



Excellence in process technology development, economic assessments, plant design and after-care programs for the resource-based industries since 1988.



2010 Individual Award for Technical Excellence – Association of Professional Engineers, New Brunswick.

2015 Dr. W.J. Wright Award for significant contributions to New Brunswick's minerals industry in the fields of mining and metallurgy – Canadian Institute of Mining, Metallurgy and Petroleum, New Brunswick.

Thibault & Associates Inc. specializes in the development of process technology, assessment of production economics and design of industrial processing facilities within the metallurgical, hydrometallurgical, chemical and power generation industrial sectors. From conceptual studies to turn-key design of processing facilities, we execute projects to comply with our client's business directives.

Since 1988, Thibault & Associates Inc. has completed multi-faceted projects for companies around the globe. Our clients range from investment firms and mineral processing operators to major players in the chemicals, specialty metals and electronics industries.

"Your Vision - Our Innovation"™. Together, they transform your business concept into a competitive production strategy. Process technology, defined by our execution of process development programs and economic modelling, is your intellectual property from "first concepts to after-care programs."

Our firm seeks ways to integrate proven process technologies together with innovative engineering solutions that are both technically and economically viable. In addition to exceeding environmental standards, we refine proven technologies to make them more efficient and industrially competitive in world-wide markets.

Thibault & Associates Inc. provide both technical and project management services for the various phases of project execution, defined as follows:

Discovery Studies (Class V Opinion of Probable Cost)

Order of magnitude or plant factored cost assessment, preliminary selection of unit operations based on bench scale tests and preliminary definition of a process - block diagram of unit operations.

Scoping / FEED / PEA Studies (Class IV Opinion of Probable Cost)

Conceptual or equipment factored cost assessment, definition of unit operations by bench scale tests, process equipment selection and preliminary process flowsheet design.

Prefeasibility Studies (Class III Opinion of Probable Cost)

Semi-detailed cost assessments, definition of process equipment, definitive mass / energy balance based on locked cycle or semi-continuous pilot scale tests programs and optimization of process flowsheets with preliminary pipe and instrumentation diagrams.

Feasibility Studies (Class II Opinion of Probable Cost)

Detailed cost assessment, definition of process equipment, plant design, process control design, demonstration or pilot plant optimization of the flowsheet and fully integrated plant design – preliminary construction drawings.

Construction (Class I Opinion of Probable Cost)

Definitive cost assessment, equipment procurement and processing plant construction documentation/tender specifications. Bid and take-off cost assessment based on approved for construction and/or fabrication drawings.



The execution of our clients' production strategies from conceptual assessment of production alternatives to after-care programs, is focused on optimum commercial viability.



Process development and plant design by Thibault & Associates Inc. From discovery and process development studies, to design, construction, commissioning and process intensification studies.

Your Vision Inspires Our Innovation

Whatever your processing goals whether it be turning natural resources into high-purity metals, chemicals or transportation fuels, our specialized chemical "know how" and decades of experience in industrial plant design will help translate that vision into commercial reality.

Thibault & Associates Inc. adapts proven technologies for the metallurgical, chemical and power generation industries. Our projects include the production of base metals, precious metals and specialty metals such as indium, tungsten, cobalt and rare earth elements for the electronics and other sectors. We tailor our innovations to reflect your business plan, market requirements and environmental parameters.

Our firm manages your entire project from initial concept to turn-key operation. Our multi-skilled group supports you through all project stages from discovery, process development, plant design, construction to start-up and after-care of industrial production facilities.

Discovery and Concept

- Conduct a technical review to identify proven technologies.
- Assess alternative process technologies and their commercial viability.
- Examine production economics and environmental criteria.
- Determine current product/end-user specifications.
- Investigate optimal market conditions and commercial opportunities.

Process Development

- Conduct prototype testing through bench-scale tests and pilot programs.
- Determine equipment sizing and performance specifications.
- Simulate mass and energy balances – define proof of concept.
- Prepare preliminary process flow diagrams.

