ANALYSIS OF ALCAN KITIMAT SMELTER'S APPROACH IN MAXIMIZING VALUES OF THE ENGINEERING SERVICES

by

Vinh (Vincent) Dang
B.A.Sc Université Laval, 1972
B.B.A Simon Fraser University, 1989
G.D.B.A. Simon Fraser University, 2003

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Name: **Vinh (Vincent) Dang**

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Supervisory Committee:

Dr. Mark Selman
Senior Supervisor
Executive Director
Learning Strategies Group
Faculty of Business Administration

Dr. Michael Parent
Second Reader
Associate Professor
Faculty of Business Administration

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SIMON FRASER UNIVERSITY

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ABSTRACT

Alcan's smelter in Kitimat is equipped with 50 year old technology and is therefore close to the end of its operating life. A major capital investment will be required sometime in the future, to extend operations at this location. Each year, approximately $100 million is spent on sustaining projects and maintenance to support smelter operations. Sustaining projects fall into two categories, one is the replacement or upgrading of existing equipment and the other is the addition of new equipment to meet changing environmental, health and safety regulations. Managing the projects generated by these sustaining expenditures is a challenge for the engineering department. With limited manpower resources, Alcan engineering has to rely on the services of engineering consulting firms. Consulting engineering firms play a key role in managing these sustaining projects by providing manpower and expertise for all project phases.

An isolated location further complicates the availability of support resources for all three major industries operating in Kitimat. Finding a satisfactory solution for both industry and consulting firms is a challenging task.

For Alcan, a long term planning strategy cannot be fully developed without consideration and promotion of a long-term business plan.

DEDICATION

This paper is dedicated to my family for their support and understanding of time away from the family due to this MBA program.

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1 INTRODUCTION

This project will address the issues facing the Alcan aluminum smelter and consulting engineering firms which support Alcan and other major industries situated in the heavy industrial district of Kitimat. The situation in Kitimat is typical of many small towns that were founded or greatly enhanced by industrial development. These towns have typically become company towns because the economy of the town depends very much on a particular industry such as a mine, a sawmill, a pulp and paper mill, a fish processing plant, etc. Normally, these towns are located in isolated areas, which do not have all facilities especially in the service areas. Industries in Kitimat, which is a heavy industrial town in an isolated area, require significant support from consulting engineering services because they do not employ enough internal engineering staff to meet their needs. The cost of recruiting, training and retaining large internal engineering staffs through the ups and downs of the economic cycle are seen as prohibitively expensive because the large companies do not hire and fire on a cyclic basis. On the other hand, this type of cyclic employment is an accepted part of the consulting business so, the consulting companies provide the flexible workforce that the major industries require.

For a long time, industries in a small remote, typically northern, towns in British Columbia have had a challenge attracting external services, such as consulting engineering services, to complement their internal expertise and resources. This paper will explore the technical needs of the industries, and the services provided by engineering consulting companies serving the community of Kitimat. Although the paper will look at these issues primarily from an

Alcan perspective, the problems and opportunities identified are applicable to the other major industries as well.

Kitimat is a town with a population of 10,000 situated at the head of the Douglas Channel. The town was formed in 1953 when Alcan was granted the water license to develop a power generating station in Kemano 70 km south of Kitimat. The objective was to utilise this power to produce aluminum in a smelter operated by Alcan and provide additional power for developing industry in the north coastal area.

Kitimat is an isolated town, with an airport located 55km to the north near the city of Terrace. Driving distance is approximately 650 km to the closest big city of Prince George, and 1,400km to the closest major metropolitan area of Vancouver.

Alcan chose the wilderness site for a new plant because of the area's deepwater harbour, flat land and hydroelectric potential. Over time the population grew and two additional major industries, Eurocan (Pulp and Paper) and Methanex (Petrochemicals) came to the town. In recent years, industrial downsizing has resulted in a population decline from a peak of 15,000 to the current level of 10,000.

Alcan Inc. is a diversified aluminum company including vertical integrated resource businesses such as power generation, bauxite mining, alumina refining, aluminum smelting, and a variety of industrial and consumer product manufacturing facilities. The company employs 70,000 people and operates in 55 countries with the head office in Montreal. In addition to the smelter in Kitimat, Alcan operates 7 smelters and is a partner in 2 others in Canada. All of these other smelters are located the province of Quebec. This provides Alcan with a pool of technical personnel, which includes engineering, research, design and development in their Quebec smelting operations.

In the mid 1980s, there was a trend toward re-engineering staff functions within corporations. As a result, Alcan corporation decided to outsource the engineering which Alcan's management team in Kitimat has no choice in the matter. As part of that initiative, a decision was made in Kitimat to outsource Engineering Services while maintaining in-house expertise in operations and maintenance. The decision was based on a detailed economic analysis conducted by the senior accounting staff at Alcan's head office which determined that outsourcing a significant portion of project engineering service was cheaper than maintaining large in-house engineering departments in each plant. Alcan has not revealed the details behind these calculations but they were based on the total costs of maintaining a full service in-house engineering department and the percentage of the costs associated with that type of department that were charged as expense and capital versus the charges from consultants that are almost 100% chargeable as capital costs.

This was a corporate decision that was forced on the plant organizations and they had no choice but to comply. The decision to outsource project engineering made sense in areas where there were a concentration of aluminum smelters such as the Saguenay region of Quebec where Alcan has six smelters and Sebree, Kentucky where the Alcan smelter is one of three aluminum smelters in close geographic proximity. These areas already had a number of established consulting engineering firms with considerable experience in the aluminum industry and there were enough plants to service in each area to provide the consultants with a solid workload base. The decision did not make as much sense in Kitimat where there was only one smelter and no consulting firms with established smelter experience.

There was essentially no risk involved in the outsourcing decision in the Saguenay or Sebree because the required expertise was available in the area. In Kitimat the decision put the future of the smelter at risk because a mistake made by a consultant due to inexperience in smelter operations could lead to improper design or equipment failure which in turn could have a

significant impact on employee health, safety or the environment. The Kitimat smelter operates in an environmentally sensitive area and a major spill could result in an order to shut it down from the provincial or federal government. The age of the smelter technology in use in Kitimat requires constant vigilance to ensure that the health of workers is protected and any mistakes that lead to increased exposure levels can bring the Workers Compensation Board into the plant. They have the power to shut down part or all of the smelter. The same thing goes for other safety issues, the older technology is inherently more unsafe than modern equipment and requires considerable technical expertise to keep it operating safely. The outsourcing decision created a dependence on consultants that results in a situation where, what negatively effects consultants in Kitimat, can negatively effect Alcan.

In order to outsource the engineering to consultants with aluminum smelting experience, Alcan approached several large consulting firms such as Bechtel and SNC Lavalin but none has expressed an interest in opening an office in Kitimat. This leaves Alcan Kititmat with the only viable option of utilizing local consultants although they do not have the required experience.

As a result of Alcan's decision to outsource, there was a rush of consulting companies setting up operations in Kitimat attempting to capture the opportunities. The strategy of all of these companies was to start with Alcan, and then extend to Eurocan, Methanex, local municipalities and the Haisla First Nation. To date, there are more than 10 Engineering Consulting Services serving the community with various capabilities and capacities. Although there are some opportunities with the district of Kitimat and the Haisla First Nation, the market for the consulting engineering in Kitimat is primarily with the three main industries: Alcan, Eurocan, and Methanex.

Even though business opportunities were created for engineering consultants, some of these consulting companies suffered losses and setbacks in the process and several did not

survive. There are many factors that contributed to the problems that the consultants had to cope with. This paper will evaluate the potential problems arising from the perspective of both the industries and the engineering consultants in the hope of providing some insights that lead to potential solutions. In a broader perspective, the relationships between the corporations and consultants will be examined in terms of outsourcing opportunities, pricing, quality of services, types of services, internal versus external expertise, understanding of operations, customer oriented service, mutual benefit relationship, expertise retention, etc.

As technical resources are the biggest assets of consulting engineering firms, the paper will also examine the problem of attracting and retaining highly qualified and motivated professionals in a small town like Kitimat where personal and professional opportunities are limited. There are a number of factors to be considered and each one has the potential to affect the decision of an engineer to; first of all accept a position in Kitimat and later, to remain in Kitimat or seek opportunities elsewhere. These factors have an impact on the engineer and the engineer's family and must be recognised by employers even though, to a great extent, they are out of the employers' control. Although the employers can not control these factors, they must strive to minimize their impact.

The problem of high personnel turnover rate in Kitimat is not restricted to Alcan and consulting engineering firms, it applies to all industries. The paper will examine in detail this particular problem as it probably has the biggest impact on the internal operation of all of the companies. Other factors must also be considered but in order to ensure success, employee retention must be a primary focus.

In addition, the paper will also examine the strategy of operating a successful engineering consulting firm based on the Michael Porter's 5 Forces Analysis. The local business opportunities will be examined and the performance of the existing consulting firms will be rated

with respect to their ability to exploit these opportunities. Also the evaluation will try to propose the roles and responsibilities of the industries and local municipality such that, with their active commitment and participation, the community and the companies will be more successful.

On the whole, this paper will not only focus on the examination of consulting engineering in the small industrial town of Kitimat, its broader perspective will take into consideration the potential in solving the issues of balancing the acquisition and provision of engineering services in any small town in a remote location far away from major cities.

While the issues are the same, the solutions to the issues raised may not be universal or typical of all small industrial towns since each location has its own complications and constraints. This paper will make recommendations to Alcan about how to manage engineering consulting firms in such a way as to maximize value. The case for this project is based on the writer's experience of working in Kitimat and his knowledge of the industrial, social and community environments in Kitimat. The observations and recommendations are based on the personal experience of the writer, the interviews of co-workers in Alcan and the interviews of engineers in the other industries and consulting firms.

2 KITIMAT HEAVY INDUSTRIES

Before we examine into the business opportunities provided by the three main industries in Kitimat, we must first understand the business within each industry. Knowledge of the business requirements and specific industrial processes involved are required before it is possible to formulate plans and develop potential engineering consulting business opportunities. With this in mind, the following will highlight some of the critical functions in each industry based partly on their specific operations as well as the general processes found in industry. It is, by no means, a detailed description of the respective manufacturing processes in the three main industries.

2.1 Alcan Primary Metal - BC

In 1950, with the agreement between the British Columbia government and Alcan, Alcan was granted the right to reverse the flow of the Nechako River, creating a large water reservoir and using the reservoir for the creation of hydro electric power, to operate a large aluminum smelter in Kitimat, British Columbia, Canada. Alcan has built the Kenny Dam in the Nechako River Canyon, the Kemano Power House, and the Kitimat smelter. The Power House is capable of producing 896 MW and the smelter can produce up to 272,000 tonnes of primary aluminum per year.

Alcan is the largest industry in Kitimat, in terms employment and economic contribution to the local community. The aluminum smelter is organized, by its manufacturing processes, into material handling (incoming and outgoing), smelting (potrooms), and casting. Since the inception of this plant more than 50 years ago, there has been ongoing maintenance and upgrading but, in general, the equipment is operating near the end of its life cycle limit. There is

an annual maintenance budget of roughly $50 million required just to keep the plant running and there are also constant upgrading projects implemented in order to upgrade and extend the life of the equipment.

The raw material, alumina, is imported from Australia where it is found in its unrefined state as bauxite. The bauxite refining process is performed in Australia and the alumina is shipped by sea from Australia to Kitimat. Alumina is comprised of two atoms of aluminum and three atoms of oxygen. To make aluminum, one must break the bond between the aluminum atom and the oxygen atom. This process requires large quantities of electricity.

At Kitimat Works, the smelting process takes place inside buildings called "potrooms." Each potroom contains bathtub-shaped steel structures known as "pots" and it is inside these pots that the electro-chemical reduction process takes place. There are more than 900 pots at Kitimat Works.

Once the aluminum is made, it is taken in its molten state from the potrooms to one of Kitimat Works' two casting centres, A-Casting or B-Casting. The metal is stored temporarily in gas-fired holding furnaces and alloying materials such as magnesium, copper, silicon, iron and manganese are added to the aluminum, based on customer's needs, to give it the required properties of strength, hardness, corrosion resistance or weldability.

Once the aluminum is ready to be cast, it is poured into moulds in a machine known as a direct chill (DC) casting machine to produce extrusion ingots (in A-Casting) as well as sheet ingots and remelt ingots (in B-Casting). This machine uses water to cool the molten aluminum once it has passed through the mould. The mould gives the aluminum its final shape.

Before the ingots can be shipped to the customer, however, they have to be inspected for flaws, heat treated, cut to length, bundled and only then can they be loaded onto the large, ocean-

going cargo vessels that take Kitimat Works' high-quality metal to markets around the Pacific Rim.

Therefore, the three main production units within the organization in Alcan Kitimat operate independently with specific equipment unique to each unit. Each production process is totally unique from each other in terms of technology, knowledge and technical process know-how.

2.2 West Fraser – Eurocan Pulp and Paper Mill

The Eurocan pulp and paper mill in Kitimat was built in 1967, and its equipment was "state of the art" at that time. Today Eurocan belongs to West Fraser Timber Co Ltd. West Fraser is an integrated forest products company producing lumber, wood chips, fibreboard, plywood, pulp, linerboard, kraft paper, and newsprint. The company carries on its operations through subsidiary companies and joint ventures owned directly or indirectly by the company's principal operating subsidiary West Fraser Mills.

West Fraser currently holds timber-cutting rights in British Columbia and Alberta representing 6.8 m^3 of Annual Allowable Cut (AAC) from which harvesting operations provide raw materials for its manufacturing operations. It has also entered into a long-term agreement for the supply of the majority of fibre required by its sawmills in the southern United States. All of the fibre requirements of West Fraser's pulp and paper mills and panel plants can be satisfied, directly or indirectly, from its own operations.

Eurocan's specialty kraft packaging papers account for 40% of Canadian sackkraft exports and 70% of linerboard exports. Processing chemicals are delivered by rail from BC, Alberta, Saskatchewan and Oregon. Data from 1997 indicated that Eurocan produced 411,098 tonnes sack kraft, liner board, and Clupak.

