Just as Baker & O’Brien consultants often perform a technical and economic due diligence analyses for projects with commercialized technologies, we also give objective assessments for technologies that are either yet to be commercialized, or not widely commercialized. We provide this advice to both technology providers and technology end users, including potential licensees and product off-takers.

We have experience in performing this role for an array of technologies, including catalyst improvements, gasification (biomass, coke, residue, and coal), deasphalting chemicals for heavy crude oil, oxidative desulfurization of crude oil and heavy distillates, and high frequency desulfurization of middle distillates. In the middle of the last decade, we began to assess the technologies and the stage of development of a number of small scale gas-to-liquids (GTL) technology providers. As the numbers of potential technology providers continues to grow, so has our involvement with this industry.

**RELATED INDUSTRIES**

- Additional Process Industries
- Gas Processing
- Oil and Gas Production
- Petrochemical / Chemical
- Petroleum Refining
- Power Generation
- Renewable / Alternative Energy
- Transportation and Storage
RELATED EXPERIENCE

- **Bitumen Technology Evaluation**
  Provided technical expertise in evaluating new technology for upgrading Canadian Oil Sands bitumen to saleable products. Reviewed technical reports and presentations, and prepared an assessment of the technical risks associated with developing a commercial scale unit.

- **Business/Technology Valuation**
  Conducted a due diligence assessment and preliminary economic valuation of an existing business with proprietary technology designed to significantly reduce crude oil exploration and finding costs.

- **Crude Oil Sludge Accumulation**
  Following a claim concerning sludge accumulation in crude oil storage tanks over a twenty-year period, advised as to the creation of sludge in crude oil tanks, its accumulation, the ways to prevent or control it, and the conventional ways of dealing with it.

- **Defective Paint**
  Evaluated automotive paint and coatings data. Analyzed survey data for paint and coatings system performance when applied by a "big three" automotive manufacturer to determine liability contribution for coating failures. Required understanding of evolution of automotive paint and coating systems. Assisted in evaluation of economic damages resulting from coating application failures.

- **Evaluate Biodiesel Technology and Plant Design**
  Reviewed and critiqued plant design for prospective biofuels production facility.

- **Evaluate Biodiesel Technology Development and Scale-Up**
  Assessed the technology development and commercialization plan for a biodiesel production hydroprocessing facility. Our conclusions helped provide the basis for the formation of a joint business venture to construct and operate a world-scale biodiesel plant.

- **FCC NOx Allocation**
  Prepared a report of FCC regenerator nitrogen oxides (NOx) production that allowed allocation of FCC NOx from a combined refinery stack. The report was used to negotiate the allowable corporate average NOx limits with the EPA.

- **Feasibility and Economics to Produce CARB Phase 3 Gasoline and Diesel**
  Performed independent assessment of a refinery project to produce CARB gasoline and diesel. Assessment included feasibility, cost, and economics of the project. Study was performed for a prospective buyer of the refinery.

- **Formaldehyde Plant Construction Litigation**
  Assisted in a dispute concerning allegations that completion delays and poor plant performance at a European formaldehyde plant resulted in a multi-million dollar damage claim. Assisted with discovery, inspected plant, evaluated plant operating records, reviewed construction contracts, valued the plant, and calculated damages. Presented and defended conclusions at hearing.

- **Gas to Liquids Evaluation**
  On behalf of a major oil and gas producer, prepared a conceptual design for a Fischer-Tropsch based gas-to-liquids unit using low value associated gas to produce LPG, gasoline, and zero sulfur diesel. Developed estimates of charge and yield, capital and operating costs, and project development and capital spending schedules.

- **Gasification Project Assessment**
  Assisted in the evaluation of a petcoke-to-substitute natural gas facility to support possible equity investment. Assessment included review of technology, commercial issues, and economics.

- **Grassroots Refinery Feasibility Study**
Conducted a feasibility study for a grassroots refinery project that included assessment of potential crude oil supplies, various refinery configurations, and a detailed analysis of target markets and product distribution logistics. The study also included an integrated coke gasification complex to supply hydrogen, power, and steam to the refinery. Capital cost estimates were prepared and project economics were developed for a range of scenarios.

- **Marine Terminal Development**
  Reviewed design requirements and monitored construction, start-up, and operation of a project to develop a bulk liquids terminal. Work included review of dredging requirement, schedule, and interfaces between this project and a project to export ammonia from the terminal.

- **Offshore Platform Design**
  Assessed design of elevated platform and ladders on a jack-up oil derrick which was under construction. Compared design to industry standards.

- **Oil Company Privatization**
  Performed due diligence for the purchase of an integrated oil company on behalf of an investor. Inspected company assets, assessed technology, analyzed feedstock and product markets, evaluated a capital investment program, and analyzed manufacturing economics.