Design and Feasibility

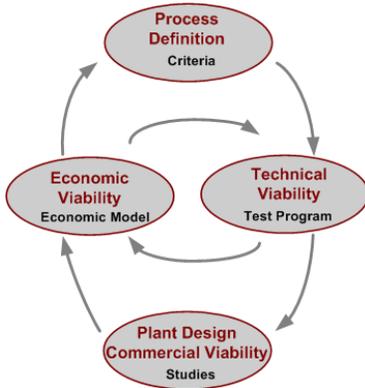
- Coordinate multi-disciplinary plant design.
- Prepare specifications and diagrams for piping, instrumentation and equipment.
- Prepare specifications for equipment sizing and procurement.
- Design the layout for process equipment within the building(s).
- Determine process control logic and strategies.
- Prepare contract documents for construction.
- Estimate costs of capital and operating expenses.
- Conduct feasibility studies.

Start-up / After-care

- Commission the plant and optimize equipment performance.
- Troubleshoot plant performance - process intensification studies
- Prepare operating and maintenance manuals.
- Conduct technology and operator training seminars.



Use of process simulation models to assess production strategies, technical demands and constraints that occur during the life span of the project.



Dynamic modelling provides a logical template to help organize resource development strategies and defines the relative impact of production technology on earning potential.

Process Development Programs

Our firm offers process development and plant design services from conceptual process flowsheet definition to in-plant process intensification and aftercare programs.

For early phase development of projects, our firm provides a review of the feedstock chemical and physical characteristics, product market specifications and an assessment of environmental compliance requirements to fully define project directives and process development strategies. Our assessment of production alternatives and definition of the process chemistry is the primary building block for process development.

Our process development test programs are done in-house as a precursor to pilot test programs at the clients' facilities. Our management of test programs are based on an on-going assessment of process design and economic factors that impact on the technical and economic viability of the project.

In addition to "proof of concept and product quality" test programs, we provide our clients with a Process Simulation and Economic Evaluation (ProSEE™) at each phase of project development. The economic parameters that control the project's earning potential (defined by our fully integrated and dynamic models) are applied as guidelines for our process development test programs - providing our clients with a cost effective development program.

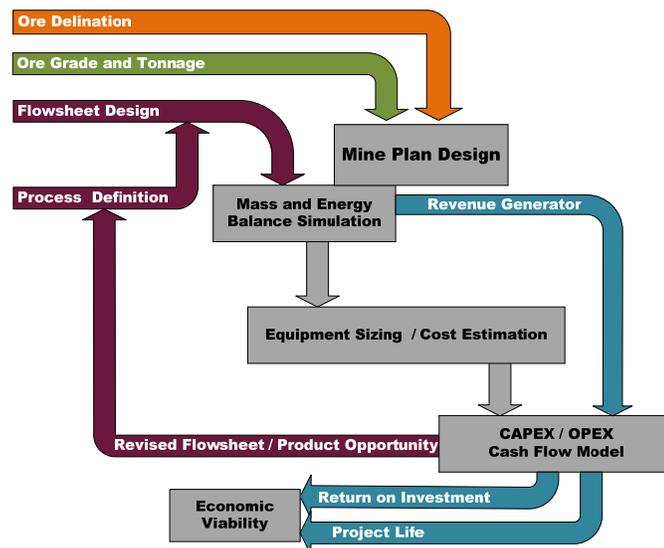


Figure 1: ProSEE™ – Dynamic Model Inputs / Outputs



Project Profiles - Metallurgical

Client: Rambler Metals and Mining Canada Ltd.

Vision: Assessment of alternative processing methods to optimize on operating costs by increasing production throughput at the Nugget Pond flotation concentrator.

Innovation / Actions: Our firm developed a dynamic economic model and conducted bench scale tests to assess the technical and economic viability of dense media separation relative to the unique mineralization of the Ming Mine Footwall Zone. The fully integrated economic model identified the economic advantages of ore preconcentration using dense media separation technology located within the underground mine, which reduces mine operating costs and improves on the flotation feed grade. Bench scale tests were conducted to optimize on dense media separation operating and design parameters, which were subsequently confirmed by mini-pilot testing of dense media prototype process equipment. Preliminary assessment of dense media process technology has led to the installation of an on-site pilot system rated at 10 tonne per hour.



Client: Marathon Gold Corporation

Vision: Development of integrated preconcentration and hydrometallurgical process to maximize gold recovery.