For more than 30 years, Eurocan has produced high quality unbleached linerboard and sackkraft paper for sale worldwide. The company utilizes the most advanced papermaking technology and manufacturing processes while operating in an environmentally responsible manner. Eurocan achieved ISO 9001 registration in May 1994. This valuable tool, provides assurance to customers around the world, and assists Eurocan in successfully increasing its product quality, reducing its variability, and continuously improving its quality system.

In 1981, West Fraser expanded into the kraft paper and container board industry by acquiring a 40% interest in Eurocan Pulp & Paper Co. Eurocan owned a linerboard and kraft paper mill, two sawmills, and partial interests in two joint venture sawmills. West Fraser increased its ownership in Eurocan to 50% in 1984 and in 1993 acquired the remaining 50%. Annual capacity at the Eurocan paper mill was most recently recorded at 450,000 tonnes of linerboard and kraft paper.

2.3 Methanex - Kitimat

In 1982, a methanol plant was built in Kitimat by Ocelot Industries, an oil and gas exploration company, to produce methanol for export. Ocelot also built the ammonia plant in 1987 to utilize a by-product of the methanol production. In 1991 the methanol and ammonia business split off from Ocelot and became the Methanex Corporation today.

Methanex was incorporated in 1992 under the Canada Business Corporations Act. It is the world's largest producer and marketer of chemical grade methanol and it has 4 production facilities around the world. Kitimat is the smallest plant among the four. The other 3 plants are in Chilie with 3 million tonnes increased to 4 million tonnes in 2005, Trinidad with 2.5 million tonnes, and New Zealand with 2.4 million tonnes per year.

The Kitimat facility is the province's only integrated petrochemical plant at tidewater, with capacity of producing 500,000MT of methanol annually, synthesized from natural gas. Methanex Corporation is the largest single consumer of natural gas in British Columbia; at 570 million cubic meters annually, and produces 1/3 of British Columbia's petrochemical output. Natural gas is supplied via pipeline from northern BC and Alberta. Petrochemical products from manufacturers based in other inland centers are transshipped to world markets through Kitimat.

3 THE NEED FOR ENGINEERING SERVICE

As mentioned in the introduction, we will focus on the need for the consulting engineering services in Kitimat by the three main industries: Alcan, Eurocan, and Methanex.

3.1 Alcan

Alcan engineering in Kitimat has gone through a full circle of re-organizing. Until the early 90's, Kitimat smelter actually was divided into three separate divisions: Power Operation, Reduction (smelting) and Casting. Each division had its own manager who reported to a different VP in the Montreal head office of the company, which was then known as Alcan Smelters and Chemicals Ltd. Under this organizational structure, each division had its own engineering department.

The Reduction division had the biggest engineering department which was called Works Engineering and it provided project engineering support for all three areas of the plant even though the other two had their own small engineering groups. Works Engineering was organized into four disciplines: mechanical, structural, electrical, and industrial plus it provided drafting services, cost estimating and project support services similar to any major consulting firm. There is no benchmark number available to compare to since there is no single point in time when an absolute number can be fixed because personnel turnover in Kitimat was always an issue but, at its peak Works Engineering employed approximately 20 draftspersons, 10 industrial engineers and technicians, 5 civil engineers and technicians, 15 mechanical engineers and technicians, 8 electrical engineers and technicians, 2 cost estimators, 2 records clerks, a departmental secretary, an engineering manager and several department heads. A comparison of these numbers with the

current organization chart included in this report shows how much smaller the project engineering department is today and it will get smaller as incumbents retire and are not replaced as per the present corporate strategy.

In 1994, Reduction and Casting were amalgamated, with Power Operations joining the group later. The Kitimat Smelter took on the form it has today as, Alcan Primary Metal, BC Operations. With the thinking that the plant was old and required a lot of attention in maintenance, the engineering department was reorganized into two groups: project engineering and maintenance engineering. The idea was to allow each group to focus on their main functions in order to support both the ongoing maintenance needs of the plant and the need to modernize and upgrade facilities through major projects.

The Maintenance Engineering groups main focus was to support the production departments by providing a quicker response to breakdowns and by honing their skills using proven techniques such as Reliability-Centered Maintenance in order to provide a higher level of reliability on the equipment.

The Project Engineering group was to focus on project management in order to provide better project results with regards to cost, time and quality on projects aimed at replacing or upgrading obsolete equipment or meeting tighter environmental, health and safety goals.

Although the organization structures were created to serve their own purposes, there is a fundamental problem related to the workload and the number of technical support personnel. Outsourcing has resulted in the number of technical personnel being reduced through attrition without replacement.

For example, the electrical project engineering has only five in-house technical personnel managing all the electrical needs in both maintenance and capital projects. And moreover, out of

the five personnel, two of them are ready to retire in less than 5 years. There are three external resources working as resident resources to the electrical project department. This situation is no better in mechanical engineering. All these internal resources are over-loaded and individual effectiveness depends very much on managing the situation with reliable external resources in their own specialized fields.

However, as mentioned in the introduction, when Alcan made the corporate decision to outsource technical services, the situation in Kitimat is very much different from the Sagueney area in Quebec. The fact that there is only one aluminum smelter in BC results in a situation where there is no consulting firm with the type of expertise or the ability to acquire the level of expertise in aluminum smelting that is required. Therefore it is not the same situation as for Pulp and Paper mills which enjoy big pools of consulting expertise in BC. The engineering consultant services for Alcan were new at that time in Kitimat and over the years, there has not been an environment conducive to attracting and retaining these consulting services. This has created a situation where Alcan's internal resources have been overloaded while external resources struggle to learn the skills to meet the needs of Alcan and to alleviate the workloads.

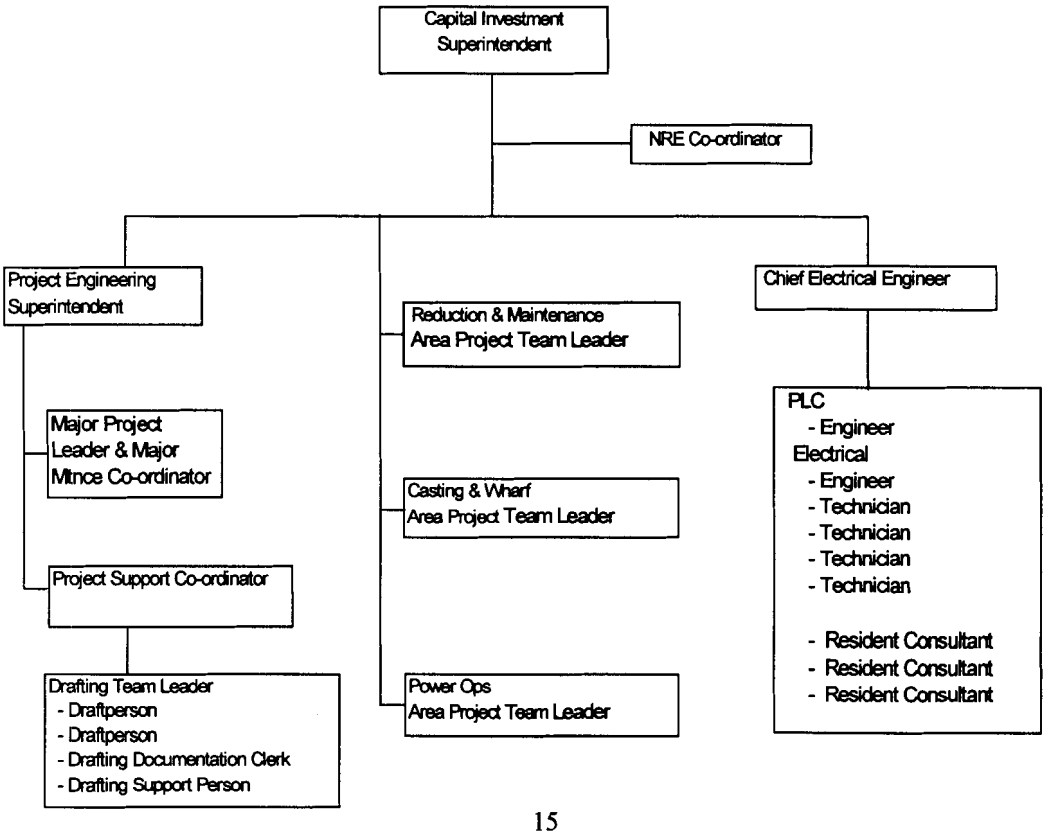
In some areas of the operations in Alcan, some critical equipment such as overhead cranes, power generation and dry scrubbers, the support for this equipment is very much depended on external resources. The failure of this equipment will shutdown some of the critical smelting process. Most of the internal expertise have since been transferred, retired or promoted without any succession.

This situation is no better in process programming where all programming for casting and reduction as well as environmental protection processes are maintained by one or two external resources. Yet, there is still no plan to hire a process programmer.

There is therefore a great challenge for Alcan to sustain its business not only to maximize its financial value but also the challenge of ensuring there are adequate technical resources to maintain reliability of its equipment and process. Moreover, there is a greater need to comply to the health and safety requirements as well as the stringent environmental policy. As such, there is really a need for Alcan to create an environment to attract and retain external resources to share the workload. Alcan needs to help the external resources to be successful in order to maximize its value.

3.1.1 Project engineering

The Alcan smelter in Kitimat was built in 1954. The physical age of the plant combined with the old technology used in the smelting process requires that maintenance and capital projects are a major focus of management attention in order to keep the smelter operating and competitive in the marketplace. To effectively deal with capital investment, Alcan Kitimat has organised the project engineering group as per the organization chart below:



Alcan has an annual capital budget that varies between $30 million and $50 million. The capital budget is divided between power operation, reduction operation, casting operation and several environmental projects. Engineering consulting fees account for an average of 15% of this budget which amounts to between $4.5 and $7.5 million.

The number of Alcan capital projects varies from 50 to 100 depending on the size and the budget of any particular year. As shown in the organizational chart, the number of Alcan engineering staff is minimal and as a result, they are fully utilized performing the project management function for these capital projects. The engineering design, construction and safety management roles for projects are mostly performed by consulting engineering staff.

In recent years there has been a steady growth in the number and size of environmental projects due to the age of the plant and new government regulations. The broad diversity of capital projects between Power Operation, Reduction, Casting and Environmental Services requires expertise in a wide range of engineering disciplines. This element of multidiscipline requirements on many projects has created difficulty for local consulting engineering firms that are hard pressed to meet the needs.

3.1.2 Maintenance engineering

Besides capital projects, Alcan also has many smaller projects less than $20,000. generated by Maintenance engineering. These projects require significant support from consulting engineering firms as Alcan does not have enough staff, particularly senior technical personnel, to respond to the problems on a timely basis.

Despite the small size of these maintenance projects, the total fees of consultants working on them is almost as much as for capital projects. The yearly maintenance budget of Alcan Kitimat is between $40 and $50 million dollars; approximate 20% is spent on external technical

assistance which generates a significant amount of work for consultants. This is an important factor since the requirements of small projects are different than those of large projects. In addition to the requirements for technical knowledge on a diversity of equipment and the need to establish personal contacts with personnel in a variety of areas, there is a critical need to be on site on short notice. The requirement to be available on short notice is a must in order to deal with maintenance problems.

Alcan's need for outside engineering services is exacerbated by the fact that there is no succession plan established by management. Over the years, with the downsizing and the retirement of experienced technical people, the in-house engineering support service has lost its ability to meet the needs of the smelter both from a volume of work and a technical expertise perspective. When this is combined with the fact that the Alcan Kitimat smelter is the only aluminum smelter in Western Canada, finding technical personnel with the necessary experience in aluminum smelting is a challenging task.

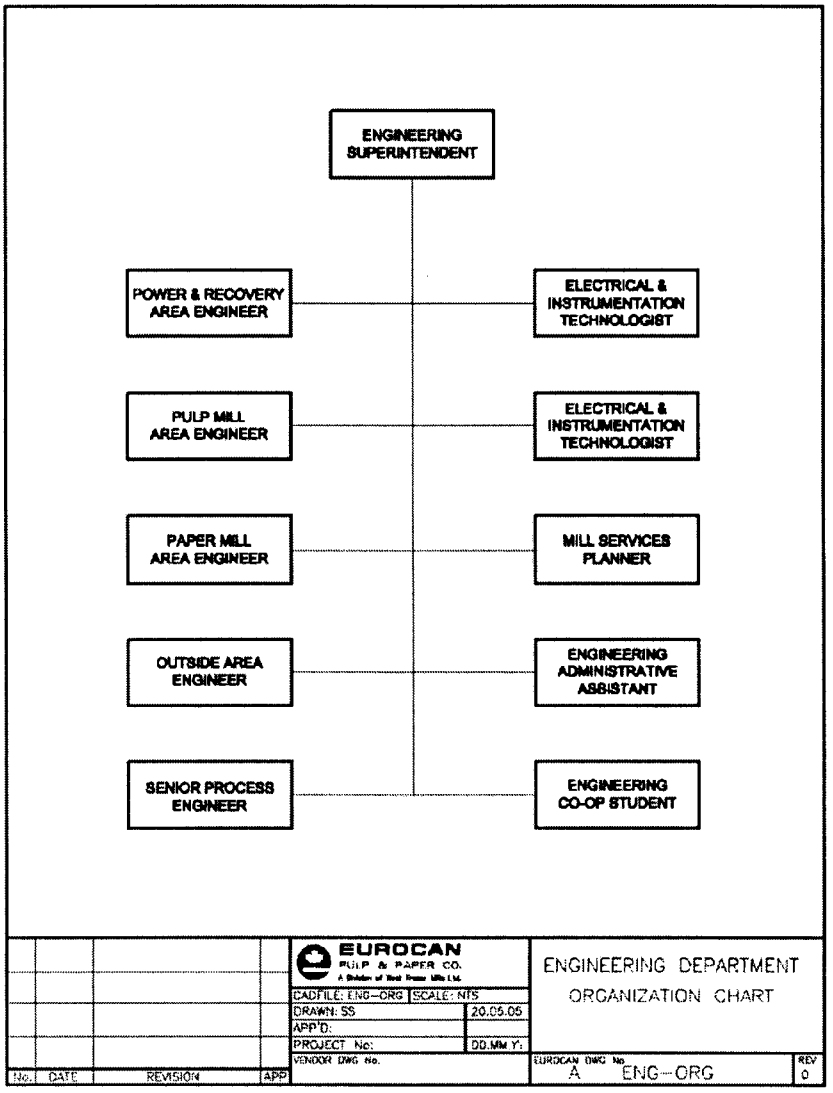
3.2 Eurocan

Eurocan was established in British Columbia in 1967. The province is the home of many forestry companies as it has an abundance of natural resources. Eurocan chose Kitimat to take advantage of the enormous wood fibre supply in the surrounding area, the wood chip availability from nearby sawmills and the shipping advantage of the port of Kitimat.