- **Technology Commercialization**
  Performed due diligence on a new gas-to-liquids (GTL) process to evaluate possible routes to commercialization. The work program included the following steps: verification of mass balance, comparison of laboratory and pilot plant yields, evaluation of alternative technologies, assessment of scale-up issues, review of preliminary commercial design, estimate of capital costs, and the development of an economic model that included sensitivity analyses for capital costs, yields, and prices.

- **Technology Assessment**
  Working for potential investors, reviewed plans for a grassroots lube oil re-refining facility, and advised our client regarding technology and commercial risks.

- **Technical Review**
  Performed technical review of chlor-alkali and calcium chloride processes and project plan on behalf of prospective lender. Reviewed the process design packages for the chlor-alkali and calcium chloride production facilities and provided opinions regarding the selected processes and their technical compatibility. Reviewed the project schedule and cost estimate for the facilities and provided input to the prospective lender regarding the appropriate level of contingency. Evaluated the contracting strategy and project execution plan and provided opinions.

- **Refinery Equipment Evaluation**
  Evaluate suitability of surplus equipment from a shut down refinery crude unit being sold for rehabilitation and then installation overseas.

- **Propylene Production**
  Studied the feasibility of reconstruction and expansion of a catalytic dehydrogenation plant at a large Gulf Coast refinery for the production of propylene from propane. The study included evaluation of the current technology, development of costs for reconstruction and expansion, estimation of operating costs, and assessments of regional markets for propylene.

- **Refinery Feasibility Studies**
  Assisted an engineering and construction firm in preparing feasibility studies for two projects in Russia. One of the projects was a new "grassroots" refinery project, and the other project was to build a new FCC gasoline complex in an existing refinery. Work included modeling of refinery operations and yields, analysis of feedstock and products markets, and evaluation of project...
economics.

- **Misappropriation of Trade Secrets**
  Using chemical engineering expertise, process design background, and experience in operations and manufacturing, provided an opinion on the likelihood of another firm’s ability to produce the same pharmaceutical chemical with comparable quality and value as the original product without utilizing trade secrets learned from the intellectual property owner.

- **Isobutanol White Paper**
  Evaluated the economic impact of blending isobutanol in place of ethanol for finished gasoline in various U.S. markets. Also evaluated isobutanol as a substitute for purchased alkylate in gasoline blending. Determined the highest value options for blending isobutanol into gasoline. Summarized the results in a White Paper style report.

- **Due Diligence of a Lube Re-Refining Facility**
  Conducted a due diligence analysis of technical and economic features of a lube oil re-refining plant involving a potential acquisition.

- **Reformulated Gasoline Study**
  Provided a large independent Southern California refiner an assessment of their existing processing equipment, outside feedstocks to be purchased, and new capital investment necessary to produce reformulated gasoline for consumption in the most regulated gasoline market in the world.

- **Plastics Recycling Feasibility Study**
  Evaluated a small German refinery for potential conversion to a plastics recycling plant. Assessed technology, retrofit requirements, operating costs, and logistics. Presented economics, capital investment plan, and likely subsidy requirements to the board of directors.

- **Privatization of Olefins Plant**
  Evaluated an olefins plant for competitiveness in operating costs, yields, feed supply, and product marketing. Identified and documented strengths and weaknesses and presented the key initiatives, which would be needed to ensure a successful transaction. Estimated the fair market value.

- **Upstream Process Equipment: Intellectual Property Infringement**
  In support of a dispute between a technology owner and a manufacturer, provided an opinion on the likelihood or not of another firm’s ability to produce the same equipment with comparable features as the original product without utilizing trade secrets learned from the intellectual property owner.

- **Gasification Process: Unauthorized Use of Proprietary Trade Secrets**
  In support of a dispute between a technology owner and a start-up company, provided an opinion regarding the extent to which the start-up company may have relied on confidential and proprietary trade secrets, know-how, and other specific process information. In developing an opinion, reviewed all pertinent technical information, including experimental results and plant data, design details, and drawings from each party. Engineering and design experience provided the background needed to understand if proprietary information had been incorporated in a new design.

- **Acetic Acid Process: Intellectual Property Infringement**
  Using chemical engineering expertise, process design background, and experience in operations and manufacturing, provided an opinion on the likelihood of another firm’s ability to produce the same organic acids with comparable quality and value as the original product without utilizing trade secrets learned from the intellectual property owner.

- **Shale Oil Prefeasibility Study**
  Assisted client with determining the economic optimum product quality for Synthetic Crude Oil (SCO) to be produced from retorted
shale oil. Determined the potential impact of various SCO qualities on refining customer process units and estimated the potential revenue changes that would result from adjustment of these qualities.