Innovation / Actions: Our firm has developed in-house bench scale test procedures to quickly and efficiently assess options for gold preconcentration using flotation and/or gravity separation techniques to reduce capital and operating costs for gold hydrometallurgical plant operations. Flotation reagent schemes have been developed to optimize on gold recovery with the option of including gravity separation unit operations to improve on recovery of coarse free gold. Process simulation using customized economic models developed in-house by Thibault & Associates Inc. are then used to assess the optimum production strategy relative to the ore processing characteristics as a design basis for preliminary economic assessments.

Client: North American Tungsten Corporation Ltd.

Vision: Technical assessment of plant operating practices and identification of operating measures to improve on tungsten recovery.

Innovation / Actions: Since 1981, Thibault & Associates Inc. have conducted in-plant process intensification studies to improve on tungsten recovery in both scheelite and wolframite concentrators. In addition to the development of operating parameters for desliming, gravity separation, flotation and high gradient magnetic separation for various tungsten processing flowsheets, we have identified measures to improve on tungsten recovery through control of the grinding and primary classification unit operations. Measures to optimize on tungsten recovery and overall plant performance were defined for the Cantung concentrator based on reducing the generation of fine tungsten within the grinding circuit and adjusting operating parameters within the gravity and flotation circuits to improve on recovery of fine tungsten.



Client: Minco Plc / Buchans Minerals Corp.

Vision: Assessment of operating strategies for production of copper, lead and zinc concentrates from various ore zones within the Lundberg deposit.

Innovation / Actions: Our firm has developed a dynamic economic model to assess alternative flowsheet configurations, changes in run-of-mine ore separation characteristics, revenue generation relative to base metal smelter schedules and production costs. Based on bench scale test data and simulation of the process relative to the test data, the client can assess the relative impact of grade, recovery and throughput tonnage on the earning potential of the project. Results of the conceptual model have been used to assess mine plan options and provide directives for the economic development of the project.

Client: Rambler Metals and Mining Canada Ltd.

Vision: Construction of copper flotation concentrator

Innovation / Actions: Initially our team developed a process flowsheet for copper flotation and hydrometallurgical processing of the flotation tails for the optimum recovery of gold. We conducted various bench scale studies to define a reagent scheme capable of processing the high variability of run-of-mine ore. We completed process, mechanical, electrical and process control design for a 1,000 tonne per day facility and assisted with construction and commissioning. Our team currently provides after-care technical services to maintain optimum plant production.



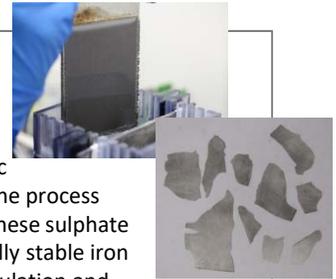


Project Profiles - Hydrometallurgical

Client: Canadian Manganese Corporation / Minco Plc

Vision: Development of a hydrometallurgical process for the production of high purity electrolytic manganese metal at a competitive production cost.

Innovation / Actions: Over a three year period, our firm developed the process technology for production of high purity manganese metal (in excess of 99.7% Mn) with fully integrated on-site sulphuric acid and quicklime production to achieve operating costs that are competitive with Chinese producers. The process development program focused on unique processing technologies to achieve an ultra-high purity manganese sulphate solution for electrowinning of the metal and chemical conversion of iron to co-produce an environmentally stable iron complex. Development of the flowsheet was also based on integration of test programs with process simulation and economic modelling to assess the relative viability of various production strategies and to define control measures for optimization of operating costs.



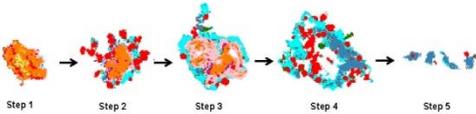
Client: Mega Precious Metals Inc.

Vision: Development of an integrated process for gold recovery with coproduction of tungsten.

Innovation / Actions: Initial work has been completed by our team to identify a technical strategy for production of gold doré and co-production of tungsten concentrates and/or ammonium paratungstate. Bench scale optimization studies to assess the flotation reagent scheme, gravity separation and leachability of gold by conventional sulphide oxidation – cyanide leaching techniques. A process simulation – economic model was also developed to identify target run-of-mine ore grades as an integral part of mine plan development and technical – economic assessment of production alternatives.