Eurocan has a yearly budget of 7 million dollars for capital projects. These capital projects need the engineering services which translate to a potential revenue of approximately $1 million to consulting engineers.

The forest industry is the number one industry in British Columbia so there are many technical people with expertise in sawmills and pulp and paper mills available. There is, however, no established forest industry based engineering consulting firm in the Kitimat area.

The Eurocan engineering organization is similar to that of Alcan since it has also downsized to a minimum size. The engineering staff looks after both project and maintenance engineering requirements so they only have enough time to perform the basic project planning and administration functions. Most if not all project work is done by outside consultants. An organizational chart has been provided by Eurocan as below:



Eurocan has close ties to a Vancouver based consulting engineering firm, Fransen Engineering Ltd. Fransen is very strong in the electrical engineering sector of the Pulp and Paper industry. Because of this, most of Eurocan's larger projects are handled by Fransen with Fransen either doing the entire job or, at least, assuming the lead role. A small number of maintenance projects are assigned to local consultants. An important factor in this relationship is that the rate that Fransen charges Eurocan is less than that of the local consulting engineering firms. The lower rate provides justification for the compensation of the travelling and living expenses of Fransen personnel. The end result is that Eurocan receives engineering service from an experienced consultant with a proven track record in their plant for the same price as a local consultant with less experience.

The use of a Vancouver based consulting engineering firm has made Eurocan less dependent on local consulting engineering firms. On the surface this would appear to be an attractive option for Alcan but it is not as simple as it seems. Fransen is an established consulting engineering firm in the pulp and paper industry. The firm supplies service to many mills across the province and as a result has an experienced cadre of engineers to supply Eurocan's needs. There is no similar consulting firm available to Alcan. There is only one aluminum smelter in BC and no consulting firm has the type of expertise or the ability to acquire the level of expertise in aluminum smelting that Fransen has in pulp and paper.

3.3 Methanex

The Methanex plant in Kitimat employs 125 people. This is a relatively a modern plant with up to date equipment consequently there is less need for maintenance work or equipment upgrades compared to Alcan or Eurocan. The company has its own in-house engineering staff

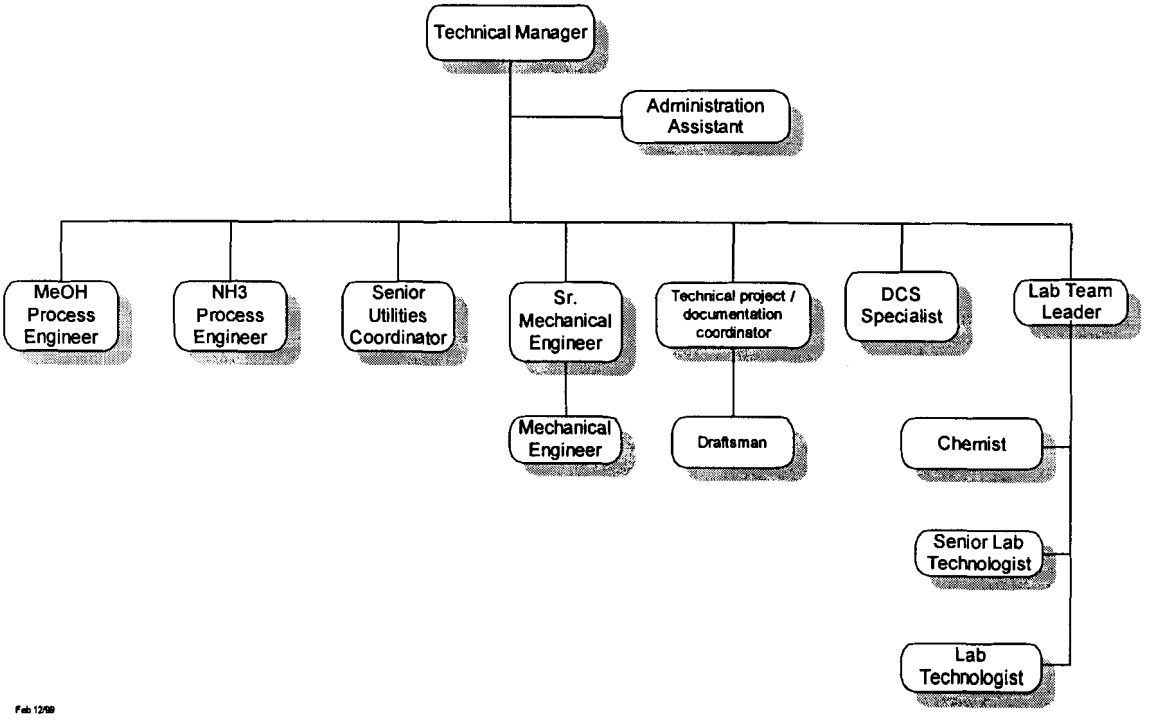
capable of doing most projects involving engineering expertise. Methanex also utilizes their corporate engineering resources when necessary.

Methanex spends approximately $400,000 per year on miscellaneous projects involving civil, structural, and electrical. These projects are small in nature and they are performed by Kitimat engineering consultants.

Methanex has a contract to purchase natural gas from Pacific Northwest Gas which will expire in 2011. The price of natural gas in North America continues to rise and is well above the price of natural gas supplies available to other Methanex plants in Chile and Trinidad. The future of the plant is uncertain and as a result, the spending on engineering projects is kept to a minimum.

Methanex technical organizational chart is as below:

Methanex Technical Department
Organizational Chart



4 KITIMAT CONSULTING ENGINEERING FIRMS

4.1 Nature of consulting engineering

Consulting engineering provides an engineering service to clients in return for fees and payments. The services provided can be broad in scope such as: design and build, project management, specific problem solving, drafting, or merely a loaning of consulting engineering personnel. Normally based outside the clients' office, consulting engineers face the same employee challenges as any regular industry employee, plus they have the burden of often having to work in unfamiliar surroundings, with relative strangers on unfamiliar equipment. If an accepted task by a consulting engineering firm is outside its normal expertise, additional problems may arise that can lead to undesirable outcomes for both the client and the firm.

4.2 Core business

Similar to any industrial firm, a consulting engineering firm's core business defines its internal infrastructure and its potential for market share. Before a consulting firm starts its incorporation, the primary stakeholder who has a vision and direction for the firm begins recruiting candidates who have expertise in a wide range of industries but specializes in a field common to the primary stakeholder. Recruitment often entails correspondence with former school colleagues, former co-workers, or references from professional colleagues. Eventually a core group of engineers of different disciplines (mechanical, electrical, civil, etc.) is formed to provide engineering service for clients. Ideally the engineering core group retains their individual

expertise but develops a collective expertise in a specific industry such as pulp and paper, mining or aluminum smelting so that their company becomes the consultant of choice in that industry.

In terms of bidding its services, a consulting firm that bids contracts within its core business will be more successful. During the process, the firm is well-aware of the scope of work and is capable of asking detail-specific questions when such areas may not be well-defined. In addition, such tasks minimize the need for requiring additional services outside the firm's expertise. By reducing these additional consulting services, communication amongst different parties is kept low, allowing the consulting firm to accurately calculate its charge out rate or fixed fee. This also reduces the need for the client to manage multiple consultants, as the majority of the work is centralized. It also allows the firm to begin building a relationship with the customer, in hopes that future work opportunities will translate into return business. If the scope of work is such that external consulting services are required, the firm may open a contract-type position or sub-contract a well-defined portion of work to another firm.

If a firm is successful in obtaining a contract that fits with its core expertise, its progress during the duration of the task is more streamlined than its competitors. In recent years, firms are pressed more than ever to meet commitment deadlines from the client. Sometimes clauses are incorporated into contracts that penalize the consulting firm for missing dated milestones. A specialized firm is most able to channel its core strengths toward meeting deadlines.

4.2.1 Multidisciplinary engineering services

With engineering projects varying in complexity from basic drafting to complete turn-key design and build projects, consulting firms have different levels of expertise in order to best serve the needs of its clients. Most consulting firms, similar to industrial firms, have in place a hierarchical structure where there are managers in different departments that look after its group

members and provide support when needed. In the beginning of a project where multiple departments are involved, managers from each department will meet to discuss the scope of work and to generate a schedule pertaining to the different tasks and its targeted completion date. This schedule will then be communicated to the client organization. A member of the client organization may assume the role of project manager while the consultant acts as designer and construction manager or, the consultant may also have the role of project manager. In projects of this magnitude, the concept of having multiple departments working concurrently and eventually merging their work into a single design package is normally employed. This has advantages of giving the firm flexibility in working on multiple projects at once depending on its progress, and it speeds up the project completion time. Throughout the course of the project, regular meetings will be set up between the firm and the client to update each other on progress.

In the event that the consulting firm does not have sufficient resources on hand to effectively complete the project, the firm will sub-contract portions of the work to one or many other firms for completion. In this situation, the consulting firm acts as the client to the sub-contracted consulting firms. The advantage of this arrangement is that it provides the opportunity to draw on the best possible combination of knowledge and expertise available among the firms. However, with multiple firms involved in the project, problems may quickly arise. One consulting firm managing another consulting firm can prove to be very difficult, especially in situations where the sub-consulting firm is located far away, such as in a different city. Not only may it prove difficult to contact the sub-consulting firm, but depending on its current workload or its familiarity with the client's process, sub-optimal work may be submitted. As more sub-contracting consulting firms are required to complete the project, the complexity of the coordination between firms increases. Problems such as an improperly designed or incomplete scope of work will appear, and much time can be wasted in discussing logistical, rather than engineering problems.

4.2.2 Specialized service

One of the business models that a consulting firm can adopt is to provide specialized services to clients, targeting small overall market share but high profit margin. The direction a firm takes depends on its internal infrastructure and the market surroundings.

If a consulting firm is starting out, its senior management could decide to build its infrastructure with a specific customer in mind. It may be for a specialized industrial process or a specific industry that the consulting firm could cater to. Depending on how successful this business strategy is, the firm will build its reputation due to its specialization and could receive additional contracts through references in the industry. However, this is dependent on the firm having enough market exposure whereby it can capitalize on this avenue of receiving additional work.

A consulting firm that is targeting a specific industry based on its local market surroundings is a way of "bringing the product to the customer" and carries associated benefit and risk. A firm that is located near the client and can provide equal engineering services as a firm located further away has an inherent advantage. Given the constraint of geography that this consulting firm accepts, it first needs to acquire knowledge of what its potential customers require in terms of engineering services. Once these needs have been identified, the firm evaluates its personnel to determine if the needs can be met and adjustments to staffing are made accordingly. At this point, the consulting firm is ready to provide its services to these firms. As contracts and services are being provided, a relationship starts to be established. If a project is executed successfully, the consulting firm's reputation is enhanced and it may receive additional business without having to go through the bidding process. However, if the work is poorly done, there could be dire consequences where the firm's reputation can be tarnished. All of the effort put forward to develop a working relationship is then in jeopardy. Another limitation with this model

is its potential for growth. The success of the consulting firm also depends on the financial situation of the client which dictates the number and value of the project opportunities.

4.2.3 Design and construction

In large scale capital projects where a significant amount of engineering is involved, consultants are used extensively to provide engineering and management services. Fundamentally, design and build projects can be broken down into 3 processes. First, a concept is developed on paper. The concept may be small scale, such as trying to implement a new piece of machinery, or large scale such as building a new and improved industrial plant. Once the scope of this concept is narrowed down, the second step is to perform the engineering. Models are used to help validate the concept and drawings are created to communicate the details of the concept. The final step is to implement the concept by building a working model and testing it to determine its actual performance against the model. In all three steps, consulting engineers play a valuable role in helping its client to successfully complete the project.

When a concept is first developed, if the company has insufficient internal resources to provide forward direction, the engineering consulting firm is hired to help oversee the entire project from beginning to end. Depending if the concept is within the firm's specialized service, the firm is able to provide insight and opinion to the client's concept. They will be able to estimate costs and provide realistic schedules for this design and build project. A good consulting firm will also be able to manage the financial aspect of the project. They can take on a budget and allocate funds throughout the different categories of work required to complete the project.

During the engineering phase of the project, the consulting firm which has established a working relationship with the client and understands its concept, begins working with the client on engineering. In the majority of design and build projects, multiple engineering disciplines are

involved. That is the main premise behind hiring a consulting firm; the client either does not have the infrastructure to support full-time engineering staff in all disciplines, or the project is too large in scale for internal staff to efficiently execute. The consulting firm will have the resources needed to carry out the engineering work to a point where equipment specifications and all engineering drawings are approved. They will also advise and support the company in obtaining any permits required by city by-laws or having legal documentation signed off. By establishing a schedule, the consulting firm is able to guide the project through the engineering phase and onto construction.

In this final phase, the consulting firm hires industrial contractors and installers who have experience with the process at hand and are able to build in accordance with the drawings presented. Undoubtedly, challenges will be presented during the build phase, but the consulting firm will work with the client and contractor to solve such issues. Once construction is complete, the consulting firm will assist the client in start-up and commissioning of this process before signing off on the project.

With the numerous steps required to successfully complete a design and build project, an experienced consulting firm can help tremendously, leaving the client able to focus on its strengths of process design engineering and daily plant maintenance.

4.2.4 Staff

In order for engineering consulting firms to remain financially viable, a hierarchical infrastructure is set up encompassing multiple engineering disciplines and specialties. In addition to senior management positions, there are managers representing each engineering discipline. These managers look after their designated discipline and report to the senior management. Managers are typically Professional Engineers (P.Engs) who over the years have shifted away

from performing engineering work towards more of a supervisory role. They are able to provide technical support for their group and can attend meetings and site visits when required. Within each discipline, a team of engineers with varying degrees of experience and expertise is represented. Engineers in training with limited experience (EITs) carry out tasks that involve project management. They look after logistical details but can also assist in engineering design when called upon. P. Engs who have worked in the industry for about 5 years are the ones heavily involved with developing engineering solutions with the client. Through the years of experience obtained, professional engineers are able to sign off on their work can provide supervision for their EITs. P.Engs also meet with the clients and help with technical design issues. Draftspersons are also a key part of the consulting firm's staff, performing drafting services for all disciplines. Normally draftspersons come from an accredited technical school (e.g. BCIT) and are familiar with codes and standards in the different engineering disciplines.