- **Storage Tank Foundation Failure**
  Following the failure of a storage tank foundation, we reviewed the applicable documentation and prepared an affidavit concerning the standard of care used during its construction.

- **GTL Technology and Cost Evaluation**
  Evaluated the technology, cost estimate and financial model for a small scale GTL project to convert natural gas to liquid specialty products. The project evaluation included a review of the synthesis gas process, Fischer-Tropsch (FT) reactor technology, product recovery and product separation. The project definition and stage of development were evaluated for technology risk, cost estimate range of accuracy and suitability of the financial model assumptions.

- **Crude Oil Pipeline System Due Diligence**
  On behalf of an investment group, provided technical and operational due diligence of an interstate (FERC regulated) crude oil pipeline system. Our focus included the review of asset integrity, design, system capacity, and operating costs of an existing asset and the design, project execution plan, schedule, cost estimate, and projected operating costs of a proposed pipeline.

- **Refinery Feasibility Study**
  Evaluated the economic feasibility for constructing a new grassroots refinery in the U.S. Mid-Continent. Developed a forecast for the feedstock and product prices. Utilized preliminary process design data to construct an economic model for two different refinery configurations. Identified the major variables which impacted the refinery economics.

- **LNG Due Diligence**
  On behalf of potential offtakers and equity investors of train one, performed a technical due diligence and risk assessment of a two-train liquefaction project, including common use of certain existing regasification facilities. Work completed during the development phase of the project involved the evaluation of pre-completion risks and post-completion risks, including a review of planned and existing facilities. CAPEX, contractor capabilities, construction schedule duration, and OPEX were reviewed for appropriateness and risk of overrun. Subsequent follow-up work included a review of an Open Book Estimate (OBE), a project risk evaluation (reviewed and quantified pre-FID and post-FID cost and schedule risk), and an assessment of the project’s draft environmental impact statement (EIS).

- **Nitroparaffin Manufacturing Evaluation**
  Evaluated technology and patents related to the production of nitroparaffins.

- **GTL Technology Assessment**
  Assisted company in evaluating a larger equity investment in a GTL technology company by visiting the prototype unit, reviewing process data, and assessing the potential market.

- **Waste to Liquid Process Evaluation**
  Performed an economic and technical screening evaluation for a client-provided process for conversion of animal waste to hydrocarbon products. Researched current patented technology as well as investigated theoretical mass balances for feed/products.

- **GTL Facility Due Diligence**
  Performed due diligence for a company evaluating an equity investment in a GTL facility under construction. Reviewed project budget and schedule for completion. Evaluated the amount of contingency included in the budget, confirmed the status of payments to contractors and other service providers, and interviewed project representatives regarding mechanical completion and commissioning plans.
Refinery Design Review
Grassroots refinery was to be a modular-fabrication with an on-site assembly on a greenfield site in North East Africa. Due to the characteristics of the crude oil (heavy, waxy and high naphthenic acid content), process design included Visbreaker-type technology. An evaluation was made of the process design and the project economics.

GTL Technology Assessment
Provided a fatal flaw analysis, evaluated the technology application and integration, reviewed the cost estimate accuracy range, and assessed the financial model for a natural gas to wax proposed project. Particular emphasis was placed on the ability to scale-up the process, the assumptions for plant capacity and availability, and the project schedule.

Lender's Engineer - GTL Plant
Served as Independent Engineer on behalf of a major Australian bank for the construction of a GTL plant. Prepared a technology assessment, analyzed feedstock supply, and reviewed contracts. Inspected equipment and confirmed permits were in place prior to authorizing draw-down certificates. Monitored construction progress, confirmed expenditures, and compared these expenditures against budget.

Pipeline Specifications Dispute
A new pipeline owner was seeking to impose tighter diesel specifications on a pipeline. Provided an expert report and testimony regarding common carrier pipeline diesel product specifications in a regulatory hearing. The dispute was ultimately settled prior to the hearing.

GTL Facility Due Diligence
Performed due diligence for a company evaluating an equity investment in a GTL facility under construction. Reviewed project budget and schedule for completion. Evaluated the amount of contingency included in the budget, confirmed the status of payments to contractors and other service providers; interviewed project representatives regarding mechanical completion and commissioning plans.

Transmix Facility Due Diligence
Completed technical, financial, and operational due diligence analysis on behalf of lenders for an existing transmix processing facility and associated terminal. Tasks included inspection of facilities, assessment of competitive market position, and an evaluation of a new hydrotreater project for ULSD production.

Refrigerants Manufacturing Arbitration
Assisted in