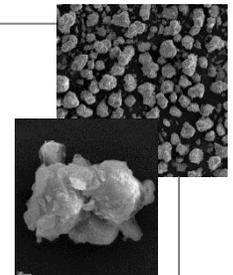


Client: Nui Phao Mining Company Limited



Vision: Assessment of hydrometallurgical operating parameters for optimum product purity.

Innovation / Actions: Thibault & associates Inc. conducted bench scale pressure leaching, solution purification and locked-cycle crystallization tests to assess optimum operating conditions for achieving the target product purity. The test program was based on the treatment of scheelite concentrate produced by pilot flotation Programs and recommendations were also developed relative to optimization of process conditions to improve on tungsten concentrate quality produced by operations. Original design of the preconcentration and ammonium paratungstate flowsheet was developed by our firm as a conceptual flowsheet. Optimum purity of the sodium tungstate solution is required to achieve high quality ammonium paratungstate for hard steel and wire filament production.



Client: Canadian Zinc Corporation

Vision: Assessment of added-value process options to improve on earning potential of base metal

Innovations / Actions: Our firm has conducted bench scale testing for hydrometallurgical treatment of base metal concentrates and has developed dynamic economic models to assess alternative processing methods for removal of impurities and/or production of added value metal products. Various add-on processing technologies have been identified to improve on revenue relative to selective flotation process technology. Process simulation and conceptual economic models have been developed for each option to identify added value development opportunities.



Client: Avalon Rare Metals Inc.

Vision: Development of hydrometallurgical flowsheet for production of a mixed rare earth carbonate product.

Innovation / Actions: Thibault & Associates Inc. completed an in-depth review of process chemistry for extraction of rare earth elements (REEs) from zircon and other refractory REE-bearing minerals. Bench scale testing of the alternative flowsheet completed by our firm demonstrated high recoveries of REEs, zirconium, niobium and tantalum to the PLS and reduced carryover of impurity elements to downstream unit operations. A fully integrated dynamic economic model was constructed to compare the capital and operating cost and overall earning potential of production alternatives.



Project Profiles - Chemical

Client: Argex Titanium Inc.

Vision: Process intensification of existing process.

Innovation / Actions: Thibault & Associates Inc. completed a detailed review of chloride hydrometallurgical process development testing and process design documentation completed to date. A gap analysis was completed describing the existing status of the process development and design, the desired outcomes, and specific steps to be taken to minimize technical risk for a 50,000 tonne per year titanium dioxide pigment product facility.



Client: Roycefield Resources Ltd.

Vision: Produce high-purity antimony trioxide as flame retardant for the aircraft plastics and electronics industries.

Innovation / Actions: Our firm has developed a technology to prepare antimony trioxide from sulphide concentrate. The process included a cost-saving reagent regeneration circuit that was patented by the client. We built and operated an on-site pilot facilities to prove the process

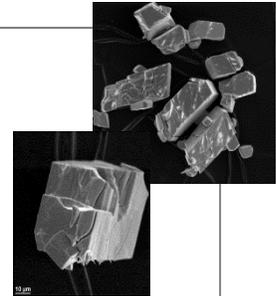
technology and to produce antimony trioxide for market trials. We also conducted a FEED study for the production of 2000 t/yr of antimony trioxide.



Client: Adex Mining Inc., Tiberon Minerals Limited, Dept. of Natural Resources

Vision: Development of process technology and semi-detailed design / cost assessment of APT production from tungsten concentrate.

Innovation / Actions: For over 25 years, our firm has worked on the development of process flowsheets for several tungsten projects including the production of high purity ammonium paratungstate. Our team of professionals has worked closely with North American end users such as Sylvania and Kennametal for development of tungsten hydrometallurgical process chemistry to provide optimum product purity to exceed industry standards. Thibault & Associates Inc. has also developed process simulation and dynamic economic models for semi-detailed design of ammonium paratungstate production facilities based on processing technologies developed in China and North America.



Client: Canadian Magnesium Corporation

Vision: Economic assessment of alternative process technologies for magnesium chemical production from asbestos tailings / carnallite brine and the development of proprietary process technology.

Innovation / Actions: Our firm developed a process technology for the production of high purity magnesium oxide with co-production of precipitated silica, based on re-processing of asbestos tailings located in Baie Verte, Newfoundland. The process technology was developed by bench scale prototype and mini-pilot testing to confirm product quality. In addition to the development of unique main stream process chemistry using chloride hydrometallurgical processing methods, the economics of the process technology was based on the development of technology for the regeneration of acid and base reagents from waste streams. The process technology has also been adapted to the development of production strategies for carnallite (potassium magnesium chloride) brines, based on the co-production of magnesium and potassium chemicals.