4.2.5 Engineering charge-out rates

Consulting firms can charge their services in two different ways depending on what agreements they have reached with the client. One way is for the firm to charge based on an hourly rate. In this case, the firm will provide a client a rate sheet detailing their hourly costs beside the names of the firm's staff. These rates take into account overhead costs and the experience level of each staff member. Costs are tracked by each staff member who logs a timesheet. Invoices to the client are based on these timesheets. There are inherent advantages of such an arrangement for the consulting firm. This format can provide the most accurate way of accounting for its work and can provide a firm that may not have sufficient expertise in serving the client's industry a good means of earning a profit on a project. This also works very well in cases where the scope of work may not be properly defined due to many unknowns in the client's concept.

The other way of charging its clients is on a contract basis with performance clauses. The consulting firm establishes a fixed cost to perform all its services based on a scope of work and will charge extras on top of any duties not based inside this scope. Extras may be charged on a cost plus fixed fee. Performance clauses are based on timelines that the consulting firm and client agree upon early in the project. Provided that certain measures are met at the end of the project by the firm, a performance bonus may be paid out by the client. Alternatively, if certain conditions are not met, the client can exercise the options of withholding payments or even charging back to the consultant for services not performed in a manner satisfactory to the client organization.

Through personal experience and private communications with reps of engineering firms, it has been established that the charge-out rates tend to be highly competitive with typical variance being in the 5 -10% range. However, each consulting firm views their rates as confidential so that a chart or spreadsheet cannot be provided to demonstrate this comparison. Also, the compensation to engineers is quite close to the salary survey done by the Association of Professional Engineers and Geoscientists of BC.

The fee charged by the one-person firm is normally between 15-20% lower than those charged by multiple-person firms due to the lower burden overhead on small firms.

4.3 Kitimat consulting engineering firms

4.3.1 Lapointe Engineering

Lapointe Engineering is the oldest and biggest local consulting engineering firm in Kitimat. The firm has provided professional engineering services to Kitimat and north western B.C. for the past twenty-five years. Lapointe has developed from a small staff of three employees in 1980 to its present-day staff of twenty-six employees.

Starting with municipal engineering, civil/structural, surveying and material testing, the company has expanded the services to mechanical, electrical, and project management. The focus of its industrial work is on the aluminum and pulp and paper industries, while the government, commercial and private work encompasses a broad range of engineering projects. Lapointe has done work north to the Yukon border, west to Prince Rupert (and the Queen Charlottes Islands) and east to Houston.

Recognising the fluctuations in the engineering market, Lapointe Engineering has tried not to concentrate more than 1/3 of its business on any client in order to keep a stable workload for its employees. This is in contrast with all other consultants in Kitimat which have most of their business based on Alcan. Even though Lapointe tries to diversify its workload, its dependence on Alcan has sometimes resulted in Lapointe devoting 75% of its business to Alcan work.

Lapointe business with Alcan has split between 50% projects and 50% maintenance. This has helped Lapointe to keep their workload steady as Alcan tends to use the maintenance projects to balance out their maintenance budget.

The success of Lapointe has to be attributed to its owner, who has decided to choose Kitimat as his home. He has used this idea of choosing the lifestyle of Kitimat as a criterion in employee recruiting. As a result, most of Lapointe employees are from Kitimat except a few brought in with the expectation that they would stay in Kitimat. This "Kitimat first" approach to business has helped prevent the take-over of Lapointe by other larger consulting firms.

4.3.2 DRG Engineering

DRG Engineering was started in 1996 by a structural engineer, its president. Originally, the structural engineer worked for Lapointe Engineering until he decided to break out on his own.

In the first year, the structural engineer provided the engineering support mainly for the structural engineering needs of Alcan. These needs varied from simple structural consultations related to maintenance issues to small capital and maintenance projects. DRG Engineering eventually expanded their service to Eurocan and Methanex. The one-man company grew to a 10 person operation which included one mechanical engineer and 4 structural engineers. At the present time, the volume of work available has diminished and DRG has undergone a downsizing from a 10 person peak to a 5 person operation.

DRG Engineering also has an alliance agreement with Sacre from North Vancouver in order to be able to take on multidiscipline projects but this venture has not yet proven to be of significant value to DRG.

The success of this company proves that a company can be successful if it finds a particular niche. However it also raises the question of continuing to be successful once it starts to diversify particularly when there is less work. DRG has experienced tremendous difficulty finding suitable employees as have all consulting firms in Kitimat. It has also experienced a high employee turn-over rate when employees gained experience and then decided to move on with their career elsewhere.

4.3.3 Earth Tech Kitimat

Earth Tech Kitimat is a satellite office of Earth Tech Canada which is a division of Tyco International Ltd. Originally, the office in Kitimat was established in 1996 by Reid Crowther, a Canadian company which was wholly employee owned until it was bought out by Earth Tech. Reid Crowther & Partners Ltd. specialized in industrial, environment, transportation, municipal infrastructure, and building engineering. Reid Crowther originally opened an office in Kitimat based on an established working relationship between one of their senior officers and Alcan. This

individual established a high level of credibility which developed into a strong working relationship with Alcan while he worked for another consulting firm. When he joined Reid Crowther, the relationship with Alcan continued and Reid Crowther benefited.

Reid Crowther started with a 3 person office, increased to 5 permanent local employees. The company concentrated in the disciplines of mechanical, electrical, environmental and construction management.

Once they established their credibility in Kitimat and with the active support of Alcan, Reid Crowther was awarded some larger projects such as D Lagoon to collect storm water in the wharf area, Coke Truck Washing Station to prevent the spreading of coke on the truck route, Human Machine Interface (HMI) for Conveyors in A area to give management and operators a graphical display control of the conveyor operation in A area. The biggest project awarded to Reid Crowther was the EPCM (Engineering Procurement and Construction Management) for the Wharf Alumina Unloader Project. The project had a capital cost of $17.6 million. The material handling portion (about 35% of the engineering fee) was subcontracted by Reid Crowther to Westmar Consultants which eventually led to the establishment of a Westmar office in Kitimat.

During that project, the office of Reid Crowther grew to a 12 person office plus 3 employees rotating from Vancouver. In 2000, Reid Crowther was acquired by Earth Tech. Earth Tech has been recognized as one of the leading providers of environmental, earth sciences, and waste management consulting.

Presently, Earth Tech is working on different Alcan environmental projects worth $5 million approximately. The Kitimat office is down to 5 employees who can be considered as local people since they prefer the Kitimat life style and have established with their families here.

Earth Tech has concentrated their efforts on Alcan which is about 95% of their business, the other 5% comes from Eurocan. Earth Tech also concentrates mainly on capital projects which account for approximately 90 % of their business with only 10% related to maintenance projects.

While Earth Tech has been relatively successful so far, the fluctuations of Alcan's capital projects budget has had a negative impact on its ability to retain a stable work force in Kitimat. The local office has been able to mitigate the effect of this by utilizing support from the Vancouver office as required, and therefore it has had less of a problem with the negative effects of employee turn-over. This could be considered as an advantage if the company can find a more balanced workload between projects and maintenance.

4.3.4 Universal Dynamics Ltd.

Universal Dynamics Terrace office, known as UDL, is a part of the Universal Dynamics Engineering. The parent company is Universal Dynamics Group covers a wide range of industry applications including material handling, pulp and paper, lime and cement, electrochemical, chemical, glass, power generation and distribution, and discrete manufacturing. Universal Dynamics Group has several offices in Canada and in the Washington State.

In Kitimat, UDL has done a number of electrical related projects in all areas of Power Operations, Reduction, Casting, Coke Calcining and Anode Paste plant. The idea of establishing Kitimat office is to have a local office as a front window that can bring business to the Vancouver office. Although it has brought a few projects to the head office, the local office has become more successful in supporting Alcan engineering needs locally.

With the weakness and lack of presence of other consulting firms in electrical engineering, UDL has carved a niche of electrical engineering in Kitimat. The local company with 5 employees performs all aspects of electrical engineering and project management

including design, drafting, PLC (Programmable Logic Controller) programming, construction and safety management.

Although UDL has performed the design and construction of some multidiscipline projects in Kitimat, its reputation in electrical has contributed to the success and the sustainability of UDL but also hinders the expansion of UDL in other engineering disciplines. Despite the fact that UDL has several employees in Vancouver office which can carry out multidisciplinary projects, Alcan tends to award only electrical engineering contracts to UDL.

Although 90% of its business is in Kitimat, the employees of UDL requested that the company locate its office in Terrace since they prefer that particular city as their home. UDL has done this and, although this has caused some inconvenience for Alcan, it has helped UDL retain highly valued, skilled and experienced employees.

4.3.5 Westmar Consultants Inc.

Westmar Consultants started out in Vancouver as a marine and offshore structure company. The company has expanded its service to include a diverse range of engineering and consulting services in a wide variety of disciplines. Its fields of practice include port and terminal planning and design, bulk materials handling, maritime and offshore structures, industrial structures, coastal processes, bridges and civil structures, site development and utilities, and inspections.

Westmar operates offices on the north-west coast of North America. The Canadian head office is located in Vancouver, British Columbia and the US head office is in Seattle, Washington. Westmar also specialises in smaller scale, local projects for a range of clients in both the public and private sectors.

Westmar has worked in Alcan Kitimat since the 1980's with different marine structure capital projects. The biggest project is the wharf Unloader which Westmar worked on in conjunction Reid Crowther (Earth Tech). This project led to the establishment of the Westmar office in Kitimat in 2001.

Westmar believes in training their junior staff with the hope of retaining them for a long time. With that philosophy, the office in Kitimat is suitable as a training ground. Westmar rotates their employees here after 2, 3 years of assignment in the Vancouver office.

Westmar's work in Kitimat is mainly confined to capital projects. The company has hoped to find more work in Prince Rupert as this area has recently seen a construction boom with the coal port terminal and planned container port.

The office in Kitimat has 5 permanent employees but the most recent manager has returned to Vancouver and Westmar has not been able to find a replacement. This is becoming more difficult since the provincial economy is picking up with work in the mining and oil and gas sectors.

4.3.6 Failed consultants - Sacre

With the potential abundance of work generated by the three industries in Kitimat, there have been many consulting engineering firms that tried to establish a permanent presence in the area. Most of them survived only for a short period and pulled out after a few years. There were design and drafting firms such as Accurate Drafting and Mechplus and multidiscipline engineering firms such as Veco , Philip Barratt Kaiser (PBK) and Sacre. None of these firms were able to establish themselves over the long term in Kitimat. Of the many failed enterprises we will examine Sacre, which is interesting because it offered a multidiscipline engineering and technical support service that seemed, at the time, as the right mix and balance to ensure success.

Sacre Consultants is a consulting engineering firm based in North Vancouver. Philip Sacre, the principal owner, had done some work in the Prince Rupert terminal area. He had explored the market in Kitimat and decided to open an office in the fall of 1995. Sacre bought the local drafting company Accurate Drafting since it provided them with an established link into the Alcan consulting market. Once they were established, Sacre dropped the Accurate Drafting name and used the Sacre name only.

At the beginning, the company had 6 employees, 1 principal engineer, 3 technicians, 1 safety specialist and one office manager. When the company moved the office to a bigger location in 1996, Sacre grew to a multidisciplinary engineering office with 6 engineers (4 mechanical, 1 structural, 1 electrical), 7 technicians, 1 safety specialist, 1 office manager and 1 support person. There were 5 people commuting every couple of months to Vancouver and 11 people moving to Kitimat with their families.

Sacre quickly became successfully established in Kitimat. The company's diversified staff worked on several small or maintenance projects for all three industries, Alcan, Eurocan and Methanex. This maintenance work accounted for 75% of the company's income.

The company started having problems when one of the senior engineers left. This engineer was a critical element in their success because he was a local person with a high level of credibility in the local industries. There were many attempts to replace him but engineers of his calibre were not interested in relocating to Kitimat.

At this difficult time, the principal owner – Philip Sacre – passed away. It became a struggle to replace him with a person that commanded the same level of respect and credibility that he had. The firm rapidly resembled a ship without the captain and quickly sank into a state of disarray. Less work came from Alcan and the lack of an experienced credible mechanical engineer led to the demise of the company and most of employees had to leave Kitimat.

5 PORTER 5 FORCES ANALYSIS:

Since Alcan has chosen to use the service of consulting engineering firms to support its engineering needs of Kitimat smelters, this approach has been conveyed to several consulting firms to attract tem to establish operations in Kitimat. In this section, we will evaluate the impact on engineering services from the perspectives in fulfilling the needs and requirements of Alcan. Basically, the needs and requirements from Alcan diversified operations can be categorized as follows:

a) **Needs for technical expertise to complement the in-house capabilities.**

   Most of the engineering expertise within Alcan focuses more on maintenance management and small-scale project management than capital project management. Thus, there are needs in the areas of engineering design, process improvement, equipment upgrade, and process trouble-shooting that can be supplied by outside consultants.

b) **Needs for quality services on time and on budget.**

   Due to limited in-house resources, there are needs for external engineering services to provide quality services with expected deliverables on time and on budget.

c) **Needs for project management on large-scale capital projects.**

   With limited diversity of technical expertise in engineering design and project management, there are always demands from external engineering consultants to

provide large-scale project management with diversified engineering disciplines, design expertise and successful project management.

d) Needs for emergency response to trouble-shoot problems.

Since most of the in-house expertise is maintenance focused, Alcan tends to require external expertise to assist in trouble-shooting emergency problems and follow-up with feasible solutions.

Based on the needs and requirements, we will deploy Porter's 5 Forces to analyse impacts on engineering services accordingly.

5.1 Threat of New Entrants

To examine the barriers to or threat of new entrants, we will evaluate them in term of the following criteria.

