

The long term demand for rare earth elements (REEs) remains strong for use in “end products” such as electronic devices, fixed-magnet motors, wind power generators and refining catalysts. China is a major producer of REEs concentrates from run-of-mine ore (currently in excess of 85% of the world supply). Export of concentrates from China are currently controlled by Chinese policies and Chinese producers are investing in downstream processing capabilities – decreasing the availability of REEs concentrate outside of China.

The reduction in the Chinese export and increase in the price of REEs (from 2010 to 2011), has led to an interest in the development of mines and production facilities outside of China. Producers of REE benefit from a “lack of substitute” commodities for the high tech industries and an increase in the demand for REEs used in electronics is forecasted for 2015 to 2020.

With uncertainty within the REEs supply chain and a turn-down in 2015 pricing (resulting from an over-supply of concentrates), the challenges to meet demands for a secure and stabilized supply of high-purity REEs outside of China includes:

- the development of process technologies with competitive production costs that are tailored to the resource characteristics;
- the assessment of alternatives technologies to improve on product purity – more selective solution purification technology at lower operating costs;
- the definition fully integrated process technologies to reduce reagent and energy consumption, and;
- the development of waste solids fixation, brine - wastewater reuse and recycle “end-of-life products” technologies to minimize the environmental impact of REE.



Figure 1: Photograph of Rare Earth – Mineralization within the Host Rock (pink color) for End-use Electronic Devices

Thibault & Associates Inc. provides customized process development and design solutions to meet the challenges faced by the rare earth processing sector by:

- ☑ capitalizing on project specific feedstock characteristics (mineralization and liberation) to optimize on front end grade-recovery relationships relative to downstream hydromet operations, to include:
 - preconcentration technologies to reduce cost for mining and transport to processing facilities;
 - intensification of comminution circuits to reduce power consumption;
 - selective flotation and high gradient magnetic separation, and;
 - site specific trade-off cost assessment of direct feed to hydrometallurgical operations.
- ☑ intensification of REE leach operating conditions to promote more selective leaching and allow for integrated regeneration and/or production of reagents on site to reduce operating costs;

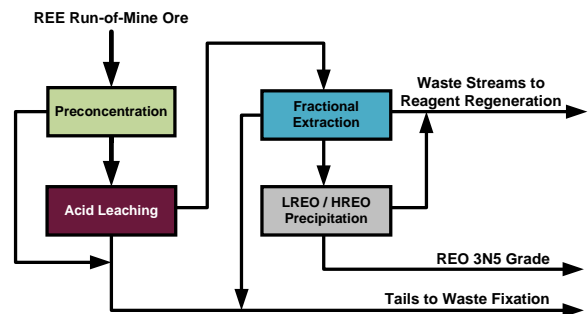


Figure 2: Illustration of Thibault & Associates Inc. Approach to Integration of Rare Earth Processing by Physical / Chemical Upgrading, Reagent Regeneration and Solid Waste Fixation

- ☑ incorporating modern advances in commercially proven process technology such as fractional extraction, selective precipitation, ion-exchange and solvent extraction to reduce the number of processing stages required for recovery of individual high-purity REEs in excess of 3N grade;
- ☑ utilizing process simulation and economic evaluation models to assess production alternatives relative to resource characteristics and optimize on the earning potential of the project, and;
- ☑ capitalizing on opportunities to regenerate reagents, recovery of valuable by-products from solid / liquid waste streams and end-of-life E-waste recycling while assuring the fixation of heavy metals and radionuclides in waste streams.

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.

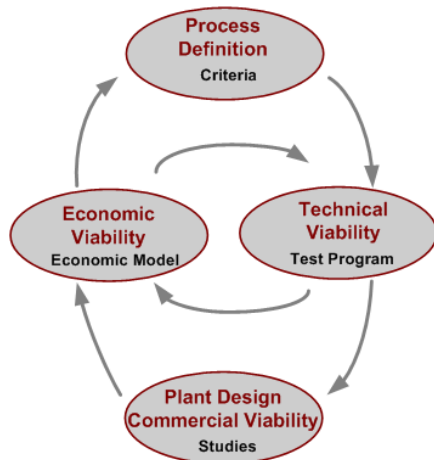
Services

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 rare earth projects include:

Conceptual Design / Cost Assessment of REO Hydrometallurgical Process - Benjamin River Deposit.

Conceptual Process Design for Processing E-Waste.

Review of REO Hydrometallurgical Processing Technology - Mount Pleasant Mine.

Co-production of Yttrium and Lanthanides Metals - Mount Pleasant Mine.

Caustic Fusion - REE Chloride Hydrometallurgical Process - Nechalacho Deposit.

REE Production Process Simulation and Economic Model - Nechalacho Deposit.



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