Client: Various firms in the chemical industries (confidential studies)

Vision: Client assessment of business opportunities and production strategies.

Innovation / Actions: Thibault & Associates Inc. has conducted several preliminary front end assessment studies for various clients in the chemical industries or resource based clients assessing alternative production strategies for value-added commodities. The extensive list of chemicals for which our firm has completed an assessment of alternative technologies and production costs include carbon black, antimony trioxide, zinc phosphates, potassium sulphate and potassium chemicals, tin oxide, lithium hydroxide, rare-earth / lanthanide oxides and high purity metal complexes for electronic such as gallium, germanium and indium.





Project Profiles – Industrial Process Water Treatment

Client: AV Nackawic Inc.

Vision: To identify design and operational issues that may be limiting system performance.

Innovation / Actions: Our firm completed a review of process flowsheet and mechanical equipment design as well as a review of system operating practices to identify limitations to the process water treatment system performance. The original work scope included a comprehensive in-plant sampling program and performance assessment of the water softener system, which provides softened water to meet stringent product quality standards for dissolving grade pulp. Fouling of the ion exchange resin as a result of excessive carryover of suspended solids and bacteria from the process water treatment system was identified as the primary cause of operational issues within this system and the scope of the performance assessment was expanded to include the entire raw water treatment system. A comprehensive program for water quality profiling throughout the raw water treatment system was completed as well as a bench scale test program to optimize on raw water conditioning parameters. Several recommendations were made to improve the overall system operability and performance including optimization of raw water chemical conditioning, conversion of the boiler feedwater and process water gravity filters to dual-media to comply with original system design specifications and changes to gravity filter backwash operating procedures to reduce effluent turbidity.



Client: Iron Ore Company of Canada (IOC)

Vision: Assessment of recycle water composition and evaluation of recycle water quality impacts on iron ore production processes to include identification of a process flowsheet to improve on recycle water quality and treatment of tailings / water clarification.

Innovation / Actions: Thibault & Associates Inc. completed a review of the overall water balance for IOC's concentrator and pellet plant and assessed impacts to various process systems based on the use of recycled process water from the tailings management system. Detailed analysis and predictions of recycle water quality were established to provide a basis for flowsheet design, equipment selection and costing of systems required to deliver recycle water of suitable quality for re-use as process water in flotation and magnetic separation circuits, boiler feedwater makeup, and for gland water and heat exchange systems. Our firm completed test programs and process design for optimum clarification and chemical treatment of the tailings recycle water to allow for re-use of up to 75% of the effluent within concentrator and pellet plant operations thus significantly reducing fresh water requirements. The project also identified several design and operating factors to reduce capital and operating costs associated with the installation of upgrades to the tailings management system, which included unit operations for recycle water treatment that effectively controlled the water quality to maintain process efficiency.

Client: Syncrude Canada Ltd.

Vision: To generate a dynamic model of the overall site and process water balance for prediction of reclaim water quality and assessment of treatment requirements for re-use as process water.

Innovation / Actions: A dynamic mass balance model was designed and implemented for the Aurora mine to simulate the collection, treatment and distribution of process water throughout the site. The project objectives focused on use of the model for prediction of water quality parameters at various locations within the process in order to identify treatment requirements for specific end uses of reclaim water. Treatment requirements to reduce levels of hardness ions and other site-specific contaminants were developed to allow for increased use of tailings reclaim water within the process. Preliminary recommendations for process design of reclaim water treatment systems were prepared for implementation at Syncrude's Aurora mine site.

Client: NB Power

Vision: To optimize on boiler feedwater treatment system performance.



Innovation / Actions: Thibault & Associates Inc. completed an in-depth review of boiler feedwater treatment system performance as an integral part of both the Dalhousie and Coleson Cove generating station repowering projects. Redesign of the existing chemical dosing systems and implementation of state-of-the-art reagent addition control philosophies were completed for Dalhousie GS. Optimization of reagent selection and reagent dosages for improved control of boiler feedwater impurities was completed for Coleson Cove GS.