5.1.1 Absolute Cost Advantage

As the engineering requirements are mainly for smaller projects, a firm with a small number of employees and even with only one employee can enter the market easily. Combined with a very low capital investment, low overhead and relatively high profit, this makes the industry attractive to new entrants particularly for small firms.

On the other hand, the company that offers comprehensive engineering services with multiple disciplines would incur higher overhead costs in term of employee retention and benefits as well as overall business expenses. In the context of large-scale project management and multidisciplinary engineering services, which can serve the needs of technical expertise, quality

service and project management as described above, there is an advantage to capture a bigger piece of pie from the annual capital spending.

A new entrant, small or large, may need to outspend an existing firm in terms of unsuccessful bids or other opportunity chasing activities. For a one-person consultant, the reputation and close contact may help to gain certain specialized contract, but it does not guarantee additional work.. Personal relation can only go so far where the scope of work has to match the skill and knowledge of the consultant. Thus, the new entrant does not enjoy advantage of costs.

5.1.2 Proprietary Knowledge

Although the manufacturing processes such as smelting, material handling, etc. and the [s1]associated equipment are proprietary in nature to different [s2]businesses, a consulting engineer has the opportunity to gain expertise by working with the company. And most of the equipment is typical and common in the processes of other manufacturing plants – such as conveyors, scrubber systems, kilns, etc. Yet, the key of success for the business does not depend solely on technical skills but relies heavily on the marketing and interpersonal skills of the engineers employed.

5.1.3 Capital Requirements

In establishing the business as a new entrant, the capital requirements can be quite low as an engineering consultant can easily run the services from home with minimal overhead as long as he/she can serve the engineering needs. A one-person engineering consulting firm with the potential to earn in excess of $100,000 per year can be started for as little as $10,000 invested in liability insurance and operating supplies.

[s3]However, not every professional wants to take risk or to get his/her hands dirty. Starting a business with an uncertain future certainly is not a favourable option particularly for a professional who is risk averse.

On the other hand, in view of the small town dilemma, there are a limited number of professionals available, especially those with experience. This is the biggest entry barrier as these experienced professionals are limited in number as most of them already have employment. Over the years, a number of individuals have entered the market as single person consulting firms but only DRG engineering has succeeded in growing to become a viable multidisciplinary engineering firm.

5.1.4 Brand Identity

Brand identity involves mainly the quality and credibility of engineering services provided. In a one-person engineering service, personal services as well as service specialisation in a specific discipline could enhance and ensure credibility and quality over time. On the other hand, consultants with branch offices or temporary relocation of personnel suffer disadvantages in terms of building personal relationships with Alcan. These relationships are important so that technical expertise does not necessarily guarantee contracts. Thus, there is always a need to balance between the services provided with a personal touch and the expertise required to successfully establish creditability.

Given the above reasons, the threat of new entrants can be considered low to medium.

5.2 Rivalry

5.2.1 Exit Barrier

The exit barrier to the one-person engineering service is low since the cost of leaving the market is minimal. The engineering company with more than one engineer would incur the cost of severance and benefit packages along with potential lease penalties and other demobilization expenses.

In any case, the exit barrier is still considered low to medium for the engineering company and is low for one-person service.

5.2.2 Industry Concentration

So far, there is no one particular firm that has become the powerhouse with high concentration and high volume of consulting contracts in the business. Most of these consultants may have captured a big proportion of a specific discipline such as structural, mechanical or electrical. However, none of them has captured more than a quarter of the overall engineering services.

So far, there is no one particular firm that has achieved a position of dominance in the industry. Some of these consultants may have captured a big proportion of a specific discipline such as structural, mechanical or electrical. However, none of them has captured more than a quarter of the overall engineering services.

5.2.3 Fixed Cost / Value Added

In term of fixed costs, the one-person operation has an advantage over the multi-person engineering company. However, in term of providing effective solutions and quality services, it

is more difficult to differentiate between the two. One-person service tends to provide better personal touch while the engineering company could provide a better and more comprehensive multidiscipline services. But surely this is related to the types of projects.

Based on the needs and requirements of Alcan, the one-person company can provide services limited to small-scale project and emergency response to specific discipline or operation. Usually, the one-person operation is allocated to a specific area such as casting, and potroom operations, or a specific expertise such as PLC program or conveyor system, where most of the jobs are generated from existing problems and from future upgrade projects. These services have a substantial value between 10% and 15% of Alcan engineering expense.

5.2.4 Intermittent Over-capacity

In Kitimat, amount of engineering work depends very much on the needs of Alcan, as it uses more than 80% of the overall engineering service demand. Since Alcan does not fully commit regarding the amount of work required in any given time period, there is always a push and pull effect on the engineering service providers. This does not help the service providers since they always have to face the challenge of adjusting their manpower levels and recruiting and retention efforts. It definitely has an effect on the costs and profit margins of the service providers. This is especially difficult for a large engineering consultants with multidisciplinary services. Since the overhead for this large company is comparatively higher than a one-person operation, any fluctuation in projected revenue would have immediate impact on cash flow to maintain the local branch office operation. Overhead costs can easily account for more than 50% of the operation costs.

This creates a catch-22 situation where engineering service providers can not fully commit the resources required to readily provide comprehensive services which Alcan desires

because Alcan has difficulty providing them with the workload required. Alcan expects them to provide service but they cannot retain quality engineers because of the intermittent demand for engineering services. This makes it imperative for Alcan to commit to a fixed level of project work each year to allow consultants to optimize their resources.

5.2.5 Diversity of Rivals

At present, there is quite a diversity of rivals in engineering services. There is no single dominant service provider in any specific field although some specialize more than others. There are one-person vs. multiple person firms working in Kitimat. There has been increasing reliance on the one-person service provider working as a resident engineer for Alcan in specific roles and expertise.

Although there are some degrees of competition among local consulting firms to get more work, this is not a serious competition because customers within Alcan and the other industries tend to view firms and individuals as specialists and tender work accordingly. As the largest customer, Alcan seeks the services from each firm based on the expertise of their personnel with regards to the particular job at hand and, in most cases, Alcan disregards the charging rate.

The consulting engineering firms compete with each other on the basis of expertise and other non-price factors such as availability, client relationships. The rivalry can be considered as medium.

Another area which all firms compete in is for local experienced personnel. These experienced persons could possess a desirable technical skill, good communications skills, and knowledge of the Alcan Kitimat plant which makes them highly attractive. A trend that does not encourage engineering service providers to expand their business is Alcan's attempt to meet its

needs through the deployment of individual resident engineers. This takes work away from the local consulting firms and negatively affects their viability. There have been complaints by larger consultants of unfair competition due to low overhead of this one-person service. Although a large engineering consulting company has an advantage handling large-scale projects, the quantity of these large-scale projects from Alcan must be substantial, in the ball-park value of more than $3 million per annum, to make the engineering consulting operations viable. Only then can this consulting company be economical staying locally to serve smaller scale jobs too.

Thus, if Alcan can not ensure large-scale projects of more than $100,000.00 with an annual spending of more than $5 million, the large engineering companies will have difficulty staying afloat. In addition to this, if Alcan pursues a strategy to meeting day-to-day needs by deploying one-person operations as resident engineers, it will adversely affect the competitiveness of large engineering companies. In order to grow several large engineering companies locally, there is a need for Alcan to ensure the capital spending is available to provide these companies with ability to utilize the economies of scale to provide quality services. Only then can these large companies effectively and economically remain in the local area and provide both large small scale engineering support.

The corporate decision by Alcan to downsize its in-house engineering department was made at an opportune time for Kitimat management in terms of firing versus retiring excess employees. A hiring freeze had been in effect for several years prior to the downsizing initiative so there were no young engineering employees and the natural turnover rate in Kitimat, which is high by most industrial standards, had already resulted in a smaller engineering workforce. That coupled with the fact that the engineering department had a high percentage of older employees made it possible to downsize by firing a few employees and offering early retirement incentives to most of the people that were let go. Most retirees leave Kitimat for warmer and drier climates and unemployed or under employed professional leave as well so there is no significant pool of

ex-Alcan engineers available to provide support for Alcan's cyclical engineering needs either as temporary hires by the consulting firms or by Alcan itself.

5.3 Buyer Power

5.3.1 Buyer Volume and Bargaining Leverage

Although Alcan dominates a big chunk of buying power with regards to engineering services, it does not have the advantage of exercising its bargaining leverage due to the fact that there are not many choices in service providers. The fact that there is always an intermittent requirement for engineering services and needs rather than a firm demand means there is not a lot of interest from the large highly qualified service providers to locate branch offices in Kitimat.

As mentioned previously, Eurocan has the ability to utilize a large Vancouver based consulting firm which has many clients in the pulp and paper business while, Alcan has no such option since there is only one aluminum smelter in BC so there is no large consulting firm in the province with the required expertise in aluminum smelting. As mentioned in the introduction section, none of the consulting firms with experience in aluminum smelting is interested in opening an office in Kitimat. That means that Alcan in Kitimat must rely on local firms to meet the bulk of their engineering needs.

Since Alcan is the largest customer because of its size combined with its financial position, it has a tremendous amount of power over the consulting engineering firms so, the buyer power can be rated as high. The percentage of capital expenses constitute to about 70% of the overall expense in the whole region

However with all the constraints listed in section 6, this buyer power is reduced somewhat. Also in order to support the consultant base, Alcan has often tried to distribute the

workload so it can keep the key consultants busy. This has led to a somewhat lower quality of service than might be expected because no single consultant has enough business to optimize their workforce either in numbers or skill levels.

5.3.2 Threat of backward Integration

There is a possibility that Alcan may restructure to backward integrate its Engineering department to play a bigger roles in supporting the engineering services. However, it would probably focus its roles on supporting small-scale projects with less than $30,000 in scale by doing away the one-person engineering service while outsourcing the bigger ones with engineering service provider. This would reduce the engineering demands for external services by about 20% to 30%.

5.4 Supplier Power

Despite the fact that there is a need of qualified technical people in Kitimat, the supplier power of these professionals is only medium. Since Alcan is the only sizeable customer, it is very difficult for the suppliers to exercise any power. Furthermore, the demand for the service is scattered from different Alcan departments and the technical requirements are very diversified. This creates a difficulty for the service providers to cover several areas satisfactorily with comprehensive multidiscipline services. Particularly when Alcan has not made a clear policy on the service of consulting engineering, there is a problem with acquiring quality service with regards to personal touch, technical expertise and multidisciplinary engineering services.

The future of the smelter is uncertain while waiting for the decision of the smelter's rebuilt. Due to intermittent volumes from Alcan, the consulting engineering firms cannot sustain a stable workload to retain good people. The service of one-person firms, although being increased, have been intermittent as only a few of these services can sustain the business cycle of

Alcan. The successful ones, while being in demand, realize that their success is only temporary as the situation can change anytime. There is a real need for Alcan to make a commitment in terms of generating a stable volume of providers.

5.5 Threat of Substitutes

5.5.1 Switching Costs

Although there does not appear to be any penalty in switching cost for Alcan, the indirect cost associated with failed and unsatisfactory services are very high. Many projects have to be reworked or abandoned due to poor design and as a result, Alcan pays the price for the long term high maintenance. It is therefore imperative for Alcan to weigh these potential problems against costs when deciding to switch to substitutes such as outsourcing engineers.

Alcan wants to have a competition among consultants in order to retain a high quality service within a reasonable cost. However Alcan needs to be careful not to eliminate all competition and ends up with a monopoly situation which can be very costly. In a way it needs to distribute the work so that there is competition, either that or settle on one company but keep them on their toes with the threat of developing internal capacity or importing engineers as needed.

5.5.2 Buyer Inclination to substitute

Due to the risk in engaging a substitute, the inclination to substitute is minimal.

Consulting engineering service is expected to provide the required expertise with experienced personnel therefore there is no threat of substitutes. With the advance of the computer age, manual drafting has been replaced with CAD and complex calculations are now

performed by software but, there is no substitute for experienced personnel. This is particularly true when the service required is related to maintenance. Trouble shooting and design require a technical person to visit the site. Therefore, the threat of substitutes is rated as low.

But there are two obvious substitutes mentioned in comments on the last section: internal engineering capacity and non-Kitimat based engineering firms.

5.6 Key Success Factors

Based on the analysis above, there are several key success factors for Alcan as follow:

5.6.1 Volume Commitment

There is a need for Alcan to commit to a stable volume with quality engineering service providers to ensure their commitment to continue providing the quality services and enhanced personal touch. Otherwise it becomes a chicken-and-egg scenario where both sides will end up a loser.

Once the established firms are driven out from Kitimat, the cost in any future large-scale projects can be substantial with the outlay amount of more than 30% extra in total cost. Moreover, the relationship between the engineering personnel would be adhoc without after-services on the completion of project. On the whole, it would increase the risk of project by more than 40%.

5.6.2 Diversity of Rivalry

Although there appears to be enough diversity among the service providers to provide a rivalry in the market, there is not a strong differentiation among the rivals. Lack of direction from Alcan engineering regarding the type of service that they desire to meet their needs, one-

person consultants, multiple person firms, locally based or branch office operations, etc. has created a mix bag of suppliers.

The heavy use by Alcan of one-person service providers has not improved the differentiation in term of engineering expertise. For most occasions, the use of one-person service providers is not based on cost but rather on its personal service i.e. the expertise and the fast response. Particularly when it comes to bring a failed piece of equipment back to service, it requires fast trouble shooting by an experienced person. Moreover, most if not all of these one-person consultants are technician and technologists who specialize in process control programming in various specialized process such as casting process, as well as specialized process equipment, such as Allen Bradley PLC.

This has a huge effect on the larger consulting firm if the firm only has one key person working in this particular discipline. Since this person works on large and small projects, his response could be slower to the service required. If maintenance projects are 50% of this person workload, taking away this work also means that it doubles the cost to the employer to retain the service of this person.

While there is a temptation to use one-person consultants for cost and expediency, this may not be in the long term interest of Alcan. There is a need to balance the use of service providers and reduce the use of single person services to provide consulting firms the opportunity to expand and diversify thereby creating service differentiation in width and depth.

