and economic assessment of production opportunities for various commodities, we have specialized in GAP analysis, independent assessment of process development test programs and the transfer of test program data for commercial process plant design, procurement and definitive engineering.

Our most recent lithium projects include:

Conceptual Design and Development of Brine Processing

Conceptual Design of Brine Reagent Regeneration for Production of Lithium Hydroxide

Development of Solvent Extraction Process Technology for Removal of Calcium and Magnesium

Assessment of Alternative Process Technologies and OPEX for Alternative Production Strategies - Separation Rapids Deposits



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