Other Industrial Process Water Treatment Projects

- Beaver Brook Antimony Mine Reclaim Water Treatment
- Mount Pleasant Mine Process Water Treatment
- ADM Sour Water Treatment
- US Steel Boiler Feedwater and Cooling Water Treatment
- Rambler Nugget Pond Process Water Recycle System

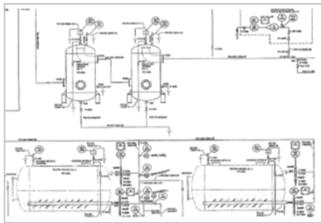
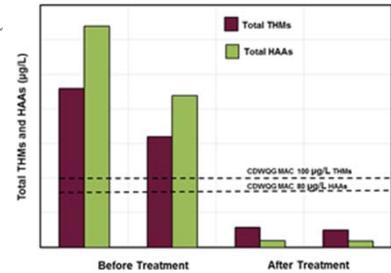


Project Profiles – Domestic Water Treatment

Client: Village of New Maryland

Vision: To identify a cost effective treatment solution to address high levels of total organic carbon (TOC) and soluble manganese present in domestic water from Production Well 3A.

Innovation / Actions: Our firm completed bench scale treatability studies to assess the technical viability of applying chemical water treatment methods to meet water quality objectives for Well 3A. Bench scale test programs resulted in the definition of a process flowsheet and operating parameters for removal of TOC and manganese using a multi-stage chemical treatment approach incorporating pre-oxidation and enhanced coagulation. Bulk simulation of the proposed treatment flowsheet resulted in significant reductions in TOC and dissolved manganese levels, 80% reduction in chlorine demand, 87% reduction in THM levels and over 97% reduction in the formation of HAAs. An ACE Class IV opinion of probable capital and operating costs was prepared to provide a basis for economic comparison of the proposed chemical water treatment process to alternative treatment options.



Client: City of Fredericton

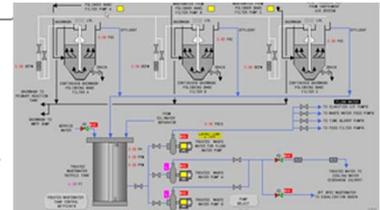
Vision: Design and construction of a fully integrated municipal groundwater treatment facility for removal of iron and manganese.

Innovation / Actions: Thibault & Associates Inc. professionals completed a fully-integrated process design package for the E. John Bliss water treatment plant. Pre-design studies included assessment of groundwater chemistry and treatability characteristics as well as a review of best available technologies for iron and manganese removal and pre-qualification of prospective equipment suppliers. Thibault & Associates Inc. personnel prepared process equipment procurement packages, process piping and instrumentation diagrams, process equipment general arrangements and process piping layouts as an integral part of the overall design of the facility.

Client: Cape Breton Regional Municipality

Vision: Installation of a state-of-the-art facility for treatment of surface water for domestic use within the community of Louisbourg, Nova Scotia.

Innovation / Actions: Bench scale test programs were conducted by Thibault & Associates Inc. Professionals for development of a process flowsheet, operating conditions and scale-up parameters for design of the Louisbourg surface water treatment plant. The combination of high total organic carbon and color with low source water alkalinity and turbidity creates challenges for conventional surface water treatment processes; however, these challenges were met with innovative chemical conditioning processes and selection of dissolved air flotation technology as the primary clarification stage. Process design elements completed by Thibault & Associates Inc. personnel included definition of the process flowsheet and process design criteria, preliminary equipment selection and definition of process equipment design requirements. Thibault & Associates Inc. personnel also assisted with plant commissioning and after-care, including remote monitoring of process control and data logging systems to provide recommendations for optimization of plant performance after start-up.



Client: Holiday Inn - Mactaquac

Vision: To identify system design and operational issues limiting the performance of the domestic water treatment system under adverse operating conditions.

Innovation / Actions: The Holiday Inn operates a compact surface water treatment system that treats raw water from the Mactaquac Head Pond for various domestic uses within the hotel. Both seasonal and short-term weather-related events contribute to rapid shifts in the influent water quality, overloading the existing in-line chemical injection and direct filtration treatment system. Thibault & Associates Inc. personnel completed a bench scale test program for assessment of alternative reagent schemes and a review of system capacity and loading restrictions. Recommendations for upgrades to the treatment system included the installation of conditioning tanks to increase retention time for coagulation-flocculation and a compact inclined plate clarifier to optimize on TOC removal and reduce suspended solids loading to the pressure filters.