6 THE CONSTRAINTS

6.1 Engineering market constraints:

At first glance, considering the presence of three major industries, the market for engineering services in Kitimat appears to be large and diverse. This apparent size and diversity has attracted the interest of many consulting engineering companies over time. In each case they analyse the situation, evaluate the market constraints and base their decision on the results of these studies. Some companies have decided that the market is not right for them while others have decided that they can be successful. Those that decided to set up shop have often found, through experience, that the engineering market constraints are far more severe than they anticipated and this has let to the failure of several of these operations.

6.1.1 Limited Work

Despite the apparent volume of work available among the three industries, the reality is that the work available is limited both in scope and in volume. There are very few large projects i.e. in excess of $1,000,000 where a consulting firm can assign one or more staff member's full time to do the engineering and installation. The bulk of the work is comprised of small construction, equipment replacement or building refurbishment projects that require engineering expertise but do not generate the long-term volume of "billable hours" that consulting firms require to stay in business. The result is that they are constantly scrambling for work trying to keep everyone gainfully employed so they can continue to operate and, at the same time, provide a profit for their owners. The nature of engineering consulting firms is that they are organized to

operate effectively on a relatively small number of large projects. But with Kitimat industries mainly limited to a large number of small projects, the smaller profit margins and shorter term work both prove difficult to employ engineering staff on a full-time basis.

6.1.2 Seasonal Work

Work in Kitimat tends to be seasonal in nature. This is not only due to the climate but to the budgeting processes of the major industries, which also follow a seasonal pattern. Typically the budgeting starts in mid-year and the final approvals are not received until close to year-end. With the exception of large projects with a multi-year life span, the project approval process lags slightly behind the main budget process. This results in an uncertainty factor since no one knows for sure what work is going to be required in the upcoming year. This affects the consultants since they too have manpower and budgeting issues and are forced to react quickly or wait according to project approvals from the sponsor.

Combine the uncertainty of the budgeting schedule with only six months of suitable construction weather available in Kitimat, and the result is that consulting firms have great difficulty keeping their employees gainfully employed on a year round basis. It is exceedingly difficult to establish a stable personnel base and an accurate charge out rate when there is work for ten people for six months and work for two people for the other six months. Add into this problem the fact that when a major project obtains approval at any point in the year, the sponsor expects the consultant to be able to devote manpower to it right away. If it happens during a period of downtime for the firm, or when the firm can perform most of the engineering in the fall or winter, it is a welcome surprise but if it occurs in spring or summer when a consultant's manpower is committed it can present a major problem.

6.1.3 Economic Cycle

There are two economic cycles that a consulting firm must contend with in Kitimat. The first one is the budget cycle, which is seasonal in nature as described above. The second, and potentially more devastating is the resource sector economic cycle. Typically the various components of the resource sector in Kitimat depend almost exclusively on international trade, which can undergo a "boom or bust" cycle. When the economy is good in the Pacific Rim, aluminium, paper and methanol sales go up. When the Pacific Rim economies slow down, so do its major industries. There are other factors related to world commodity prices and overall world demand but the cycle in Kitimat is closely tied to the Pacific Rim.

In an area with a diverse economy, consulting firms can ride out economic cycles because their work is not confined to one customer or a single sector like the resource industrial base in Kitimat. The effect of a declining economic cycle in Kitimat is multiplied for consulting firms since there is less project work available, and what little there is, is retained for the in-house engineers in the major industries. The effect of a negative economic cycle in Kitimat is not simply less work for the consultants, it can mean no work for the consultants, and it is virtually impossible for a consulting firm to stay in business through a prolonged economic downturn. This in turn means that when the economy improves, there are limited consulting resources available to meet industries rapidly increasing needs.

6.1.4 Quality of Technical People

There are major problems with the ability of consulting firms to attract and retain quality people. These problems are covered in detail in section 6.2 of this paper so in this section we will only examine the impact.

The quality and diversity of technical people on staff at a consulting firm has a direct impact on the ability of consulting firms to bid on and execute projects. If the customers do not view the personnel available as high quality engineers who can meet their needs, they are not going to offer jobs to the firm.

The term quality, when applied to engineering professionals, does not relate solely to technical expertise. Obviously there are degrees of technical competency in engineering just like there are in any other profession or trade but, for a consulting engineer working in a limited market such as Kitimat, interpersonal skills, leadership and project management expertise are equally as important as technical skills. There is no place in a small consulting office for a reclusive designer or aggressive "straw boss" type project manager even though these people might fit in well in the head office of a major consulting firm or even in a large branch office.

High quality engineers with all of the right attributes are hard to find, so faced with employee turnover due to market constraints, consulting firms are often forced to compromise on the people they hire. They can obtain young engineers with little or no field experience, which adversely affects the quality of the technical support they can provide. Or, they can hire immigrant engineers who may be highly competent from a technical point of view but lack the language skills to develop the strong interpersonal relationships required to work in a limited marketplace.

When faced with employee turnover and hiring difficulties consulting firms have attempted to bolster their manpower levels by the use of short-term "rentals". This has not been particularly successful because the very nature of rentals is that they are people who are not regularly employed for any number of reasons. They may be incompetent, unstable, or just between jobs. The fact that they are working as rentals implies a level of uncertainty that is incompatible with the desire to hire permanent, stable, competent employees.

Another approach is to utilise temporary assignments from the main office or other branch offices. This approach generally fails as well since, if these people wanted to work in Kitimat, they would prefer to be on location with a long term assignment rather than a temporary assignment. A last resort is to use engineers from the main office or another branch office and fly them back and forth between Kitimat and their home city. This approach is called "suitcase engineering" and it is not only exceedingly expensive it is simply unworkable in the long term.

6.1.5 Generalists and Specialists

The three major industries in Kitimat require a wide diversity in engineering skills and experience that few, if any, individual engineers are equipped with. There are common technical requirements of course so there is work for generalists but each industry has its own specialised requirements as well. Alcan requires experience in the aluminium smelting business and there are no related industries in BC that are a close substitute to aluminium smelting. Methanex has requirements in the petrochemical field and although there is growing expertise in BC, that expertise is located in the north east of the province far removed from Kitimat. Eurocan as a pulp and paper company has the advantage of being in a province with a wealth of experience in this field with many similar mills and processing plants.

Although 80% of the work in Kitimat is with Alcan, the success of the consulting firm is enhanced if they can support all three industries. This spreads out the overhead and eases up the impact from the business cycle. Generalists, of course, can do some types of work in all three plants but the need for site specific expertise is paramount. This does not mean that a single individual must have this tri-level expertise (although that is the ideal situation) but it means that a firm requires at least one person with experience in each industry. In addition to the purely technical expertise required, the consulting engineers need time to gain familiarity with the individual plant sites and the personnel that they have to work with at those sites. The required

expertise and site knowledge can be acquired over time, but aside from the pulp and paper industry at Eurocan, Alcan and Methanex are relatively more specialised. Engineers may deem that the skills learned as a consultant in Kitimat may be non-transferable when looking for work in a different company.

6.2 Personnel turnover

One of the most serious problems confronting consulting engineering firms in Kitimat is personnel turnover. The problem of attracting and retaining highly qualified and motivated professionals is not limited to consulting firms since the major industries face similar problems but it is a more of an issue for the consultants because of their relatively small employee base. The loss of an experienced professional is an inconvenience for the large industries but it is a much bigger loss for a consulting firm. A single employee quitting or transferring represents a significant percentage loss for a small organisation and may adversely affect the other members of the team to the extent that they consider leaving. There are a number of different causes for personnel turnover, and in many cases the decision to leave is based on dissatisfaction related to multiple professional and personal issues combined with one final trigger event that finally causes the individual to leave the firm or the area. The loss of an experienced professional or the inability to attract a skilled employee to fill a vacancy has a negative impact on the ability of a consulting firm to meet the needs and expectations of its clients.

6.2.1 Professional Reasons

Working in a small town, even with several major industries, severely limits the variety and range of work experience that an engineer can obtain. This is especially important to young professionals who want to build a resume that enhances their opportunity for advancement both

within their existing company and on the open market. The major industries often assign the "cutting edge" and "state of the art" projects to in-house engineers, both local and corporate, and leave the routine and mundane work for the consultants. The consultants, given less technical challenging work, do not have the opportunities to become more experienced hence the pool of competent engineers is limited.

In addition to work experience, most professionals require some degree of continuing education to keep their skills up to date. Continuing educational opportunities in a small town like Kitimat are limited to correspondence courses and the occasional course sponsored by one or more of the major industries. In a major departure from this approach, Alcan sponsored an MBA course from Simon Fraser University and provided the opportunity for any professional who qualified to participate, regardless of which company they worked for. This was a unique opportunity for individuals interested in an MBA but did not meet the need for technical upgrading that most practicing engineers need to keep current in their engineering discipline. With most technical upgrading classes based in the Lower Mainland, justifying the need to leave work, flying out of town, and funding the class is extremely difficult for a consulting engineer working in Kitimat.

Both the limited variety of work and the limited opportunity to upgrade technical skills have the potential to negatively impact career development and promotional opportunities. Unlike the in-house engineers who can develop a career path that is not strictly dependent on technical knowledge and ability, the consulting engineer is in danger of becoming obsolete if he does not continue to develop on the technical side through both job experience and educational upgrading. For these reasons, consulting firms have great difficulty retaining employees in Kitimat for more than a few years.

6.2.2 Limited Job Opportunities for Spouse

When a consulting company attempts to recruit or transfer an employee who is married to fill a position in their Kitimat office, one of the issues that they face is the limited job opportunities for the spouse of the candidate. Many modern families rely on two incomes to provide the standard of living that they desire and the families of engineers are no different. In most cases, if there is no job for the spouse, the engineer declines the position.

In its present state, Kitimat can best be described as a community in decline but, even in times of relative prosperity and growth, the number of jobs available for the spouse of a newly arrived professional is severely limited. If the spouse happens to be another engineer, opportunities increase, but with the possible exception of medical professionals i.e. doctors or nurses, there are few, if any, job vacancies on an ongoing basis.

For an unskilled spouse the job market is particularly bleak. The major industries hire very few new employees and are trending towards downsizing in order to stay competitive in the global market. Retail positions and other similar jobs are few and far between in a declining economy and, in a small town, they tend to go to "local people" rather than "outsiders". While this practice may be somewhat in contravention of government legislation related to employment, but it is a fact of life in a small town.

There are some people willing to take the risk and accept a position with a consulting firm in the hope that their spouse will find a job. If the spouse fails to find acceptable employment in a reasonable amount of time the stress builds and eventually a point is reached where, as a family, they must look for job opportunities elsewhere or accept a lower standard of living. Very few professionals are willing to accept a lower standard of living and the end result

is that they leave Kitimat either by transfer to another branch of their consulting firm or by leaving for a position with a different company altogether.

6.2.3 Limited Opportunities for Children

An important factor in many people's decision to move into a new neighbourhood or a new town is the reputation of the schools in the area. Although academic performance is the primary factor, such things as the variety and range of programs available for children who are not necessarily university bound, are also concerns for many parents. These are important issues in a large city like Vancouver and equally important in a small town.

Even though funding per student is roughly equal throughout BC, the larger school districts have larger budgets, which allow more flexibility and therefore a wider range of programs. An analogy in the retail sector would be that the Surrey school district operates like Wal-Mart and Kitimat is more like a corner store.

This has an effect on consulting firms when they are recruiting new employees but it also has an effect on retention since the impact of educational opportunities or lack thereof increases, as children grow older. While a parent may tolerate certain shortcomings in the elementary schools, they are less likely to be satisfied with at similar shortcomings the secondary school level.

In recent years, the annual rating of secondary schools in BC published by the Fraser Institute ranks the secondary school in Kitimat near the bottom of the list. This has had a negative impact on parents throughout the entire community and in the case of professionals with highly portable skills, it is an important factor in the decision to stay or leave. The shortcomings of the education system in Kitimat has been a direct factor in the decision of several engineers to

leave Kitimat in recent years. This has had a negative impact on the consulting firms that employed them and impaired their ability to meet the needs of their clients.

Although education is of great importance to parents, there are other factors affecting children that have an impact on their decision to permanently relocate to a community like Kitimat. Things like entertainment, recreation and competitive sports also have a bearing on the decision making process.

Of course entertainment takes many forms and with the exception of television, every other form of entertainment in Kitimat is severely limited compared to a larger metropolitan center. There is only one movie theatre with one screen that makes a valiant attempt to supply the latest hits in a timely fashion. A single screen 1950's style theatre, even with an updated sound system, can not be compared to the variety and quality of entertainment opportunities and comfort available at a modern movie theatre.

The availability of "cultural" entertainment opportunities is even more limited than movies. A concert society exists which brings in several live music shows per year and there is an amateur theatre group that puts on several plays per year but compared to a major city, the quantity and quality are not available. Parents cannot take their children to the art museum, amusement park, or aquarium because they simply do not exist.

Outdoor recreational pursuits in the traditional sense of camping, hiking, fishing and hunting exist almost at your doorstep in Kitimat although the north coast climate does provide a limiting factor. Other recreational activities are far more limited and a family that comes from an urban background and is not heavily involved in these outdoor activities will not find Kitimat particularly attractive as a permanent home.

Organized sports like hockey, soccer, swimming, figure skating, gymnastics etc. are available in Kitimat and, at the entry levels, are favourably comparable to programs anywhere in the province. The problem is at the more advanced level. With the exception of hockey, if an athlete has the potential to advance to a national or international level of competitiveness, they must leave Kitimat at an early age. The obvious limiting factor is the level of coaching available but that aside, there is insufficient high level competition to challenge the athlete and drive them to a higher level of excellence. In these instances, if the parents want their child to progress, they must move or send their child out of town. There have been examples of both approaches in recent years but in either case, there are financial and emotional costs that do not reflect favourably on the ability of firms to attract and retain professionals. Hockey is an exception to this rule because there is sufficient competition and coaching ability to carry a budding star long enough to go to university or junior hockey, which requires leaving home in most cases everywhere.

6.2.4 Health Care

Health care is an issue throughout BC and Kitimat suffers from the same problems that plague the system elsewhere but like many small towns it has its own unique problems that can, and do, negatively effect the ability to attract people to the town. The services offered by the local hospital are general in nature with no "specialists" as such. There are additional services available at the regional hospital in Terrace, which is 60 kilometers away by road, but there is no public transportation link. In most cases, if a person needs to see a specialist or have any treatment other than routine surgery, they must travel to Vancouver. This is not only inconvenient but it often requires significant out-of-pocket expenses especially if the patient is a child and one of the parents has to travel to Vancouver and stay at a hotel while the child undergoes medical treatment.

A major illness often results in a total disruption of family life as one parent stays in Vancouver to provide moral support for the child in hospital while the other remains in Kitimat to look after the rest of the family. The stresses, both emotional and economic, are difficult to deal with and if someone in the family has a chronic illness that requires frequent specialized treatment the family often leaves Kitimat. This is true for employees of all the companies in town not just the consultants but, once again, professionals have portable skills and it is much easier for them to relocate.

High turnover among medical professionals also has a negative impact on families. Similar to engineers, if medical doctors can sustain a high standard of living in the big city, there is little incentive for them to relocate. In the 50 years of Kitimat's existence, there has only been one doctor that has started and finished their career here. Typically, young Canadian doctors or more experienced foreign doctors come to town to earn money and gain valuable experience before leaving for larger centres. Presently South Africa appears to be the main source for doctors but in the past, it has been Europe. The inability to establish a long-term relationship with a doctor, especially for women and children, is a major issue. Although medical files are transferred, the personal link and trust are lost and dissatisfaction with the system grows. This has an impact on people's view of the community and is one more irritant that contributes to families leaving town.

6.2.5 Climate

The climate in Kitimat may be the single most negative factor of all when it comes to retaining employees. Its geographic location at the head of the Douglas Channel creates a micro-climate where the annual precipitation is similar to that of Prince Rupert which is famous, or more correctly infamous, for the amount of rain it receives but, in Kitimat, a significant

percentage of this precipitation during the winter months falls in the form of snow. The climate is not necessarily an issue during recruiting since most prospective employees do not understand the impact that climate will have on their lives once they live in Kitimat.

The word Kitimat or, more properly the first nations version Kitamaat, means "people of the snow" and Kitimat averages 450 cm of snow on an annual basis plus a significant amount of rain. The snow is not the white fluffy snow of the prairies or the powder snow of the ski hills. Kitimat snow is heavy, wet, slushy, back breaking, and for lack of a better word, crud. It is hard to describe to a person who has never experienced a major snowfall in Kitimat what it is like to have 70 or 80 centimeters fall in your driveway overnight. Equally difficult to imagine is having to shovel off the roof of your house to prevent it from collapsing under the cumulative rain saturated snow load. Combine this with the fact that aircraft are not able to land at the Terrace airport, the highway is closed and you have not even had one hour of sunshine in the past 30 days, it is inevitable that people say, "enough is enough, I'm out of here first chance I get".

Even if there is a low snow fall winter with only 150 or 200 cm of snow, the precipitation is still there in the form of rain. Spring, summer, and fall are also wet, so "sun worshippers" have a great deal of difficulty adjusting to life in Kitimat and it is definitely the wrong place for people who suffer from Seasonal Affective Disorder. All employers in Kitimat face the same problem and, once again, it is the professionals with portable skills who find it easiest to leave if they find that the climate is seriously affecting them or a member of their family.

6.2.6 Salary Versus Cost Of Living

The big three industrial employers in Kitimat pay good salaries but do not pay isolation premiums even though, in some respects, Kitimat is an isolated community. For that reason, local consultants cannot pay isolation premiums or salaries significantly higher than the industrial

salaries or their charge-out rates will be prohibitively high. At the same time, the cost of living in Kitimat is higher than in many other centres in BC or the rest of Canada for that matter.

Housing is relatively inexpensive but, most other necessities and luxuries are higher, so the overall cost of living is somewhat higher than most other areas. Specific costs such as vacation travel and post secondary education stand out as high cost items compared to living in a major centre. Take vacation as an example. In many cases half of the airfare to a vacation destination is the cost of flying from Terrace to Vancouver and most often a trip requires an overnight hotel stay in Vancouver on at least one leg of the trip. The option of driving to Vancouver is not particularly attractive since it is a two-day trip each way with the associated fuel, food and accommodation costs adding to the vacation expenses.

The higher cost of living for the same salary is a major factor relating to employee turnover. Once again, a new employee may not recognize the reality of the economics or, may decide it is worthwhile since he or she needs a job. Once they have lived with the situation for a while, they start looking around and asking themselves, "why am I putting up with all of the shortcomings of this place when I could be living in a more attractive location, where the cost of living is lower and making the same money?"

6.2.7 Family and Peer Pressure

This is a very subtle factor that virtually every professional working in Kitimat is subjected to even if it is not overtly expressed. It comes from family members, in-laws, professional peers, former classmates and friends. It is implied that one must not be very good at their profession if the only job one can get is in a remote backwater like Kitimat. If one were any good, then that person should be able to land a respected job in a large city. Although these thoughts are not necessarily expressed openly, they are implied in many other ways.

On top of this, the family members on both sides of the family put pressure on the worker to move closer to "home" or, to an area that is at least easily accessible. They use the well-being and development of children to create unease in the parent's minds by implying that they are being culturally or socially deprived living in such a remote centre. Grandparents complain that they don't get to see their grandchildren often enough and other family members bemoan the fact that the Kitimat branch of the family seldom takes part in family gatherings and social events.

This type of pressure wears people down over time. By itself, it may not be the cause of employee turnover but, when combined with other factors, it can have a major impact on the final decision to leave.

6.3 Uncertainty Regarding the Future

In recent years, a new factor has arisen that did not exist in the past and, that is, uncertainty about the future. For the first 40 years of its existence, Kitimat was seen as a "boom town" with an unlimited future. First Alcan established the town, then Eurocan built a plant, then Methanex followed and there were plans for other major industrial developments. Alcan had immense potential for growth with the planned expansion of the Kemano powerhouse and the future of the community was guaranteed.

The first blow to the local economy was the cancellation of the Kemano powerhouse expansion project by the provincial government in the early 1990's for environmental reasons but which were, in reality, largely political reasons. Alcan invested over 500 million dollars in the project and it was a write-off at the end. The downturn in the forest industry and increases in the price of natural gas which is the feed-stock for Methanex followed on the heels of the cancellation of the Kemano project so that all three industries were negatively effected at the same time. Suddenly the future of the community was not as bright.

In recent years, Alcan has put expansion and modernization plans on hold and has downsized its workforce. West Fraser, the owner of Eurocan, has repeatedly announced that the mill is either losing money or is only marginally profitable. Methanex has indicated that their operation is no longer competitive on the world market and will soon be shut down. This has resulted in the closure of local service and retail businesses, a crash in real estate values and created a "doom and gloom" atmosphere in the community as a whole.

The future of Kitimat is uncertain. The town will continue to exist in one form or another but the prospects for future growth and prosperity appear to be dim. The "for sale signs" on virtually every block and the vacant business and retail facilities provide a constant reminder of the condition of the community. With this as a backdrop, it is extremely hard to recruit professionals. Even those that accept positions seldom purchase houses since, although the price might be attractive, they are afraid of losing money in a falling real estate market. Because of a high vacancy rate, rental accommodation is inexpensive and, by not purchasing a house they have no ties to the community so, leaving is easy. One consulting firm, Westmar, with a branch office operation in Kitimat has actually purchased an executive home to provide accommodations for their branch manager. Their objective is to make it attractive for a senior engineer to relocate to Kitimat without risking personal financial loss in the real estate market. Even with this incentive they are having difficulty attracting and retaining personnel. If competent personnel cannot be attracted and retained, consulting firms will be forced out of business. This is an every day reality of doing business in Kitimat and it is the largest single problem facing consultants.

7 CUSTOMER ADVANTAGES AND DISADVANTAGES OF USING CONSULTANTS

Providing consulting engineering services to the client brings inherent advantages, especially if the client does not have sufficient staff to do the engineering. However, if the services provided are poor, any initial cost savings will soon lead into cost overruns. It is the responsibility of the client to keep the consulting firm accountable for all its actions so that it serves the best interests of the company.

7.1 Advantages of using consulting firms

7.1.1 No obligation

When day-to-day operations are the main thrust of an industrial plant, the number of engineering staff ready to undertake large projects is insufficient, thus requiring consulting services. When large projects have been approved to proceed, quite often the internal engineering staff is not able to efficiently handle the project. Capital projects, on top of day-to-day activities regarding plant maintenance and troubleshooting prove to be overwhelming. By having the option to call upon a consulting engineer when required, it allows the company to keep the payroll at appropriate levels. The consulting fees only occur on an "as need" basis. A side benefit of being able to contact an engineering consultant when needed is that for everyday operations, the trim staffing levels make it such that everyone is more efficient.

7.1.2 Lower Overall Cost

In general, a project cost is lower using the engineering consulting firm vs. in-house staff. as the chosen consulting firm is more cost efficient. With the expertise related to the project, the consultant will take less time to do the work.

Experienced engineering consultants, even though they charge more per hour, can utilize their level of expertise to assess the clients needs and find a technical application or solution faster and more effectively than an internal engineer and this will subsequently cost the company less. As a consultant, every project that is undertaken is different. This allows the consultant to be exposed to many different industrial applications and industrial equipment. Over a period of time, a consultant is exposed to wide variety of industrial applications and equipment and develops more knowledge in his field to the point where he/she becomes a specialist. This is in contrast to the internal engineer who may be assigned to one area of the plant and therefore has limited exposure to other industrial applications. However the internal engineer can use his knowledge of his specific area to work together with the consultant to diagnose the situation and effectively devise a solution. If the company had decided to undertake the project without the aid of a consultant, not only would time be spent in researching ways of solving the problem, the potential pool of solutions would smaller due to limited application exposure. This could translate into a sub-optimal solution with lower quality. At the end of the concept phase, an experienced consultant would be able to present plausible solutions to meet the customer's objectives and can provide recommendations. If managed correctly by the internal engineer, the consultant's efficiency in determining a solution will justify the cost charged by the consulting firm.

Due to the competitive nature of consulting engineering, consultants should normally be intently focused on providing the best services for the client. It is in the consulting firm's best

interest to provide good service for one client and to complete the project as quickly as possible so that it may entertain additional work from other clients. This mindset may be slightly different from the internal engineer. When employed by the company, there may be instances where the employee may not put out their full efforts, knowing that the chances of any negative repercussions are slight.

7.2 Disadvantages of Using Consulting Firms:

7.2.1 Higher Costs for Small Projects

When undertaking smaller scale projects, it may be more cost effective for the internal engineering staff to perform all the project tasks. With any project involving an engineering consultant, the internal engineer will be acting as the overall project manager. This requires some time spent in managing the consultants particularly keeping them accountable. For small projects where capital cost is low and the scope of work is clearly defined, it may not be financially justifiable to hire a consultant due to their increased charge-out rate. There is no set formula to decide whether or not it is economically feasible for a company to hire a consultant when a new project begins. It is dependent on the existing workload of the internal engineering staff, the staff's technical expertise relating to the project, and experience with regards to start-up and troubleshooting once the project is complete.

7.2.2 Quality of Work

The quality of work that a consultant produces directly affects the overall cost of the project and can leave a lasting impression on the consulting firm represented. If a company decides to bring on a consultant, the company assumes that the value of the consultant is justifiable. What the company does not always know is who might the consultant be, or their

previous working background in a similar project capacity. Depending on how occupied the consulting firm is, the company may not be receiving the ideal candidate for the project. On large scale projects, this may not bode well. If the consulting firm is extremely busy and short-staffed, the consultant could be working on multiple projects and may not give the company the full attention it deserves. This situation can manifest itself when the consultant is geographically far away from the client. There is more difficulty in communicating between the internal engineer and consultant in addition to the reduced face-to-face interaction.

Another problem that may arise is that once the project is underway, the consultant's performance begins to subside. At this point, it becomes nearly impossible to turn back and bring in different consultants without adversely affecting the project's schedule. There may also be situations where an engineering mistake has been made, and additional time and labor will be spent on re-engineering and correcting. Even though the company may find grounds to inquire about back charging for such a mistake, it is extremely difficult to prove such a case. The end result is the project may have a cost overrun.

When projects are not clearly defined in the beginning of the time cycle, a consulting firm that is interested only in financial gain will request more money for extras. Even though this may be justified from the consultant's point of view, the customer is now at the mercy of paying whatever price the firm will charge for the extra work.

The quality of work a consultant brings also translates into a level of confidence the company has in the consultant. If the level of confidence is low, it will require more effort from the internal engineer in managing the consultant in order to keep the quality, cost, and schedule of the project on track.

8 OPTIONS FOR INDUSTRIES COPING WITH ENGINEERING ISSUES

To cope with various issues related to engineering services in Kitimat, corporations such as Alcan, Eurocan and Methanex may utilize a variety of options to meet their specific needs and situations. Although each of these major industries has unique requirements, there are many similarities in their needs so, although the following options are explored based mostly on Alcan's needs and requirements, they are applicable to the others as well.

8.1 Use Own Resources Internally

With its existing organization structure, the Alcan engineering group provides both maintenance support as well as project planning and project management support. The strength of the in-house engineering group is process knowledge and the local plant maintenance requirements; they are not strong in the areas of equipment and facilities design. There is design expertise available within the corporation. This expertise is primarily located in eastern Canada in the Quebec smelter system and Alcan's Arvida Research and Development Center. Considerable expertise is also available from Europe through the former Alesa and Pechiney engineering and technical support groups that are now part of Alcan.

One approach for Alcan in Kitimat would be to re-structure the existing engineering group to better support the maintenance function and the smaller maintenance related projects. This would require that they focus primarily on small-scale maintenance and capital projects of less than $30K. This approach also has the benefit of providing a stable environment for training

and developing junior engineers and decreases the reliance on "resident engineers" who are external contractors presently performing this type of work but who have no attachment to Alcan career wise so they can leave at any time and take their expertise with them. This will also benefit local consulting firms since they have lost engineers and business when members of their organizations have opted to set up as their own one-person engineering services and contract to Alcan as resident engineers.

This re-structuring process would also provide better direction for the engineering consulting companies since they would have a better grasp of the technical needs and services that they would be required to supply. The consulting firms can make adjustments to their staff level with the expertise accordingly.

8.2 Use of Each Firm's Expertise

There are several engineering consultants in Kitimat that specialize in one particular engineering discipline such as electrical, mechanical or civil. There are only a few of these engineering service providers that are multidisciplinary to the point where they can offer complete comprehensive technical support. Essentially, the expertise within this group is very limited since these service providers have great difficulty retaining a wide spectrum of experienced engineers in a remote town like Kitimat.