Other Domestic Water Treatment Projects

- Town of Oromocto Surface Water Treatment
- Mount Pleasant Mine Potable Water System
- Moosehead Brewery Clean-In-Place Systems

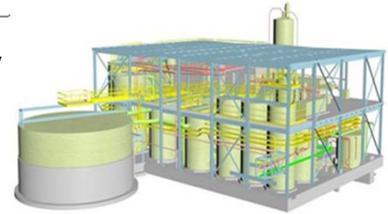


Project Profiles – Industrial Wastewater Treatment

Client: NB Power

Vision: Design and construction of upgraded industrial wastewater treatment facilities to effectively manage increased wastewater loadings from flue gas desulphurization, powerhouse and process water treatment operations.

Innovation / Actions: Our firm provided process engineering services for design, construction and commissioning of new wastewater treatment systems for both the Dalhousie and Coleson Cove Generating Station repowering projects. Process flowsheet design, operating and equipment sizing parameters were based on bench scale wastewater treatability test programs for optimized removal of heavy metals (primarily iron, nickel and vanadium), suspended solids and emulsified hydrocarbons. Thibault & Associates Inc. completed detailed engineering design including preparation of cost estimates for construction budget control, P&IDs, equipment procurement packages, equipment and process piping layout drawings and definition of operating control philosophies for all process systems. In addition, our firm prepared operating manuals and provided operator training for the new systems, as well as providing commissioning, start-up and after-care services.



Client: Rambler Metals and Mining Canada Ltd.

Vision: Installation of a compact wastewater treatment process for initial mine dewatering and subsequent mining operations at the Ming Mine site to comply with MMER effluent regulations.



Innovation / Actions: Thibault & Associates Inc. completed bench scale treatability studies on mine water from historic mine workings and successfully proved the technical feasibility of the proposed treatment concept for removal of zinc, copper, iron, ammonia and suspended solids from dewatering effluent to the Newfoundland and Labrador Department of Environment for Approval to Construct.

Our firm developed definitive process design documentation including installation cost estimates, P&IDs, process piping and electrical schematics, process equipment general arrangements and technical specifications for equipment procurement and installation contracts. Operating procedures were also developed for the system and on-site commissioning and operator training services were provided.

Client: Adex Mining Inc.

Vision: Development of process design and cost estimates for installation of a wastewater treatment system for initial mine dewatering and subsequent operation of a flotation concentrator and hydrometallurgical circuit at the Mount Pleasant property.

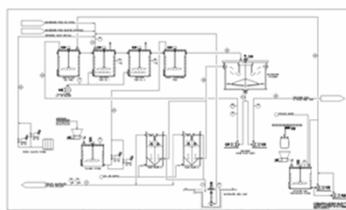
Innovation / Actions: Our firm prepared a semi-detailed design and cost estimate for installation of an integrated mine wastewater treatment system for removal of aluminum, arsenic, zinc, fluoride and suspended solids from operation of the underground mine and proposed concentrator facility at Mount Pleasant. Bench scale treatability studies were conducted on bulk samples of untreated mine water and established proof-of-concept for compliance with site specific effluent discharge guidelines. A front-end engineering design (FEED) study was prepared for the client complete with preliminary P&IDs, process piping and electrical single line drawings, overall site plan and building layout, sludge disposal cell preliminary design package, and process equipment general arrangements. Thibault & Associates Inc. also managed the execution of baseline studies and provided process design inputs for the preparation of environmental assessment registration documentation by the client's environmental consultant.



Client: Florida Light and Power

Vision: Assessment of FGD wastewater treatment options.

Innovation / Actions: Thibault & Associates Inc. prepared a preliminary design and capital cost estimate for treatment of the wastewater effluent resulting from flue gas desulphurization (FGD) and power plant operations proposed for the Manatee generating station. Process design and equipment sizing parameters for preliminary design of the system were based on a dynamic mass balance simulation of the process, utilizing wastewater flow rate and composition data supplied by prospective FGD system suppliers. Process



flowsheet design and equipment selection were based on previous experience with similar installations and the application of commercially standard unit operations for treatment of FGD blowdown wastewater.

Other Industrial Process Wastewater Treatment Projects

- NL and Labrador Hydro FGD WWT
- Iron Ore Canada Red Water Treatment
- Albert County Shale Oil WWT
- Cook's Aquaculture Net Washing Effluent Treatment
- Atlantic Beef Processors Effluent Treatment
- PCS Potash Brine WWT
- Phalen Mine WWT
- Caribou Mine WWT



Project Experience Overview

BASE METALS / NICKEL AND COBALT

Crushing and grinding of base metal ores
Flotation Copper, Lead and Zinc Ores
Bulk Sulphide and Selective Flotation of Base Metals
Chloride and Sulphate Hydrometallurgical Refining of Nickel and Cobalt
Chlorite and Sulphate Hydrometallurgical Refining of Copper and Zinc
Tailings and Wastewater Management Systems

OXIDE METALS

Multi stage grinding of Tin and Tungsten Ores
Flotation, Gravity and High Gradient Magnetic Separation (HGMS)
Production of Oxide Metal Chemicals (APT, Acids, Tin Chloride)
Titanium Oxide, Iron Oxide, Zinc Oxide
Vanadium Oxide, Antimony Oxide, Niobium Oxide, Tantalum Oxide

PRECIOUS / SPECIALTY METALS

Leaching and Refining of Gold and Silver
Extraction and Refining of Rare Earths and Platinum Groups
Extraction and Refining of Indium, Gallium and Germanium

INDUSTRIAL METALS

Ultra-fine Grinding for Specialty Chemical Markets
Upgrading and Purification by Beneficiation Technologies
Alkali and Fertilizer Production from Salts

IRON AND STEEL

Communion and Beneficiation of Iron and Manganese Ores
Magnetic Separation using LGMS Units
Hydrometallurgical Production of Electrolytic Manganese Metal
Concentrate Dewatering – In-plant Optimization
Pellet Plant Production
Red Water Treatment
Tailings Management

INORGANIC CHEMICALS

Acid and Base production by Chlor-alkali Technologies
Nitric Acid and Ammonia Production Technologies
Sulfuric Acid Production from Acid Gas
Production of Metal Oxide Complexes (Antimony, Zinc and Indium)

HEAVY OIL / METHANE AND SOLID FUELS

Combustion of Solid, Liquid and Various Fuel Blends
Fuel Storage and Delivery Management Systems
Fuel Purification and Upgrading
Combustion of Oil / Petroleum Coke / Biogas / Coal / Biomass

PETROCHEMICALS

Integrated Complex for Petrochemicals from Natural or Syngas
Production of Olefins, BTX and PVC – Synthesis and Refining

PRECIOUS / SPECIALTY METALS

Leaching and Refining of Gold and Silver
Extraction and Refining of Rare Earths and Platinum Groups
Extraction and Refining of Indium, Gallium and Germanium

ORGANIC / SPECIALTY CHEMICALS

Extraction of Organic Compound from Biomass
Refining by Solvent Extraction / Distillation of Pharmaceuticals

TRANSPORTATION FUELS

Extraction and Upgrading of Kerogen from Oil Shale
Extraction of Bitumen from Tar Sands
Hydrotreating and Refining of Syncrude
Distillation Bottom Treatment

ACID GAS TREATMENT

Flue Gas Scrubbing of Sulfur Oxides by Wet and Dry Methods
Flue Gas Amine Scrubbing of Carbon Dioxide by Amine Systems
Catalytic Conversion of Nitrogen Oxides
Waste Gas Treatment of Hydrogen Sulfide and Ammonia

WATER PURIFICATION / WASTEWATER TREATMENT

Treatment of Industrial Wastewater for Recovery of Heavy Metals
Organics, Ammonia, Cyanide, BOD and COD Removal Systems
Industrial Process Water Cooling and Reclaim Systems
Water Purification Systems for Boiler Feedwater
Domestic Water Purification Systems

HAZARDOUS WASTE

Waste Solidification and Fixation Systems
Wastewater Management Systems with Leachate Treatment
Recovery of Metals from Smelter Residues and Flash

FOOD AND BEVERAGES

High Purity Water Treatment Systems
Fermentation and Reactor Temperature Control Systems
Clean in Place Systems
Product Distillation and Refining



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