As described above, there are two general categories of engineering work required by Alcan; namely maintenance support and capital project support that includes design, construction and project management. The maintenance support requirements are usually time-sensitive and thus, they require prompt response from the consulting engineering firms. In addition to the timing issues, these maintenance support jobs generally require technical expertise and familiarity with the processes and equipment in the plant. Most often, the consulting firms can not mobilize

resources with the necessary expertise in the time required so they are taken care of by Alcan technical personnel or by resident engineers assigned to a specific area.

The engineering services, which are more effectively supplied by consulting engineering firms, are those related to capital projects. These capital projects tend to be scheduled with both a longer lead-time and a longer duration. They lend themselves to service providers with a comprehensive multidisciplinary engineering team. The multidisciplinary engineering companies have an advantage over those with less comprehensive teams and pretty well rule out one-person service providers.

8.3 Use of a Preferred Consultant

Generally, it would be economical and effective for a corporation like Alcan to work with a few preferred consultants depending on its needs and the expertise required. The aluminum smelting process and its supporting processes such as coke calcining, liquid pitch handling and direct chilled casting are complicated and require a significant degree of knowledge transfer between Alcan personnel and engineering consultants. This takes time and it costs money as do all learning processes so, a small number of preferred consultants with stable work forces would facilitate this knowledge transfer process and save both time and money for all parties concerned.

This strategy should also help to alleviate the dilemma of manpower planning for the consulting companies involved since work could be allocated and manpower resources assigned to the benefit of both parties. This would also help create a more stable pool of expertise available to Alcan that would enhance the quality of the work performed and reduce the cost of engineering service in the long run.

8.4 Combined Consultant Work Force / Alliance Among Consultants

The option of having two or more consulting firms form a partnership to support Alcan's needs and provide a comprehensive engineering package that they can not do individually appears to be an attractive option. For the consulting companies, this is a good way to save costs in providing multidisciplinary expertise and Alcan related process knowledge without adding additional personnel or overhead costs. If the synergy between the consulting companies works well, the resulting efforts would be beneficial to both Alcan and the partnering parties.

This may, however, pose a certain level of risk for Alcan since they would have fewer bidders on jobs and this could lead to less competitive bidding and therefore, higher costs. This might also require more management involvement by Alcan personnel to ensure that there is clear understanding between Alcan and the partnering parties in term of leading roles as well as their respective deliverables. The risks can be high if Alcan is dealing with an alliance of two service providers with conflicting philosophy and objectives.

8.5 Alliance Among Industries for Consulting Engineering Work

The next option deals with an alliance among the major industries for consulting engineering services. On the surface it appears to be a possibility. There is an obvious advantage in that there would be a single pool of work available that would allow consulting firms to match their resources to the work required. This would ensure the right people were available when required on specific jobs.

Although it appears to be attractive, it would be difficult to implement and maintain this alliance. The three main industries have totally unrelated processes such that there would be no synergy between them. There are general engineering areas where they could share engineering expertise but their specialty requirements are so different that there would be no effective benefit

from such an alliance. Even with the general engineering requirements, such an alliance would require common objectives and philosophy with regards to dealing with consulting engineering firms. Each of the big three industries in Kitimat has its own distinctive "personality" with regards to objectives, process, performance, cost, quality etc. and it is highly unlikely that these differences could be resolved to the extent that such an alliance would work

8.6 Contracting Out the Engineering to big firms such as ABB or SNC-Lavalin

This option is similar to the option in section 8.3 – Use of a Preferred Consultant.

When the needs and requirements are clearly defined, contracting out the services to a large national/international consulting firm such as ABB or SNC-Lavalin makes good business sense. Since Alcan is limited in its ability to hire engineering expertise in all fields, outsourcing these services to large engineering companies becomes more cost effective. It is easier for ABB and SNC-Lavalin to attract and retain the required level of engineering expertise to their organizations because they serve multiple Alcan sites and other similar clients. Although they may require a small resident group, they can supply the service, including process related expertise, without having to permanently assign a large number of personnel to Kitimat. Alcan definitely has difficulty attracting personnel with this level of expertise, let alone retaining them.

8.7 Using Employment Service Like The Design Group Staffing Services

This option is to use a professional employment service such as the Design Group Staffing Services Inc. The company is the largest employment agency in Western Canada with over 100,000 contract personnel across Canada. The company advertises as it understands

industry challenges and it provides the client with contract, temporary, leased and full-time technical, professional and administrative personnel.

Alcan Kitimat has tried this option but it failed. Four technical people from this service were hired to support the engineering requirements for a period of one year. At Alcan, the specific needs and process related knowledge requirements for both maintenance support and project services make it virtually impossible to use a temporary employment service company. Maintenance support requires a prompt response to emergency problems and it also requires an engineer with the technical expertise and good knowledge of the existing process to trouble shoot and solve the problem. There is no time to learn when dealing with an emergency so hiring temporary help simply does not work.

The same problem exists on the project support side since few projects are of a large enough size to keep an engineer fully occupied so project engineers at Alcan have to juggle multiple projects at the same time. Few, if any, of the temporary engineers available possess the background to handle the variety of different projects that they would be required to do simultaneously. In addition to this, the very nature of the temporary engineering service work attracts individuals who are transient by nature and only interested in short term assignments which is directly counter to Alcan's needs. There is also the difficulty in ensuring quality work and any required follow-up activity with temporary employees

Alcan has attempted to use employment service engineers from The Design Group in the role of "resident engineers" but even in this role, they failed to remain on the job long enough or lacked sufficient process knowledge to provide any long term benefit.

8.8 Planning Cycle of Workload

In an effort to alleviate the dilemma of manpower planning for engineering consultants, it would definitely be worthwhile for Alcan to plan its workload in advance. This would be a major benefit to the branch office operations that could arrange for additional manpower as required. It would also help Kitimat based engineering companies with regards to recruitment requirements and the urgency of replacing an employee who has left the company.

This would focus mainly on capital projects planning but maintenance emergency calls could also be planned for if Alcan allocated work to the consulting companies based on a fixed percentage of overall maintenance activities.

8.9 Develop Long Term Plan Including Succession Plan

The Alcan facilities in Kitimat have been operated since the 1950s. Although there have been technology improvements and some parts of the plant are quite modern, the overall facility is still over half a century old. The professional workforce has been downsized through attrition and hiring controls so that, at this time, the project engineering group has an average age above 50. The equipment and workforce in the entire plant are aging and there are plans to modernize the smelter sometime in the next decade. The age demographic may play a role in the timing of the modernization plans since a new smelter of equal or even greater capacity would employ less people in all areas so that the workforce can be downsized through retirements rather than layoffs. With respect to the project engineering group there is an urgent need to develop a succession plan.

The urgency is based on the need to ensure the availability of in-house expertise. The old engineers will disappear along with the old technology but there must be new engineers available to take their place with the new technology. A decision has to be made on how to achieve this.

Alcan can maintain an in-house project engineering group, which means hiring new engineers or transferring maintenance engineering personnel into the project group. They can outsource specific expertise to preferred consultants and rely on them to maintain a knowledge base. They can rely on support from other Alcan technical groups around the world since the new technology would be in line with what exists elsewhere. They could outsource through the use of resident engineers or they could hire a single large consulting firm to handle all of their project work. Whatever course of action is chosen, a decision should be made soon to facilitate a smooth transition.

9 OPTIONS AVAILABLE TO CONSULTING ENGINEERING FIRMS

9.1 Remain Within Own Area of Expertise

For a consulting firm with a single discipline area of expertise such as mechanical, structural, environmental electrical etc., there is a business niche available to them if they are prepared to limit their work to their own expertise. In Kitimat, the majority of the work available from Alcan and the other major industries tends to be limited in scope and is quite specific with regards to discipline because it is targeted towards the solution of maintenance driven problems. In many cases, therefore, this work does not require multi-discipline engineering services.

Historically, there has always been a substantial demand for single-person consultants to serve the market to meet a particular need within an engineering discipline. Using Alcan as an example, there was a specialist in the aluminum billet sawing business who for many years supplied this type of niche service and there are similar examples still ongoing. Even relative generalists who have managed to develop a reputation for quality work with a limited number of clients within Alcan or one of the other industries have managed to carve out their own niche. This type of service with a specific, albeit limited expertise, will probably always be required and individuals or firms who are prepared to offer this service will find work available.

Obviously, this option does not allow such a consulting firm to participate in large capital projects, which require multi-discipline engineering services. In addition to this, it does not provide opportunities for the growth of the firms business which is, after all, the goal of most

consulting firms. Nonetheless, it has proven to be a viable approach for those small firms or individuals that are prepared to find and exploit a niche market.

9.2 Rotate Senior Employees

To mitigate the negative aspects of working in Kitimat that were discussed previously; consulting firms can chose to rotate senior employees. Although this might appear to be an attractive option it would be a challenge to implement and manage over the long term. It could create dissatisfaction among the senior employees who do not want to work in Kitimat, even on a limited basis, and it could also create more dissatisfaction among junior employees who could perceive that they are being treated unfairly because they are not rotated. The costs of travel and accommodations for employees who are being rotated would also impact the profitability of the consulting firm.

Rotating senior engineers would not necessarily be a viable approach to meeting the requirements of the client organizations. On the surface, such an arrangement may appear to meet the technical requirements of the client but there are other factors which are equally important. Much of the credibility of a consulting firm operating with a specific industry is related to the personal relationships and trust established between individual clients and individual consultants.

Good design engineers do not necessarily have good interpersonal skills so that, even though technical expertise is important, personality often comes into play when decisions are made to hire a consultant to do a job. Once a client forms a bond with a member of a consulting firm, the client, assuming other things are approximately equal, will be more likely to assign work to that firm. A firm that rotates out a popular consultant who has developed a good business relationship with a client organization may find themselves back to "square one" with regards to

the credibility and continuity of their business relationship with that client. Rotating personnel has a high potential to be counter productive toward building a good customer base and, as a result, it may prove to be flawed strategy that works against the long-term viability of a consulting firm.

9.3 Alliances with Other Consultants

Alliances with other consultants require a lot of compromises (give and take) between the interested parties. To make it work, these parties must share a common vision, credibility, business ethic and management style in order to create synergy and take advantage of the opportunities that this synergy provides.

In practice, a successful alliance of this type usually occurs between or among companies with different disciplines and expertise where they can combine their expertise to create an attractive package for the client organization. These alliances are often challenging regarding the issue of leading roles but it is possible to work out an agreement with compromises by all parties. Since these are typically short term alliances formed to meet the needs of a single large project the compromises must be worked out on project-by-project basis.

In practical terms, this type of alliance among consulting firms, on large capital projects which require multiple disciplines and expertise is an attractive and workable option. Alliances of this nature have proven to be successful on individual projects but there appears to have been no attempt to establish such an alliance on a continuous basis. Unless there is an actual merger of two companies such an alliance is highly unlikely due to the competitive nature of the industry and the volume of business available.

9.4 One Firm Takes Over the Other Consulting Engineering Firms

Among the options available, this might appear to be the most practical, even though it is a somewhat hostile, solution. Once the take over process is completed, any redundant aspects of the new combined firm can be eliminated and the resulting multidisciplinary team can provide a more effective approach to meeting the clients requirements.

There are, however, several difficulties with this approach. The first problem is that several of the local operations are branch offices of much larger companies and it is highly unlikely that a local firm has the resources to take them over. Secondly, among the locally based firms, the business volume and profit margins do not appear to be adequate to generate the capital that would be required in a hostile take-over situation. Similarly, if a local firm or branch office wants to get out of business in Kitimat, it doesn't make sense to buy them out since the reason they want to leave is because they can't make a profit so; they will eventually close down anyway.

10 RECOMMENDATIONS

Since Alcan has no intention of increasing its in-house engineering capacity to meet its needs, Alcan requires the services of engineering consulting firms based in Kitimat. This creates a dependency where, anything that negatively impacts the consultants ultimately has a negative impact on Alcan's operations.

Given the existing economic climate in Kitimat, there are no local consulting engineering firms willing to take the risk of investing more in Kitimat either by expanding their services, or by committing more resources or by buying out competitors. Since it is too expensive to import engineering support from Quebec, Alcan must adopt practices and policies that will ensure that local consultants are economically viable and possess the technical expertise required to meet the smelter's needs. Failure to do this will put the operation of the smelter at risk due to environmental considerations, health and safety concerns or critical production equipment failure.

Options are limited but Alcan can identify a small number of key consulting firms and provide them with enough work to ensure that they are economically viable and that they can retain key technical expertise. This can be in the form of a yearly contract or a committed dollar amount to each firm.

At the same time, the use of one-person consultants both as outside consultants and resident engineers should be discontinued and this will provide more work for the larger consulting firms and help them stay in business. Providing larger contracts to the key consulting firms will provide them with a larger and more stable workload. This in turn should provide Alcan with a negotiating position to bargain for better rates.

The consequence of Alcan concentrating their work with a few key consultants will be that some, or all of the others, will go out of business. This could actually prove to be a benefit to the remaining consultants since they may be able to recruit experienced staff that are willing to live in Kitimat from these failed firms. This will ease the burden of recruiting and retaining experienced staff for the consultants which will ultimately be beneficial to Alcan.

At the corporate level, Alcan would make a big difference to the local economic outlook and the future of the community by announcing a smelter modernization project. Obviously this is a decision that must be made at the corporate level and local concerns are not going to influence the decision to any great extent. Having said that, an announcement of this nature, even if the actual project is still several years away, will help local consultants to retain staff since they will see that they have a future in Kitimat and this will benefit the existing operation.

If an announcement on smelter modernization is not imminent, i.e. in the next one to two years, then it is strongly recommended that Alcan in Kitimat stop the ongoing downsizing of the in-house engineering group. The uncertainty in the community related to Alcan's plans or, lack thereof, is making it difficult for the consultants to attract and retain high quality employees. The loss of experienced in-house engineers combined with the shortage of skilled support from the local consultants puts the operation of the smelter at risk. Even the recommendation to concentrate on a few key consultants may not be enough to ensure sufficient technical expertise exists to nullify this risk.

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